The Field of Competence of Physical and Rehabilitation Medicine Physicians

PART ONE

European Union of Medical Specialists (UEMS)

Section of Physical and Rehabilitation Medicine - Professional Practice Committee

Edited by

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CONTENTS

INTRODUCTION

This book reflects a part of the work done the last 5 years in the Professional Practice Committee of the Physical and Rehabilitation Medicine Section of the European Union of Medicals Specialists (UEMS). UEMS was established in 1958 as the first European Medical body. Since then it has been increased enormously, having a Section and Board for each recognised medical specialty on European level. Our Section of Physical and Rehabilitation Medicine accepts delegates from the European Union States, as well as from associate countries and other European countries interested to participate as observers. Today our Section has about 70 delegates from 40 countries. With these numbers and its broad geographical distribution in Europe is considered the biggest, strongest and more significant European Body in Physical and Rehabilitation Medicine. The Section has three wings, the Board which deals with Educational Affairs, the Professional Practice Committee which deals with the Field of Competence of our specialty and the Clinical Affairs Committee which deals with the standards of Clinical Practice. The overall aim of our work is the harmonisation of education and services throughout Europe.

This book aims to describe the current competence of the Physical and Rehabilitation Medicine physicians in several medical fields of diseases, injuries and other medical problems. Also, it describes the PRM intervention in medical problems during their acute phase, the post-acute phase and in the long term. Besides others it focuses to the significance of the multidisciplinary rehabilitation team, coordinated by a PRM physician. A series of papers having to do with the rehabilitation of musculoskeletal and neurological problems are included. For each paper is written a link to the journal which has published the paper. We would like to express our gratitude and appreciation to the editors of these journals, having given us the permission to use the papers for this publication. Of course the contents of this book are not covering all the field of competence of our specialty. This is way we have decided to name it as Part One.

Since the contents of this book are a series papers published in several PRM journals the recent years, having been written by several PRM physicians, mainly delegates in the UEMS PRM Section, the english language and the way of expression is not always the same. Nevertheless, they reflect the knowledge and experience of our delegates in the several fields of our competence in Europe today and they have been written with the aim of harmonization of services throughout Europe, contributing in Evidence Based Medicine, for convincing the officials of the several national health systems for our field of competence and for a better and more understandable communication among the physicians of other specialties relevant to PRM.

Prof. Nicolas Christodoulou

***President of the UEMS PRM Section*!**

Action plan of the Professional Practice Committee-UEMS Physical and Rehabilitation Medicine Section: Description and development of our field of competence

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Gutenbrunner C, Delarque A.

Action Plan of the Professional Practice Committee-

UEMS Physical and Rehabilitation Medicine Section: description and development of our field of competence

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The main focus of the Professional Practice Committee of the UEMS-PRM-Section is the description and development of the field of competence (FOC) of the PRM specialists in Europe. The field of competence is an umbrella term for expertise, skills and aptitudes of PRM specialists as well as the way of cooperation and interaction with other specialties and health professionals. Of course, the role of PRM in different settings (from acute hospitals to the community) and the parameters for the access to specialised PRM programs are included too. [1]

In Europe as well as in other parts of the world survival rates from serious disease and trauma are increasing, leading to an increasing number of persons with complex problems and functional disabilities. Additionally life expectancy is increasing among Europe's inhabitants. For instance, life expectancy in Germany rose by almost three years between 1990 and 2000, but by 2030, one person in four will be aged 65 or over. [2, 3] The number of patients with chronic conditions is increasing too. Epidemiologic surveys demonstrate that about 10% of Western Europe's population experience a disability. At the same time there is a growing expectation of good health in today's society. Both tendencies places high demands on health care, especially aiming at an improvement of functioning. Many studies show that PRM is effective in reducing the burden of disability and in enhancing opportunities for people with disabilities. [4-10]

The term functioning is defined in the International Classification of Functioning, Disability and Health (ICF). [11] Within this model functioning is related to the components body functions and structures, activities and participation and influenced by the health condition as well as by personal and environmental factors. It describes the interaction between an individual with a health condition and his or her environment. PRM is concerned with the multi-professional promotion of a person's functioning (Figure 1).

A functional approach is relevant for people with disabilities as well as for patients with chronic conditions. The aim of PRM is to enable people with disabilities to lead the life they would wish and achieve maximum performance and participation. This is

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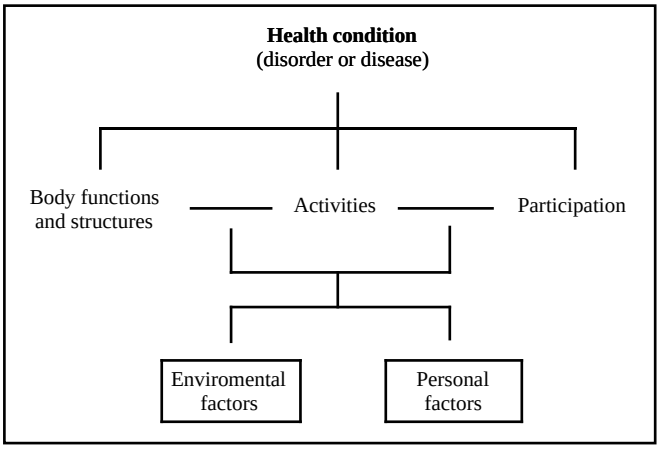

Figure 1.—The current framework of functioning and disability – the WHO International Classification of Functioning, Disability and Health (ICF).

achieved by a combination of measures to overcome or to work around their impairments, to remove or reduce the barriers to participation in the person's chosen environments and to support their reintegration into society. PRM provides methods to improve functioning including all components of the ICF-model and facilitation empowerment and participation of people with disabilities and chronic disabling conditions.

Such activities are relevant in all sectors of the health system, which range from specialised PRM centres and departments in acute hospitals to outpatient and community settings. Acute PRM rehabilitation is important in order to utilise heroplasticity and adaptive capacities as effectively and as early as possible and to reduce the potential for complications. Patients also require PRM interventions in dedicated PRM facilities directed by PRM specialists and those with long-standing, often progressive disabilities and disorders, will need it in the community to ensure that their fitness, health and abilities are maintained and their independence is promoted.

The recent concepts of PRM integrate a patient-centred approach and are based on interdisciplinary cooperation and a multi-professional teamwork (Table I). As any other medical activity PRM is based on diagnostic and staging of underlying pathology. Additionally PRM performs a detailed functional assessment and systematically sets up a medical and social plan in order to coordinate the multi-dimensional interventions. In the course of the PRM programme regular re-evaluation is performed by the PRM-specialists. These activities are necessary in a wide range of pathologies and disabilities.[12]

To perform the tasks in rehabilitation PRM-specialists need a wide range of skills an aptitudes including diagnostic methods, team working skills and have to know about a wide range of interventions, including medication, physical therapies and social measures.[13]

ICF-based conceptual description of Physical and Rehabilitation Medicine

As the comprehensive model of functioning (World Health Organization [WHO]) is the basis of PRM. Stucki and Melvin in cooperation with the Professional Practice Committee made a proposal for a conceptual definition of the specialty.[13]

«PRM is the medical specialty that aims to enable people experiencing or likely to experience disabili-

TABLE I.—*Field of competence of the specialty of Physical and Rehabilitation Medicine (PRM).*

PRM-specialist activities	Rehabilitation teamwork	
Diagnostics — underlying pathology — functional capacities and activities — participation in society — contextual factors Interventions — medical treatments — physical treatments — education and psycho-social interventions	Rehabilitation team — physiotherapists — occupational therapists — psychotherapists — social workers — nurses — and others	Interdisciplinary cooperation — other medical specialisations

ty to achieve and maintain optimal functioning in interaction with the environment. It is based on WHO's integrative model of human functioning, the rehabilitative health strategy, and includes the diagnosis and treatment of health conditions. PRM specialists assess functioning, perform or apply biomedical and engineering interventions to optimize capacity and lead and co-ordinate intervention programs in a multidisciplinary iterative problem-solving process to optimize performance. They provide advice to people of all age groups and relevant persons in their immediate environment, service providers and payers along the continuum of care and across sectors in all situations from the acute hospital to the community and along the course of the condition. PRM specialists manage rehabilitation, health and multi-sectorial services. They inform the public and decision-makers about suitable policies and programs in the health sector and across sectors that provide a facilitating larger physical and social environment, ensure access to rehabilitation services as a human right, and empower PRM specialists to provide timely and effective care».[13]

Within this context, rehabilitation is defined as part of PRM activities.[14] Of course all other medical activities (general medicine and specialised care) as well as many social, vocational and other measures may contribute to comprehensive rehabilitation. The description of Stucki *et al.*[15] is as follows:

«Rehabilitation is the health strategy that, based on the WHO's integrative model of human functioning and disability, aims to enable people with health conditions experiencing or likely to experience disability to achieve and maintain optimal functioning in interaction with the environment. It achieves its goal by applying and integrating biomedical and engineering approaches to optimize a person's capacity, approaches that build on and strengthen the resources of the person that provide a facilitating environment, and that develop performance in the interaction with the environment. Rehabilitation is the core strategy for the medical specialty pRM, a major strategy for the rehabilitation professions and a relevant strategy for other medical specialties and health professions, service providers and payers in the health sector. It is also a relevant strategy for professionals and service providers across sectors, including education, labor and social affairs caring for or interacting with people with health conditions experiencing or likely to experience disability».[14]

Skills and aptitudes of the PRM specialist

The skills and aptitudes of the specialist of PRM are described in the White Book on Physical and Rehabilitation Medicine in Europe that has been adopted by the main European bodies of the field.[11] In this document the diagnostic skills, the set-up of the PRM plan, the team work and the interventions used are described as follows. Additionally a description of the settings in which PRM interventions are performed is given.

Diagnostics, assessment and evaluation

PRM doctors recognise the need for a definitive diagnosis prior to treatment and problem-orientated PRM programme. In addition, they are concerned with aspects of functioning and participation that contribute to the full evaluation of the patient in determining the treatment goals. These are reached in conjunction with the person with disability, his or her family and members of the PRM team.

Diagnostics and assessment in PRM comprise all dimensions of body functions and structures, activities and participation issues relevant for the PRM process. Additionally relevant contextual factors are assessed. History taking in PRM should include analysing problems in all the ICF dimensions.

In order to obtain a diagnosis of structural deficits relevant to the disease and to the PRM programme standard investigations and techniques are used in addition to clinical examination. These include laboratory analysis of blood samples, imaging, etc.

Clinical evaluation and measurement of functional restrictions and functional potential with respect to the rehabilitation process constitute a major part of diagnostics in PRM. These include the clinical evaluation of muscle power, range of motion, circulatory and respiratory functions. Technical measurements may include muscle testing (strength, electrical activity and others), soft tissue and joint echography testing of circulatory functions (blood pressure, heart frequency, EMG while resting and under strain), lung function and others. PRM specialists may use standardised measurements of performance such as gait analysis, iso-kinetic muscle testing and other movement functions. In rehabilitation of patients with certain conditions specialised diagnostic measures will be required, *e.g.* dysphagia evaluation in patients with stroke, urodynamic measurements in patients with

spinal cord injury, or executive function analysis in patients with brain injury.

Patients' activities can be assessed in many ways. Examples of two important methods are:

— standardised activities of single functions performed by the patient (*e.g.* walking test, grip tests or handling of instruments, performance in standardised occupational settings). These tests can be evaluated qualitatively (assessed by PRM-doctors or specialised therapists) or quantitatively (performance time, capacity to lift loads, and others);

— assessments of more complex activities, such as the activities of daily living (washing oneself, dressing, toileting and others) and performance in day-to-day living (walking, sitting, etc.). These assessments may be performed by rehabilitation professionals or may be as self rated using standardised questionnaires.

Participation is mainly analysed in interviews with the patient through standardised questionnaires. Socio-economic parameters (*e.g.* days of sick leave) are used in order to evaluate social or occupational participation problems.

Many assessment instruments in PRM consider parameters of body functions, activities and participation. They either can focus on the general health status and health related quality of life (so-called generic scales) or deal with specific symptoms of the given disease or health condition (so-called disease- or symptom-specific scales). Both may be used to decide on the indication for PRM interventions measures (assignment) or to assess the result of the intervention (evaluation). The appropriate instruments and methods have to be chosen in accordance with the individual functional problem and the phase of the PRM programme.

The relevant contextual factors with respect to the social and physical environment are evaluated by interviews or standardised ICF-based checklists. For the diagnosis of personal factors, *e.g.* coping strategies of the patients´ standardised questionnaires are available.

Many tools can be used to evaluate both global and specific functional capacity as well as the PRM programme. Some cross the individual ICF components. For instance, the Functional Independence Measure and the Barthel-Index incorporate aspects of body functions and activities as well as relevant co-morbidities and the extent of external support needed. The choice of measures will depend on the phase and aims of the rehabilitation process and the functional capacity of the individual.

PRM programme

PRM devise and employ a PRM plan for each individual to direct his or her future problem-orientated PRM programme. Patients actively participate in its development along with the other members of the patient-centred PRM team. The emphasis of the PRM programme varies depending on the particular problems encountered, but the essential elements have a similar basic format. The plan must be regularly reviewed and updated by the PRM team and forms the basis of team members' regular communication on patients' progress during PRM programme.

PRM specialists are responsible for the development of a PRM programme and for identifying the time frame in which it should be delivered. The PRM programme should include information on diagnosis, presenting problems and preserved functions (according to the ICF framework), the individuals' goals, carer and family goals and the professionals' goals.

Interventions in Physical and Rehabilitation Medicine

PRM uses diverse interventions. PRM-specialists develop a PRM programme based on the diagnosis and functional limitation of the patient. Thereafter, the specialist either performs the intervention aiming at solving the given problems or another team member may do so. In other settings the PRM-specialist will prescribe the therapy. Interventions include:

— diagnostic assessments either performed by PRM specialists (using clinical examination, specific tools and methods such as EMG, ultra sound) or performed by other specialists on request of PRM specialists (neuroradiology, ophthalmology, and others);

— medical interventions (*e.g.* medication aiming at restoration or improvement of body structures and/or function, *e.g.* pain therapy, inflammation therapy, regulation of muscle tone, improvement of cognition, improvement of physical performance, treatment of depression). Practical procedures include injections and other techniques of drug administration);

— physical treatments (*e.g.* manual therapy techniques for reversible stiff joints and related soft tissue dysfunctions, kinesiotherapy and exercise therapy,

electrotherapy and others including ultrasound, heat and cold applications, phototherapy, hydrotherapy and balneotherapy, diathermy, massage therapy and manual lymphatic drainage);[14]

— occupational therapy to analyse activities, such as those of daily living and occupation, support impaired body structures (*e.g.* splints), to teach the patient skills to overcome barriers to activity of daily living (*e.g.* adjusting private facilities), and to train in the presence of impaired function and cognition and to facilitate participation such as return to wash;

— speech and language therapy within the framework of complex specialized rehabilitation programmes to evaluate and address problems with communication and may also closely be involved with dysphagia management;

— neuropsychological interventions;

— psychological assessment and interventions, including counselling;

— nutritional therapy;

— disability equipment, assistive technology, prosthetics, orthotics, technical supports and aids;

— patient education;

— rehabilitation nursing.

Physical and Rehabilitation Medicine Practice - Clinical Activities and Settings

PRM specialists are involved in all stages of the rehabilitation and recovery processes, as well as in the care of patients with chronic conditions. They practise in a variety of clinical settings, ranging from acute care facilities, stand alone PRM centres, hospital based PRM facilities departments to community settings and independent specialist practice. Their activities vary according to the clinical settings, but they adopt the same general principles of PRM in all.

Specialised PRM facilities are essential in acute hospitals. There should be dedicated beds under the responsibility of a PRM specialist together with a peripatetic PRM team providing advice and treatments to patients in intensive care units and other acute wards. PRM provides the diagnostics and assessments as well as the interventions both for patients in their dedicated facilities as well as for patients in other wards. The consultative role of the PRM specialist helps to ensure that rehabilitation, functional restoration and prevention of secondary loss of function *e.g.* from immobilisation (such as contracture, pneumonia or thrombosis) start as soon as possible. Early specialised PRM interventions prevent and or reduce long-term restrictions of functioning.

In the immediate period following injury, it is known that the simple act of transferring a brain-injured patient from a busy surgical or neurosurgical ward to the calmer, quieter atmosphere of a PRM ward has a therapeutic effect in itself and improvement in attention, irritability and cognition is observed.[16] Acute general wards are not conducive to the practice of multi-professional rehabilitation for patients with complex needs.[17]

In PRM centres (including day-hospital care) and PRM departments of acute hospitals with beds all patients are seen by a PRM-specialist. He or she investigates the patient, performs functional assessments and explores the influence of contextual factors on functioning. The necessary interventions are selected, *e.g.* physical therapies, psychotherapy, occupational therapy, speech therapy, neuropsychological training, drugs or social interventions. Therapists also evaluate the patient prior to applying their intervention techniques. The results of the PRM-specialist investigations and therapists' functional assessments form the basis for the PRM programme and further decisions made by the rehabilitation team.

Decisions on discharging patients are the responsibility of the PRM-specialist on the basis of team conference, in which the person with disability and the family members actively participate. PRM-specialists provide a comprehensive discharge report on the basis of the investigations and the information provided by the team members. This report covers information on the presenting conditions, the patient's functional state, activity capacity and participation at discharge as well as on the prognosis and recommendations for further care, treatment and rehabilitation.

In out patient departments and private practice, there is a different emphasis on PRM practice. The emphasis here is on diagnostic assessment and initiation of treatment. After an investigation and functional assessment, patients are prescribed either a single course of therapy (PT, OT, or others) or, if multi-professional rehabilitation is required, a team approach is adopted. Following treatment, the PRM-specialist reassesses the patient and decides on further interventions or discharge back to the primary physician, as appropriate.

PRM-specialists cooperate closely with the patient

and family and aim to communicate well with the patients' general practitioner and with other specialists, particularly, when diagnostics or interventions are needed in other medical fields *e.g.* neurology, cardiology, orthopedic surgery etc.

PRM specialists in addition work with specialised community rehabilitation teams (such as those for acquired brain injury, for chronic neurological disease, for transitional problems or for musculoskeletal disorders) and also provide advice to general community teams.

Future activities

The above given definitions and descriptions are a starting point for further discussions and a consensus finding process at a European level. Based on this the tasks and field of competence of the PRM specialist in the different clinical settings and in rehabilitation programs for special groups of patients will be described more in detail. Examples for this are

— the role of PRM in Acute Rehabilitation Units (ARU) and peripatetic Acute Rehabilitation Teams (ART);

— the role of PRM in rehab teams (and access to therapists);

— the role of PRM in integrative care concepts;

— the cooperation with other medical specialties;

— the role of PRM in community based rehabilitation;

— the contribution of PRM in rehabilitation of children and of elderly people;

— the role of PRM in rehabilitation of defined medical conditions.

For the gathering of information and discussion a series of special sessions will be implemented in National and European congresses within the field. The process of consensus will be open to all European specialists interested and coordinated by the UEMS-PRM-section. Continuous information will be provided on the website of the Section.[18]

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Describing and developing the field of competence in Physical and Rehabilitation Medicine (PRM) in Europe

Preface to a series of papers published by the Professional Practice Committee of the PRM Section of the Union of European Medical Specialists (UEMS).

http://www.ncbi.nlm.nih.gov/pubmed/21126937

Gutenbrunner C, Neumann V, Lemoine F, Delarque A.

Describing and developing the field of competence in Physical and Rehabilitation Medicine (PRM) in Europe – preface to a series of papers published by the Professional Practice Committee of the PRM section of the Union of European Medical Specialists (UEMS)

Décrire et développer le champ de compétences en Médecine Physique et Réadaptation (MPR) en Europe. Préface d'une série d'articles publiés par le Comité des pratiques professionnelles de la section MPR de l'Union européenne des médecins spécialistes (UEMS)

1. English version

The field of competence (FoC) of specialists in Physical and Rehabilitation Medicine (PRM[1]) in Europe follows principles previously described in the White Book of Physical and Rehabilitation Medicine in Europe [5,6]. An agreed basis for the FoC is the European Board curriculum for the PRM-specialist certification (www.euro-prm.org). However, there is considerable diversity in PRM practice between countries in Europe. Even within a country, the professional practice of the individual doctor may vary because of the specific setting he or she is working in.

Fig. 1 gives an overview of factors influencing the professional practice of a PRM specialist. As in every specialty, education and training forms the basis of professional practice. Following basic medical training, the PRM curriculum is based not only on traditional medical principles (diagnosis, functional evaluation, treatment and monitoring outcome) but also the ICF-model [12], and scientific evidence. Three additional factors influence professional practice:

- the nature of underlying health conditions as classified in the International Classification of Diseases (ICD) [13] as well as the levels of functioning as classified in the International Classification of Functioning Disabilities and Health (ICF) [12];
- the setting: this includes the facilities, programmes, equipment (as classified in the International Classification of Health Interventions ICHI) [11], and team structure;
- the public health strategy of the country or region including the health care system, funding systems, epidemiology of diseases, and disabilities as well as the general health policy.

Last but not least, continuous evaluation and quality management as well as ongoing scientific work are factors improving the quality of professional practice in PRM.

In order to describe and further develop the field of competence of PRM specialists, a series of papers will be discussed and approved in the UEMS-PRM-Section (especially in the Professional Practice Committee) in cooperation with other national and international bodies. These papers will deal with PRM work in specific setting (e.g. acute hospitals, interdisciplinary team work) and for specific indications (e.g. patients whose activities are limited by neurological disorders).

PRM specialists treat a wide range of pathologies and functional deficits [5,6]. The remit of PRM is to address functional limitations affecting, for example, mobility, communication, activities of daily living, participation in work, and leisure activities (see below). This is achieved not only by treating the underlying pathology and preventing complications, but also by interventions at environmental, family, social, professional, and recreational levels Thus PRM is a ''transverse'' specialty with a comprehensive focus on all dimensions of functioning. PRM-programmes also include preventive strategies [5,6].

In order to reach these targets, different from one patient to another and tailored for each one, the PRM specialist has to be

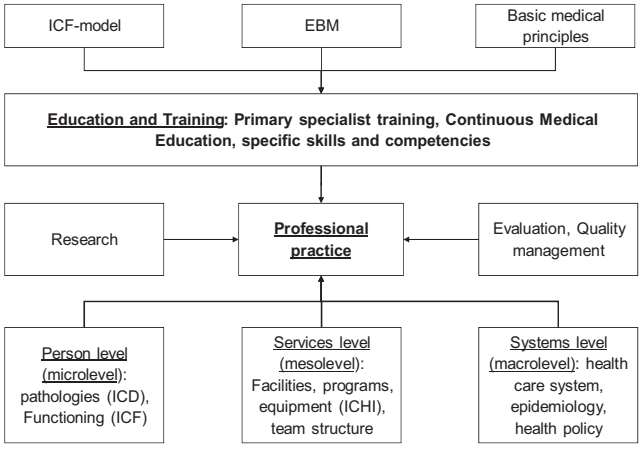

Fig. 1. Factors influencing professional practice in Physical and Rehabilitation Medicine.

aware of a wide range of treatment modalities (drugs, physical therapies, orthoses and prostheses, assistive and rehabilitative technologies as well as in some cases, surgery) and to be able to coordinate interprofessional teams involving people from health, social, and technical fields [8]. PRM specialists have also to cooperate with other specialist physicians in diagnosis of health conditions, evaluation of systems and of functions and specialized treatments, including embedded or interactive systems, signal and detection processing devices. This includes consultations as well as patient-centred team conferences (Fig. 2).

PRM specialists need to have empathy to motivate and coordinate a team and to communicate effectively with patients, their families, with other professionals involved in the treatment and the follow-up. These skills are of uppermost importance and form part of the teaching and training programme of the PRM specialist [7].

PRM is supported by evidence-based medicine, which, in turn, is discussed within national and European PRM scientific societies. National and European guidelines are regularly edited [14,15,1]. An UEMS PRM accreditation system for the accreditation of the quality of PRM programmes has been running since 2008 (www.europrm.org) [2].

PRM interventions are relevant during the acute phase of illness, the post-acute phase, and may be lifelong in some circumstances (Fig. 3). PRM specialists may therefore work within acute care units, within post-acute care or in longterm facilities [3]. They may also work in ambulatory (out-patient) facilities, or in community settings. PRM specialists may treat very different pathologies ranging from low back pain to brain injury, with the same objectives – to restore function and optimise participation and quality of life [5,6]. In these diverse situations, with different life consequences, PRM specialists will nevertheless use the same evaluation process, based on clinical diagnosis using the International Classification of Diseases framework and the evaluation of disabilities, activity limitations and participation restrictions as related to the ICF-model [9,10].

The Professional Practice Committee of the PRM Section intends to publish a series papers aiming to describe and further develop the FoC of PRM and to make this information accessible for everybody interested. Main target groups are professionals in medicine, students, and residents as well as persons with responsibilities within health care system and health policies especially in the sector of rehabilitation. These papers will also be part of the ebook of the committee. The papers describe the role of the PRM specialist in general, in specific settings, and in persons with disabilities and defined health conditions. Thus it will not describe rehabilitation or treatment concepts in general but focus on skills, aptitudes, and competencies of PRM specialist.

The papers on FoC in PRM start from the premise that PRM activities are relevant to all sectors of the health system [4]. They are based on general medical principles, specific skills, and aptitudes for the treatment and rehabilitation of people with disabilities and chronic conditions as well as on the comprehensive model of functioning as defined in the International Classification of Functioning, Disability, and Health (ICF) [12,9]. Additionally, it takes into consideration that professional practice of the PRM doctor is influenced by

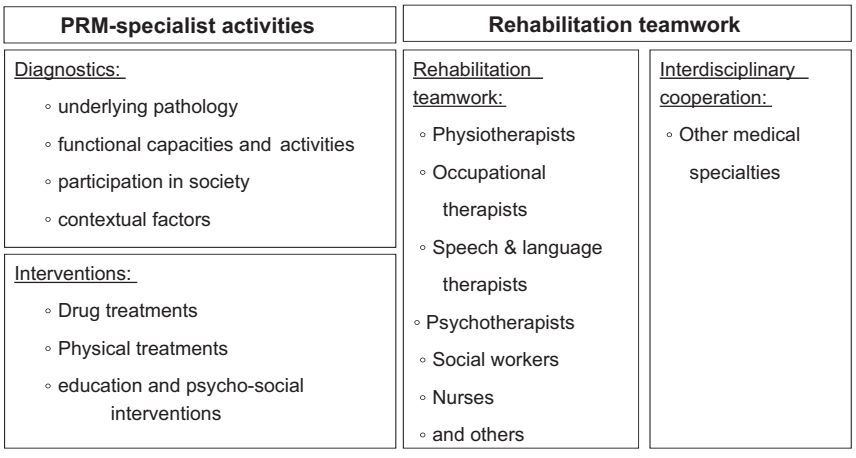

Fig. 2. The field of competence of Physical and Rehabilitation Medicine including diagnostics and assessment, interventions and teamwork.

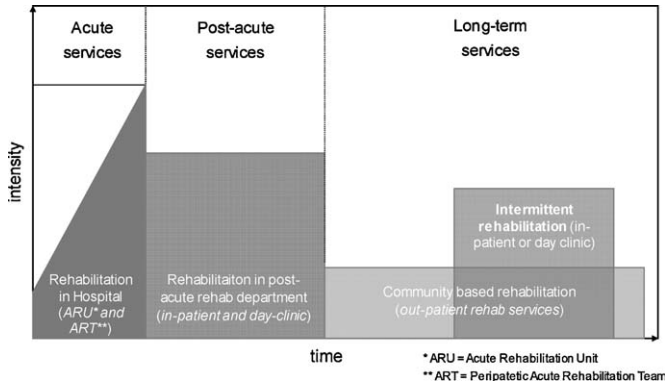

Fig. 3. Sectors of PRM-practice.

scientific results and quality control as well as the context in which the work is done. This includes the micro- (level of the person to be treated, its pathologies, and level of functioning), meso- (level of services including facilities, programmes, equipment, and team structure), and macrolevel (level of health care systems, epidemiology of functioning, and health policies) [4].

The ebook on the field of competence will be one of three ebooks published by the UEMS-Section and Board of Physical and Rehabilitation Medicine. The other parts are the ebook on Quality of Care in Physical and Rehabilitation Medicine (editor: Georges De Korvin) and the ebook on Education in Physical and Rehabilitation Medicine (editor: Franco Franchignoni).

The editors of the series of papers and the ebook hope the publication will induce a debate on the field of competence of PRM in Europe and thus contribute to further development of PRM and hence to improvements that benefit people with disabilities and chronic disabling health conditions and to society.

2. Version française

Le champ de compétences (CC) des spécialistes en Médecine Physique et Réadaptation (MPR) en Europe suit les principes décrits précédemment dans le libre blanc de la MPR en Europe [5,6]. Un socle agréé pour ce CC est le cursus du Board européen élaboré pour la certification des spécialistes en MPR (www.euro-prm.org). Cependant, il existe une diversité considérable des pratiques de MPR entre les pays d'Europe. Même dans un pays donné, la pratique de chaque médecin peut varier en fonction de son environnement de travail.

La Fig. 1 donne un aperçu des facteurs influençant la pratique professionnelle des spécialistes en MPR. Comme dans toutes les spécialités, l'enseignement théorique et pratique forment la base de l'exercice professionnel. Venant à la suite de l'enseignement médical de base, le cursus de MPR est fondé non seulement sur les principes médicaux traditionnels (diagnostic, évaluation fonctionnelle, traitement et suivi), mais aussi sur le modèle de l'International Classification of Functioning Disabilities and Health (ICF) [12] et sur les preuves scientifiques. Trois facteurs supplémentaires influencent l'exercice professionnel :

- la nature de l'état de santé sous-jacent selon l'International Classification of Diseases (ICD) [13] mais aussi les niveaux de fonctionnement selon l'ICF [12] ;
- l'environnement : c'est-à-dire l'offre de soins, les programmes de soins et l'équipement (selon l'International Classification of Health Interventions [ICHI]) [11] et la composition des équipes ;
- la politique de santé publique du pays ou de la région ce qui inclut le système de soins, le système de remboursement, l'épidémiologie des maladies et des incapacités et plus généralement l'organisation globale de la santé.

Enfin, mais c'est essentiel, l'évaluation permanente et la démarche qualité ainsi que la réalisation de travaux scientifiques sont des facteurs d'amélioration de la pratique professionnelle en MPR.

Pour décrire et continuer à développer le champ de compétence des spécialistes en MPR, une série d'articles sera élaborée puis approuvée à la section MPR de l'UEMS (en particulier par le comité des pratiques professionnelles) en coopération avec d'autres organismes nationaux et internationaux. Ces articles traiteront de la pratique de la MPR dans des environnements particuliers (hôpital de court séjour, équipe interdisciplinaire) ou pour des indications spécifiques (par exemple patients dont les activités sont limitées par des problèmes neurologiques).

Les spécialistes en MPR traitent une grande variété de pathologies et de déficits fonctionnels [5,6]. La mission de la MPR est de s'intéresser aux limitations fonctionnelles concernant par exemple la mobilité, la communication, les activités de la vie quotidienne, la participation au travail et aux activités de loisirs (voir ci-dessous). Cela est obtenu non seulement en traitant la pathologie sous-jacente et en prévenant les complications mais aussi par des interventions à un niveau environnemental, familial, social, professionnel et de loisir. La MPR est donc une spécialité transversale qui s'intéresse à

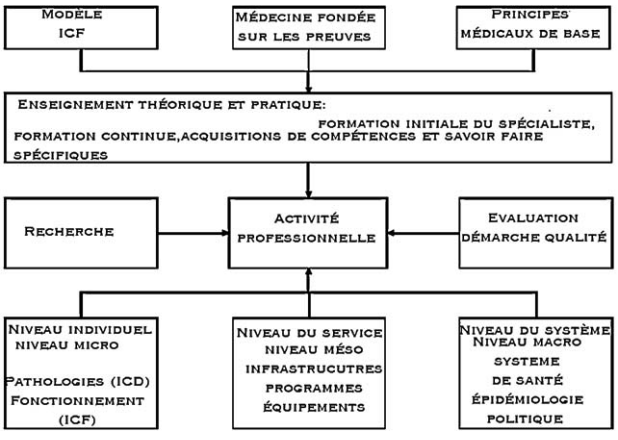

Fig. 1. Facteurs influençant l'exercice professionnel en Médecine Physique et Réadaptation (MPR).

toutes les dimensions du « fonctionnement ». Les programmes de soins en MPR incluent aussi des stratégies de prévention [5,6].

Pour atteindre ces objectifs, différents d'un patient à l'autre et donc élaborés sur mesure, le spécialiste en MPR doit connaître une grande variété de modalités thérapeutiques (médicaments, traitements physiques, appareillage, technologie d'assistance et de rééducation, et aussi dans certains cas la chirurgie). Il doit être aussi capable de coordonner des équipes interprofessionnelles associant des personnes venues des champs de la santé, du social et de l'ingénierie. Le spécialiste en MPR doit aussi coopérer avec d'autres médecins spécialistes dans le diagnostic de l'état de santé, l'évaluation des pathologies et des fonctions et dans des traitements spécialisés. Cela suppose des consultations mais aussi des réunions d'équipe autour d'un cas particulier (Fig. 2).

Les spécialistes en MPR doivent avoir une certaine empathie pour motiver et coordonner une équipe et pour communiquer utilement avec les patients, leurs familles et les autres professionnels impliqués dans le traitement et le suivi. Ces capacités sont de la plus grande importance et font partie du programme éducatif théorique et pratique du spécialiste en MPR [7].

La MPR repose sur la médecine fondée sur les preuves, qui, en retour, est établie au sein des sociétés scientifiques de MPR nationales et européennes. Des recommandations nationales et européennes sont régulièrement éditées [14,15,1]. Un système d'accréditation en MPR fonctionne sous l'égide de l'UEMS pour l'accréditation de la qualité des programmes de MPR depuis 2008 (www.euro-pmr.org) [2]. La MPR est utile durant la phase aiguë de la maladie, la phase subaigüe, et même tout au cours de la vie dans certaines circonstances (Fig. 3). Les spécialistes en MPR peuvent de ce fait travailler dans les services de court séjour, dans les services de soins de suite ou dans les établissements de soins de longue durée [3]. Ils peuvent également travailler dans des structures ambulatoires ou dans des dispositifs extrahospitaliers. Les spécialistes en MPR sont susceptibles de traiter des pathologies très différentes allant de la lombalgie au traumatisme crâniocérébral avec les mêmes objectifs, restaurer la fonction, optimiser la participation et la qualité de vie [5,6]. Dans ces diverses situations aux conséquences différentes sur le cours de la vie, les spécialistes en MPR utiliseront cependant la même stratégie d'évaluation, fondée sur un diagnostic clinique utilisant l'ICD et l'évaluation des incapacités, des limitations d'activité et des restrictions de participation selon le modèle de l'ICF [9,10].

Le comité des pratiques professionnelles de la section de MPR a l'intention de publier une série d'articles ayant pour but de décrire et développer le CC de MPR et de rendre cette information accessible à toute personne intéressée. La cible principale est constituée par les professions médicales, les étudiants et les internes, ainsi que toute personne ayant des responsabilités dans le système de santé et les établissements de santé, en particulier dans le domaine de la rééducation. Ces articles feront également partis d'un *ebook* élaboré par le comité. Les articles décrivent le rôle des spécialistes de MPR en général, dans des cadres particuliers et chez des personnes avec des incapacités et un état de santé bien défini. Il ne s'agit donc pas de décrire des concepts de rééducation ou de traitement en général, mais de se focaliser sur les savoir-faire, les aptitudes et les compétences des spécialistes en MPR.

Les articles sur le CC en MPR commencent par le postulat que les activités de MPR s'appliquent à tous les secteurs du système de santé [4]. Ils sont fondés sur des principes médicaux généraux, des techniques et des aptitudes spécifiques aux traitements et à la rééducation de personnes avec des incapacités et des affections chroniques et aussi sur le modèle du fonctionnement défini par l'ICF [12,9]. En plus, les articles prendront en considération la pratique professionnelle du médecin de MPR qui tient compte des données actuelles de la science, du contrôle qualité et aussi du contexte d'exercice. On prend donc en considération trois niveaux : un niveau micro (niveau de la personne à traiter, de ses pathologies et de son niveau de fonctionnement), un niveau méso (niveau de prestations incluant les établissements et les organisations, les programmes, l'équipement, la composition de l'équipe) et un niveau macro (niveau des systèmes de santé, de l'épidémiologie, de la participation, de la politique de santé) [4].

Le *ebook* des champs de compétences sera l'un des trois *ebook* publié par la section de l'UEMS et le Board de MPR, à côté du *ebook* sur la qualité des soins en MPR, coordonné par Georges De Korvin et le *ebook* sur l'éducation en MPR, coordonné par Franco Franchignoni.

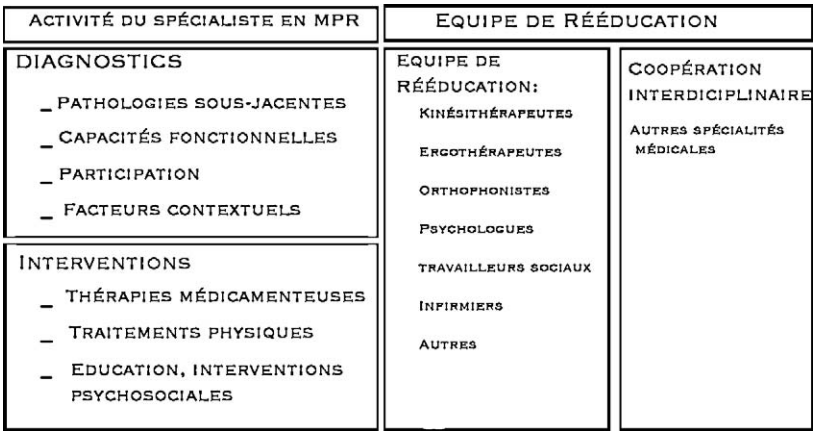

Fig. 2. Le champ de compétences en Médecine Physique et Réadaptation (MPR), incluant le diagnostic, l'évaluation, l'intervention directe et le travail d'équipe.

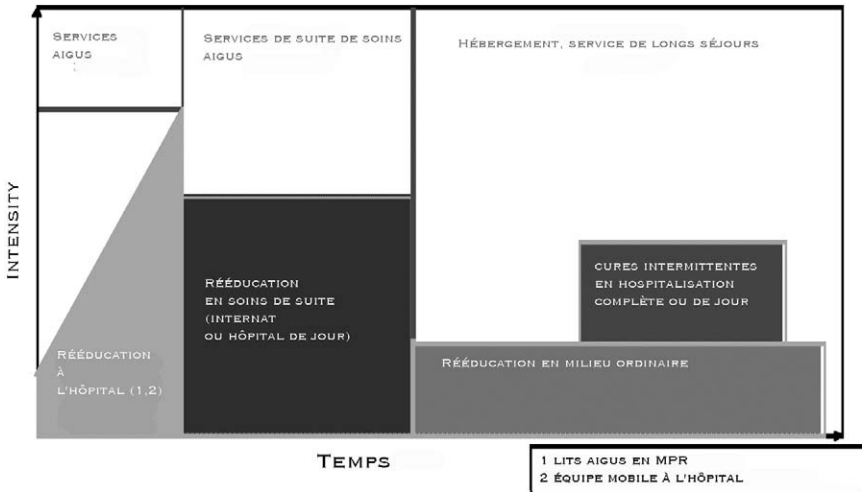

Fig. 3. Secteurs d'activité en Médecine Physique et Réadaptation (MPR).

Les rédacteurs de la série d'articles et de l'*ebook* espèrent que cette publication amènera un débat sur le champ de compétences de la MPR en Europe et ainsi contribuera à la poursuite du développement de la MPR au plus grand bénéfice des personnes présentant des incapacités ou une maladie chronique invalidante mais aussi au plus grand bénéfice de la société.

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INTERDISCIPLINARY TEAM WORKING IN PHYSICAL AND REHABILITATION MEDICINE

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From the UEMS-PRM-Section, [1]UK delegate and member of Professional Practice Committee, [2]German delegate and Chairman of Professional Practice Committee, [3]Austrian delegate and member of Professional Practice Committee, [4]Cypriot delegate and member of Professional Practice Committee, [5]Spanish delegate and member of Professional Practice Committee, [6]Italian delegate and member of Professional Practice Committee and [7]French delegate and President of Physical and Rehabilitation Medicine Section

Effective team working plays a crucial role in Physical and Rehabilitation Medicine (PRM). As part of its role of optimizing and harmonizing clinical practice across Europe, the Professional Practice Committee of Union of European Medical Specialists (UEMS) Physical and Rehabilitation Medicine (PRM) Section reviewed patterns of team working and debated recommendations for good practice at a meeting of national UEMS delegates held in Riga, Latvia, in September 2008. This consensus statement is derived from that discussion and from a review of the literature concerning team working.

Effective team working produces better patient outcomes (including better survival rates) in a range of disorders, notably following stroke. There is limited published evidence concerning what constitute the key components of successful teams in PRM programmes. However, the theoretical basis for good team working has been well-described in other settings and includes agreed aims, agreement and understanding on how best to achieve these, a multi-professional team with an appropriate range of knowledge and skills, mutual trust and respect, willingness to share knowledge and expertise and to speak openly.

UEMS PRM Section strongly recommends this pattern of working. PRM specialists have an essential role to play in interdisciplinary teams; their training and specific expertise enable them to diagnose and assess severity of health problems, a prerequisite for safe intervention. Training spans 4–5 years in Europe, and includes knowledge and critical analysis of evidence-based rehabilitation strategies. PRM physicians are therefore well-placed to coordinate PRM programmes and to develop and evaluate new management strategies. Their broad training also means that they are able to take a holistic view of an individual patient's care.

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Key words: interdisciplinary, team work, physical and rehabilitation medicine, organization, networks, care pathways.

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BACKGROUND

Every medical specialty has to define its fiel d of competence and to improve professional skills and competencies. Physical and Rehabilitation Medicine (PRM) has been defined by the Section of Physical and Rehabilitation Medicine of the European Union of Medical Specialists (UEMS) (1). The background as well as the skills and aptitudes and the role of PRM specialists in the rehabilitation process are described in the *White Book on Physical and Rehabilitation Medicine in Europe* (2, 3). A conceptual description of the field, based on the model of the International Classification of Diseases (ICD), and of Functioning, Disability and Health (ICF) has been published by the Professional Practice Committee of the UEMS-PRM-Section (4). A consensus paper about the Field of Competence (FOC) of PRM specialists, focusing on skills and aptitudes and on clinical work will be published soon (5).

The FOC of specialists in PRM is based on the Education and Training curriculum as defined by the European Board for PRM (6) as well as by national authorities or professional colleges in the various European countries. It is based on fundamental medical principles (establishing a diagnosis, functional evaluation, treatment-plan, and evaluation), the ICF-model (7) of body function and structure, activities, participation and contextual factors, and scientific results (evidence-based healthcare). However, professional practice of a single specialist is also influenced by other factors, e.g. the type of patients to be treated, the settings and the public health strategy of the country or region, the epidemiology of diseases and disabilities in that country as well as the general health policy (5). Last but not least, continuous evaluation and quality management as well as ongoing scientific work are factors

improving the quality of professional practice in PRM.

In order to describe and further develop the field of competence of PRM specialists, a series of position papers will be discussed both within the UEMS PRM-Section (especially in its Professional Practice Committee) and with other national and international bodies. These papers will deal with PRM work in specific settings (e.g. acute hospitals) and for special indications (e.g. people with neurological disabilities). This paper is part of this activity and deals with interdisciplinary team work. It has been approved by the General Assembly of the UEMS PRM-Section at the occasion of its meeting in Riga in September 2008. Publication at this stage is intended to generate further discussion and refinement. For that reason comments to the authors or editors are very welcome.

INTRODUCTION

PRM aims at optimization of activity, social participation and quality of life of people with acute and/or chronic health conditions (i.e. agreed aims). This involves empowering the individual to achieve autonomy and typically entails: establishing a diagnosis; treating the underlying pathology where possible; reducing impairment; reducing the impact of impairment on activities; modifying context where possible to facilitate participation; and preventing and treating complications.

PRM is necessary to reduce the consequences of disease and trauma in patients with severe and complex problems. These may include loss of employment following an insult to the brain or spinal cord, immobility following trauma or reduced performance after myocardial infarction. Additionally, impairments such as pain, nutritional difficulties, incontinence, communication disorders, mood and behavioural disturbance have to be addressed. Another key task in PRM is prevention of complications such as pressure ulcers and contractures and minimization of problems such as behavioural disorders in brain injury or mood disturbances associated with pain.

The aim of this position paper is to review the rationale for interdisciplinary team working in PRM and describe optimal working patterns for such teams.

INTER-DISCIPLINARY TEAM WORK

As stated in a previous UEMS resolution (Appendix I), team working is considered essential for many reasons. These include the broad range of knowledge and skills required to: diagnose and assess impairments, activity limitations and participations restrictions; select treatment options, often from a diverse range. For example, management of back pain may include education, advice to continue usual activities, medication, physical therapy and, rarely surgery; co-ordinate varied interventions to achieve agreed goals; and critically evaluate and revise plans/goals to respond to changes in the patient's health and function.

No single clinician is likely to have the necessary skills to achieve optimal results alone.

The overwhelming view amongst PRM specialists who represent their nations at UEMS is that *"interdisciplinary working"* is the preferred pattern of team working. This means that PRM teams not only comprise members from many different professional backgrounds, but also work towards agreed aims and using an agreed and shared strategy.

Since that UEMS resolution, scientific evidence has accrued to strengthen the case for team working in PRM programmes. However, published studies to date have tended to use the term "multidisciplinary team" (MDT). As the exact nature of the relationship between team members is not always specified, this term is used in the following literature review.

Studies have shown superior clinical outcomes in patients with a range of disorders treated by units with MDT working patterns compared with other settings. These data are summarized in Table I.

Evidence is particularly strong for cerebro-vascular disease (stroke), where MDT-based services also yield significantly better survival data. The Stroke Unit Triallists' Collaboration (15) have published data concerning 3249 patients in Sweden, Finland, Australia, Canada and UK randomized to stroke units with MDT working or routine care. Amongst the latter, only 277 out of 1346 participants were exposed to multidisciplinary PRM programmes. Stroke units (with MDTs) showed better

Table I. *Summary of literature*

Clinical field	First author (ref)	Studies (No. of participants)	MDT more effective?
Sub-acute low back pain – multidisciplinary biopsycho-social intervention	Karjalainen, 2009 (8)	2 RCTs (233)	Earlier return to work with MDT intervention
Coronary heart disease – multidisciplinary disease management	McAlister, 2001 (9)	12 (9803)	Fewer admitted, better control of risk factors. MI recurrence and survival unchanged
Chronic disabling lung disease – outpatient multidisciplinary rehabilitation	Griffiths, 2000 (10)	1 RCT (200)	Lower hospital and home visit rates better walking and health status
Heart failure – community MDT treatment vs usual care	Stewart, 1999 (11)	1 RCT (200)	Fewer admitted, better diet and drug compliance, survival same
Multiple sclerosis – inpatient MDT	Khan, 2008 (12)	8 RCTs (747)	Better activity participation, impairment unchanged
Brain injury – community MDT vs information only	Powell, 2002 (13)	1 RCT (110)	Better than information alone
Severe TBI – MDT vs standard hospital care	Semylen, 1998 (14)	1 quasi-random	Better clinical outcome and carers less distressed

survival. Only 23.8% of those in stroke units died in the first 4 weeks compared with 27.8% of those not in stroke units. This difference was especially noticeable in those with severe stroke (Barthel Index less than 15/100 on admission); fewer neurological, cardiovascular and immobility-related deaths. The authors concluded this was not due to medication; and patients were less likely to need institutional care because they were less dependent. The authors proposed that this might be attributable to more encouragement and support for carer involvement in PRM programmes by the MDT.

ORGANIZATION WITHIN THE TEAMS

The clinical literature provides limited guidance on what makes a good team. However, key features of successful team working in other situations have been utilized to provide guidance for PRM physicians in highly respected rehabilitation texts, such as that edited by DeLisa (16). These include (17):

- agreed aims
- agreement and understanding on how best to achieve these (avoiding jargon unique to a particular profession)
- appropriate range of knowledge and skills for the agreed task
- mutual trust and respect
- willingness to share knowledge and expertise and speak openly

The team should work with people with disabilities and their families to negotiate and agree on appropriate, realistic and timely treatment goals within an overall coordinated rehabilitation programme (1). These goals should be person-centred, should not be imposed on the individual and should be endorsed by the team as a whole rather than by a single professional. Goals also need to be adjusted repeatedly as the PRM programme proceeds.

KEY MEMBERS OF INTERDISCIPLINARY TEAMS IN PRM, THEIR QUALIFICATIONS AND ROLES

Successful teams will need to include a wide range of knowledge, aptitudes and professional skills, and members will primarily include: PRM specialists; nurses with rehabilitation expertise; physiotherapists; occupational therapists; speech and language therapists; clinical psychologists; social workers; prosthetists and orthotists; and dieticians.

A range of additional clinicians may also be required, depending on the clinical field and specific needs and goals of each patient. On the other hand, for some patients and at certain stages in their PRM programmes, only a few of the above disciplines, and sometimes only the PRM physician, would be involved. It should be noted that in many parts of Europe the decision to involve particular team members rests with the doctor, who also holds medico-legal responsibility for people under his/her care. Elsewhere, such decisions (and legal responsibility) are shared amongst team members. Clearly, the method of working must be in keeping with each country's pattern of medico-legal responsibility.

Team members must be appropriately qualified. Knowledge and respect for the skills and aptitudes of the other team members is required. Each team member should recognize what particular knowledge and skills he or she can offer to the PRM programme (18).

In common with other interdisciplinary team members, PRM specialists have a duty to provide adequate information, training and support to others. However, each health professional has individual responsibility to uphold his or her profession's standards

The following are some of the competencies typically associated with specific professions, although considerable overlap occurs in practice:

- Physicians: diagnosing the underlying pathology and impairments, medical assessment and treatment, setting-up treatment and rehabilitation plan, prescription of pharmacological and non-pharmacological treatments and assessment of response to these.
- Rehabilitation nurses: addressing and monitoring day-to-day care needs. Expertise in the management of tissue viability and continence problems. Providing emotional support to patients and their families.
- Physiotherapists: detailed assessment of posture and movement problems, administering physical treatments including exercise to restore movement and alleviate pain, etc.
- Occupational therapists: assessing the impact of physical or cognitive problems on activities of daily living, return to work, education and/or leisure activities, etc. Providing expertise on strategies that can be used by the patient and his/her family and environmental adaptations to facilitate independence.
- Speech and language therapists: assessing and treating communication and swallowing disorders.
- Clinical psychologists: detailed assessment of cognitive, perceptual and emotional/behavioural problems. Development of strategies to manage these with the patient, his/her family and with other health professionals.
- Social workers: promoting participation, community reintegration and social support.
- Prosthetists, orthotists and rehabilitation engineers: expertise in the provision of technologies ranging from splints and artificial limbs to environmental controls to address functional limitations, for example, following limb loss, loss of independent mobility, loss of ability to communicate.
- Dieticians: assessing and promoting adequate nutrition.

RELEVANCE OF MEDICAL DIAGNOSIS FOR THERAPY AND REHABILITATION

Every clinical intervention has to address the health condition, impairments, activity limitations and participation restrictions. However, virtually every rehabilitation intervention has risks, which may be magnified if the underlying medical diagnosis, its severity and potential complications have not been properly evaluated. This is the case for both drug and physical treatments. Examples are: manipulation of the spine in someone

with, for example, undiagnosed spinal malignancy or aplasia of dens axis; rotation of the hip-joint after total hip replacement; massage under the condition of anticoagulation; and attempted mobilization with artificial limbs in patients with inadequate cardiopulmonary reserve as a consequence of, say, ischaemic heart disease.

For this reason, a thorough medical diagnosis and assessment is essential prior to every rehabilitation intervention. This principle is enshrined within the Medical Act (19), whose agreed definition is given below:

"The medical act encompasses all professional action, e.g. scientific teaching training and educational, clinical and medico-technical steps to promote health and functioning, prevent diseases, provide diagnostic, therapeutic and rehabilitative care to patents, individual groups or communities and is the responsibility of and must always be performed by a registered medical doctor/physician or under his or her direct supervision and/or prescription."

SAFE CARE PATHWAYS

Patients will almost invariably need more than one rehabilitation intervention during their PRM programme. Such interventions are likely to be delivered in different places by different PRM teams and at different times in what is called the patient journey or the "care pathway". This process has to be managed seamlessly. Networks, links with other specialists and clinical services, also need to be well-delineated, but fluid enough to respond to the patient's changing needs.

For PRM programmes to function optimally, interdisciplinary members must understand their specific contribution to each patient's care pathway. Other health professionals are trained to a high level of expertise to assess specific impairments within their fields. However, PRM specialists have a unique responsibility for providing an integrated description of an individual's pattern of pathologies and impairments.

People in whom complex problems are exerting a significant impact on functioning according to the ICF model, are best served by carefully organized PRM programmes under the direction of a specialist in PRM. This applies to both in-patient and ambulatory settings as well as to private practice.

CONCLUSION

In summary, evidence from published scientific literature from larger trials indicates that PRM programmes with multidisciplinary teams achieve better results in, for example, those with sub-acute and chronic low back pain, cardio-respiratory and neurological disorders than services that lack such PRM teams. Indeed, good team working may have a significant influence on survival.

Whilst there is limited evidence concerning what constitute the key components of successful teams in PRM programmes, the theoretical basis for good team working has been well-described in other settings. This includes: agreed aims; agreement and understanding on how best to achieve these (avoiding jargon unique to a particular profession); appropriate range of knowledge and skills for the agreed task; mutual trust and respect; and willingness to share knowledge and expertise and speak openly.

UEMS PRM Section therefore believes there is a very strong case for recommending this pattern of working.

PRM specialists have an essential role to play in interdisciplinary teams; their training and specific expertise enables them to diagnose and assess severity of health problems, a prerequisite for safe intervention. Their broad training also means they are able to take holistic view of an individual patient's care, and are therefore well-placed to coordinate PRM programmes and develop and evaluate new management strategies.

ACKNOWLEDGEMENTS

We wish to acknowledge the very helpful comments on thi s paper received from other members of the UEMS Professional Practice Committee when it was discussed at their meeting in Riga on 5 September 2008. This paper represents a synthesis of views expressed there.

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"In all integrated Rehabilitation Teams the responsibility for diagnosis and treatment can only belong to a medical practitioner competent in Rehabilitation. He or she alone can take responsibility for modifying the prescribed or alter its administration, taking account of the advice and suggestions proposed by the other members of the team, through their professional relationship with the patient, at the regular team meetings.
In all cases, the final decision and responsibility rest entirely with the competent medical practitioner in medical charge."

Approved unanimously by the executive committee of the UEMS, in Brussels, 28 April 1989.

Approved by the General Assembly of the "Standing Committee of European Doctors", 1990.

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EUROPEAN UNION OF MEDICAL SPECIALISTS (UEMS) SECTION OF PHYSICAL & REHABILITATION MEDICINE: A POSITION PAPER ON PHYSICAL AND REHABILITATION MEDICINE IN ACUTE SETTINGS

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Physical and rehabilitation medicine (PRM) specialists have an important role in the clinical care of patients during the acute phase of a disabling health condition. This phase is defined as once definitive care or resuscitation has taken place and a patient's need to stay in hospital as an inpatient is primarily for PRM services for rehabilitation. This paper describes 4 models for the delivery of services for people, who, among other indications, continue to require to be inpatients and who will benefit from PRM interventions. These are described, along with their clear benefits during the acute phase of a health condition. This paper describes the options for PRM interventions during the acute phase of a health condition. The first 2 models are the most effective in making best use of the acute facilities and PRM services. The benefits of dedicated PRM beds appear to outweigh those of the other options and may be cheaper, although no cost-effectiveness studies comparing the first 2 options have yet been undertaken. Prospective trials are required to show this benefit, and a number of examples need to be set up to pilot this in order to provide realistic cost-effectiveness data.

Key words: Europe; acute disease; PRM programme development; hospital administraiton; organisational objectives.

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INTRODUCTION

Every medical specialty has to define its field of competence (1). The specialty's character, as well as the role, competence and skills of physical and rehabilitation medicine (PRM) specialists is described in the *White Book on Physical and Rehabilitation Medicine in Europe* (2) (*White book*). Recently, the Professional Practice Committee of the Union Européenne des Médecins Spécialistes (European Union of Medical Specialists; UEMS)-PRM-Section has published a conceptual description of the field, based on the model of the International Classification of Functioning, Disability and Health (ICF) (3) and the International Classification of Diseases (4) and other papers (5). In addition, further data has been given in European Union papers (6, 7).

The definition of acute rehabilitation for the purposes of this paper is the process of rehabilitative treatment that occurs within the first month of injury or illness. This paper refers to the involvement of rehabilitation teams led by a PRM specialist. It is hospital-based and primarily differs from post-acute rehabilitation by virtue of time and by the interaction of the professionals' involvement. Patients enter a programme of goal-oriented multidisciplinary rehabilitation under the responsibility of a PRM specialist. This differs from post-acute PRM programmes, when they may still be in hospital, but are, by this time, usually treated in stand-alone rehabilitation facilities or in PRM departments as ambulatory patients.

Defining the concepts is important, and these definitions reflect those given in the *White Book* (2) (Fig. 1). PRM in acute settings (hereafter called acute or early PRM) is an activity under the clinical responsibility of a specialist in PRM. It delivers a programme of specialist medical rehabilitation for patients during an acute hospital admission following injury, illness or in response to complex medical treatment or its complications. PRM programmes also include the contribution to patient care from the whole of the PRM multi-professional team, with whom PRM specialists work closely, as well, of course, in acute settings, of the other relevant medical and

Fig. 1. Definitions of rehabilitation by WHO and by UEMS EBPRM

The World Health Organization's (WHO) definition of rehabilitation is: "The use of all means aimed at reducing the impact of disabling and handicapping conditions and at enabling people with disabilities to achieve optimal social integration".

The definition of PRM by the Union Européenne des Médecins Spécialistes (European Union of Medical Specialists) (UEMS) Section of PRM is "an independent medical specialty concerned with the promotion of physical and cognitive functioning, activities (including behaviour), participation (including quality of life) and modifying personal and environmental factors. It is thus responsible for the prevention, diagnosis, treatments and rehabilitation management of people with disabling medical conditions and co-morbidity across all ages."

surgical specialties. The members of the team and their roles are described in Section 4.1 and Fig. 5 of the *White Book* (2) and will not be repeated here.

There is a need for hospitals to consider a transfer to early rehabilitation in order to achieve shorter inpatient stays. In reality, once definitive care or resuscitation has taken place and a patient's inpatient stay in hospital is primarily for rehabilitation, dedicating facilities, including beds, for this purpose will bear fruit to meet healthcare priorities. However, the situation is sometimes unpredictable and definitive surgical and other specialized medical care and medical rehabilitation overlap. Functional treatment and acute interventions may be required together at the same time because a patient's medical condition may not yet be stable. This, therefore, identifies the need for providing facilities for PRM programmes in acute settings.

Why should this be under a PRM doctor as opposed to continuing under the acute physician or surgeon or even through a therapist- or nurse-led activity? The reasons are explained in the *White Book* (2). Specialists in PRM have the knowledge and expertise, based on their broad and comprehensive training, as well as the time and resource through their team links to deliver high-quality services, which benefit the patient and his or her family, the provider unit by ensuring an efficient process of care, and health service economics and society at large by promoting the individual's participation in society.

The point of entry to an acute PRM programme is defined as when the priority (or the over-riding emphasis) of care has moved from the definitive acute treatment to one of rehabilitation. Multidisciplinary treatment, interdisciplinary cooperation and good liaison are very important, but it is at this point that the specialist in PRM takes the lead for clinical care.

To clarify the situation for a pan-European readership, it should be noted that, in many countries, the physiotherapy professions providing rehabilitative treatments to many patients under the clinical care of acute medical and surgical specialties are anyway centrally directed by PRM specialists and departments. The activity described below is over and above that.

MODELS

Rehabilitation is provided to patients at a number of levels, as described in the *White Book* (2), but there is a hierarchy of interventions depending on the complexity of patients' problems and functioning and the need for intervention. To many, this will be a single therapeutic intervention by a therapist, whereas other patients will require more specialized attention, such as gait retraining, continence management, etc. PRM in acute settings is characterized by the need for a multi-professional approach to the management and promotion of physical and cognitive functioning, activities (including behaviour), participation (including quality of life) and modifying personal and environmental factors (1, 2). It applies and integrates the biomedical and engineering approach to capitalize on a person's capacity through an approach that builds on and strengthens the resources of the person, provides for a facilitating environment and develops the person's performance in interacting with the environment. This includes the diagnosis and treatment of health conditions (3, 4). It is different from the work of other physicians in acute settings, and can thus be delivered in several ways, for example:

- Transfer of patients to PRM beds in the acute hospital (acute rehabilitation unit (ARU)).
- Establishment of a mobile visiting PRM team under the responsibility of a specialist in PRM, while the patient remains in the referring specialist's bed (acute rehabilitation team (ART).
- Daily visits to the acute wards by specialists from a standalone PRM facility.
- Establishment of facilities in PRM centres to take patients very early to start their PRM programme.

A combination of these is required for most situations with the use of a mobile PRM team intervention for patients in the intensive care unit and a subsequent transfer to an acute PRM bed.

Acute PRM beds (Table I)

The advantages of acute PRM beds are that the PRM team (and, in particular, the nursing and therapist staff) can develop the required PRM philosophy under the direction of the PRM specialist, which changes the emphasis of care from acute medical treatment to one concerned with individual functioning within the framework of both the ICD and ICF. This may promote a change from providing direct care to encouraging and facilitating patients to take charge of their own activities. An adequately staffed PRM facility is vital for this to be successful (see below) and good interaction should exist between it and other rehabilitation settings, where further rehabilitation can occur. Discharge would be fast-tracked to other PRM or rehabilitation services for further rehabilitation, to the patient's home whenever possible, to nursing homes (skilled care facilities) and to acute care facilities (in the event of a post-acute complication or illness, as more dependent and sick patients are discharged earlier from acute wards).

Mobile visiting PRM team (Table I)

A mobile team, which reports to a PRM specialist, is able to advise on setting up PRM programmes and preventing complications in the acute facility until such time as the patient can move to the PRM department for further inpatient or outpatient (ambulatory) rehabilitation, as required. This is particularly important where PRM beds do not exist in an acute hospital. The PRM specialist needs to be an integral part of the team and good collaboration is required with referring specialists and with their own clinical teams, who will implement the PRM plan. The problems to be addressed are mostly at the impairment level, with the aim of improving personal functioning. This is particularly relevant, when patients may not yet have the stamina to attend sufficient outpatient therapy from home. Patients may often be unsafe to be discharged home and may anyway need to be in hospital for further acute treatment of the underlying condition, e.g. dialysis.

Daily visits to acute wards by PRM specialists (Table I)

This is possible where the acute hospital cannot include facilities for the PRM service. The advantages are a closer link between PRM specialists and the medical teams in the acute facility, who also learn exactly what their PRM specialists can and cannot undertake. This is the type of arrangement that could exist where community hospitals admit patients acutely and general practitioners (GPs) and general physicians need to seek the advice of PRM specialists. They will not have the facility to dedicate beds for specialist rehabilitation, and the visit from a PRM specialist will also be valuable in working with community therapists to further the patient's care. The disadvantages of this model of care are that the PRM specialist spends a considerable amount of the working day travelling between the two and cannot really control the quality and exact content of the rehabilitation programme in the acute ward. Although the PRM can produce the required rehabilitation plan for the patient, there needs to be sufficient training and competence amongst those delivering it to ensure that optimal standards exist. A disadvantage of this model is that other members of the PRM team are not involved in developing and delivering the PRM plan.

Establishing acute PRM centres (Table I)

Some centres, particularly in large university hospitals, already fulfil this activity, but they usually extend their role until the patient is able to go home and most do not have strict limitations to the duration of inpatient stays. Setting up new facilities may not be so valuable, as they would duplicate what can be done in acute general hospitals with PRM beds. Taking all the patients referred would never be possible in an acute PRM facility unless the latter was limited to certain strict entry criteria. The dilemma would then be what one would do with those excluded patients.

The acute rehabilitation unit, where acute PRM beds are established in an acute hospital, provides the most comprehensive and preferred option. There will be pressure on these beds and a number of permutations may have to be considered. They may take the form of dedicated facilities in a local hospital for one particular or frequently occurring pathology, e.g. post-hip arthroplasty, stroke, or be grouped at a regional centre for less common or more complex conditions. These units will need to be in close proximity to acute care specialty's facilities and clear care pathways and service networks need to be established for both the transfer of patients into the acute

Table I. *Models of acute physical and rehabilitation medicine (PRM) activities*

Establishment	Activity	Advantages	Limitations
PRM beds in acute hospital (acute inpatient specialized team)	Transfer of patients to PRM beds within acute hospital	Rapid change to PRM clinical activity	Limited numbers of beds and, therefore, of patients taken
		Early rehabilitation principles under the charge of a trained specialist in PRM	Potential for bed-blocking – need to wait to transfer patients out to either home or rehabilitation facility
		Capitalize on the expertise, time and resource of PRM team	Need to protect against transfer of inappropriate patients
		Requires adequate number of dedicated staff	Difficulties if staff numbers inadequate
Mobile PRM team (acute PRM liaison team)	A PRM team working solely within acute hospital visits patients under care of other specialists	Possible to consult on larger numbers of patients with wider range of conditions	No clinical control – patients under care of other specialists
		Good liaison between team and staff on acute wards	Treating nurses and therapists not within PRM team
			Least specialized format for acute PRM
			Does not often address participation issues
PRM consultation to acute wards	A PRM specialist from stand-alone PRM centre visits patients under care of other specialists	Possible to consult on larger numbers of patients with wider range of conditions	No clinical control – patients under care of other specialists
		Closer links between PRM and acute specialists	Treating nurses and therapists not within PRM team
			Time and expense to be effective; need to be on site
Acute PRM centre	Rapid transfer of patients to fast-track facility in stand-alone PRM centre	Patient exposed to the total PRM team and facilities at an early stage	Patients must be medically stable
		PRM specialist competence in treating acute conditions	Patients may be transferred back in case of deterioration
			Little contact between PRM team and acute specialists
			Little or no service for patients not transferred

PRM beds and the return of patients to the acute specialty's beds, if a complication occurs. An example of this would be the transfer of a traumatic brain injury patient with increased intracranial pressure back to the care of the neurosurgeons for the fitting of a ventriculo-peritoneal shunt.

Acute PRM beds are likely to be seen in larger and academic centres, but may not be possible in smaller facilities. Service planners may have to consider one of the other options above, which will work nonetheless, but will in some cases not provide patients to the range of PRM services so early in their care. This paper therefore focuses on the advantages of acute PRM beds; the other 3 models will be described in more detail in subsequent papers.

WHO REQUIRES AN ACUTE INPATIENT PRM PROGRAMME?

Some countries (particularly Italy and the UK) have produced and published standards criteria for inpatient rehabilitation (8–10). Patients requiring these facilities at the start of their rehabilitation programmes are likely to include:

- Patients, who require 24 h nursing and medical supervision for their rehabilitative needs.
- Patients with neurological and musculoskeletal disorders, who have the capacity for, require and who will benefit from rehabilitation, i.e. patients in whom the evidence shows that active intervention improves function, life satisfaction or prevents deterioration.
- Severely disabled patients whose needs can only be met by a multi-professional team practising inter-disciplinary rehabilitation.
- Patients with complex needs, i.e. requiring more than 2 professionals working in a team.
- Some very severely disabled patients with little hope of improvement in personal functioning, but who require assessment and appropriate equipment and whose families require education for caring purposes.

This has also been addressed by the UEMS Section Clinical Affairs Committee in describing the quality of care of PRM services (11–12).

Table II. *Typical conditions presenting to acute physical and rehabilitation medicine (PRM) programmes*

System	Condition
Neurological	Traumatic brain injury
	Stroke, including subarachnoid haemorrhage
	Global brain injury (e.g. post-cardiac arrest, near-drowning)
	Post-neurosurgery, e.g. for hydrocephalus
	Acute flare of multiple sclerosis
	Spinal cord injury following trauma, intervertebral disc prolapse, transverse myelitis
	Cerebral and spinal cord infection
Musculoskeletal	Joint replacement surgery, particularly hip arthroplasty
	Spinal surgery
	Limb amputation
	Limb and truncal trauma
	Intervertebral disc prolapse
	Heterotopic ossification
	Post-traumatic compartment syndromes
Cardiovascular	Arterial occlusion
	Exclude acute coronary syndromes, incl. myocardial infarction
	Others
Respiratory	Acute exacerbation of asthma and chronic obstructive pulmonary disease
	Pneumonia
	Pneumothorax and haemopneumothorax
Post-surgery and trauma complications	Infection
	Haemorrhage
	Venous thrombosis and pulmonary embolus
	Pressure sores
	Bowel perforation
	Burns, tissue loss and skin graft difficulties
Cancer	Cancer surgery and chemotherapy
	Bone marrow transplantation
Organ transplantation	Heart and lung
	Liver
	Kidney

DIAGNOSTIC CATEGORIES

Acute PRM is concerned with any condition producing complex disabling problems or an acute event in a person with an established disability. Table II gives a range of conditions, which PRM specialists may include in acute PRM programmes (2). An acute PRM service would need to define its area of working according to demand and would have specific admission criteria for its particular area of expertise and the demand created by the range of other services with which it works.

ACTIVITIES

The emphasis is on:

- Providing rehabilitation therapy for patients with complex problems requiring an input from at least 3 disciplines of a multi-professional team.
- Preventing preventable complications and providing treatment for them, should they occur.
- Informing and educating patients and their families/carers on their contribution to their rehabilitation, on living with a disability and on adaptations to their personal and environmental situation.
- Providing a triage for further definitive PRM and other rehabilitation programmes, which may prevent the need for further health interventions.
- Educating acute care staff on the practicalities and principles of PRM treatment.

Clinicians in acute PRM will develop a PRM plan together with their patients. They identify the problems and seek to establish a long-term solution. As a result, they also need to determine what can be carried out in acute PRM programmes, what should be achieved in further inpatient PRM settings, and what can best be achieved in outpatient (ambulatory) or community settings. An important function during the acute phase is the education of family members, who may become care-givers for the first time.

STAFFING

The staff serving an acute PRM unit should reflect those seen in other areas of PRM. This would also be governed by the kinds of patients admitted and by the care pathways and priorities for discharge. An inpatient unit would be composed of doctors, therapists (physiotherapist, occupational therapist, speech and language therapist), nurses, clinical psychologists, a resettlement officer and a social worker.

The workforce establishment in UK units is very low when benchmarked against national and international standards, but is targeted at the following level for each 25 inpatient beds (13):

- 2.0 whole time equivalent (WTE) trained specialists in PRM, plus 1 trainee in PRM
- 5.0 WTE qualified physiotherapists, plus students
- 5.0 WTE qualified occupational therapists, plus students
- 1.5 WTE qualified speech and language therapists
- 2.0 WTE clinical psychologists
- 30 WTE nursing staff of variable qualifications
- 1.0 WTE resettlement officer
- 0.5 WTE social worker
- In addition, 1.0 WTE brain injury coordinator or rehabilitation coordinator, depending on the work of the unit.

JUSTIFICATION FOR ACUTE PRM INTERVENTIONS

There is sufficient evidence in the literature to support the concept of inpatient PRM facilities.

The role of the specialist in PRM is to provide medical interventions for the patient's presenting medical and functional problems and to coordinate the activities of the members of the PRM team, with whom he or she works, after making a comprehensive assessment of functioning (a "functional diagnosis") and establishing or confirming a medical diagnosis (14, 15). To do this he or she must use a number of *functional* evaluations and clinical and laboratory/scientific measures and review treatment regularly, so that it can be updated as necessary (16).

The specialist's aim in PRM is concerned with the promotion of physical and cognitive functioning, activities (including behaviour), participation (including quality of life) and in modifying personal and environmental factors. He or she is thus responsible for the prevention, diagnosis, treatments and rehabilitation management of people with disabling medical conditions and co-morbidity across all ages (1).

Inpatient standards were also published in 2002 in a supplement of *Clinical Rehabilitation* on behalf of the Clinical Standards Committee of the British Society of Rehabilitation Medicine (13). This stated that patients could expect certain standards, such as:

- Specialist services in rehabilitation should be supported by dedicated sessions from a specialist in PRM.
- Patients should have access to appropriate rehabilitation services, or when these are not provided within the locality, defined systems should be in place for referral and funding to ensure equity of access to them.
- PRM programmes should have defined selection criteria for referral and there should be a written procedure for accepting patients according to the selection criteria.

Further quality statements are set out in the guidelines.

FEDMER also produced criteria, which highlighted the areas where PRM specialists could provide early specialized interventions to promote function and prevent or lessen any disablement and potential complications (17, 18).

These all clearly state that inpatient rehabilitation requires a team led by a competent medical specialist and, in a European setting, this means a specialist in PRM. The focus in this standards document is on inpatients, but the same applies to a peripatetic team working in an acute hospital. The evidence from this is in stroke rehabilitation. Not only do acute stroke units save lives (19), but early access to specialist rehabilitation has an impact on secondary prevention (i.e. complications), the impact of other co-morbidities and tertiary prevention (rehabilitation outcomes) (20). Indredevik and colleagues have also shown similar benefits from interventions by specialized teams working closely with the stroke service (21, 22).

FURTHER EVIDENCE

The addition of therapy provided to adults in hospital can accelerate the rate of recovery of personal independence and result in earlier discharge from hospital. It is also associated with enhanced functional recovery and shorter hospital stays, if provided in the context of an integrated service that can provide ongoing community support. In acquired brain injury, there is no evidence of any ceiling effect of therapeutic intensity beyond which no further response is observed (23), but no studies exist to show this in other conditions.

Further conclusions may be drawn, that PRM programmes:

- Reduce complications, e.g. physical effects of neurological injury, immobility, etc.
- Optimize the physical and social functioning of patients.
- Identify cognitive and emotional complications of traumatic brain injury, even in the absence of physical sequelae.
- Improve the chances of living independently at home and returning to work.
- Concentrate therapy. More therapy input is associated with

shorter hospital stays and improved outcomes (24).

- Have the correct environment and skill mix with trained therapists.

Stroke units also improved functional outcome following an intensive period of early rehabilitation (25–28). Another large-scale overview of stroke rehabilitation in a total of 3717 patients also demonstrated that focused rehabilitation can improve functional performance (29). The best results were obtained with younger patients and those receiving rehabilitation early after their stroke.

Similar results, although with smaller patient numbers, have been demonstrated for rehabilitation after head injury and after spinal cord injury (30, 31). Most of these studies confirm the value of 2 different aspects of rehabilitation. First, most of the studies documented improvements in functional outcome and speed of attaining such outcome. Secondly, disabled people going through rehabilitation units have less unnecessary complications. There are less unnecessary physical problems, such as those associated with spasticity, contractures and pressure sores and less unnecessary psychological problems, such as untreated depression. There is clear evidence that an intensive period of rehabilitation after an acute event, such as head injury or spinal cord injury, produces clear, short-term functional gains (32). However, there is also evidence that short-term gains are lost unless longer-term support is available (33). Thus, longer-term contact with the disabled person is important in order to provide rehabilitation until natural recovery is complete and to prevent the later development of unnecessary complications. Assessment of care costs should allow for continuing rehabilitation support.

BENEFITS

- The benefits are well recognized through the evidence for starting rehabilitation as early as possible. The most important are an early and prompt response to treating the ill effects of immobility and complications (as shown above) and in educating staff in acute facilities of the areas where rehabilitation can be of major benefit. There is good evidence that the money spent on rehabilitation is recovered, with estimates of savings of up to 17-fold, and that rehabilitation is both effective and cost-effective (34, 35). The net effect also ensures that patients pass through acute care as quickly as possible and their quality of care is improved. The simple act of transferring patients from acute wards to a rehabilitation setting has a beneficial effect on patient activities and on preventing unnecessary sedation (36). Early intervention in spasticity management can prevent contracture formation and reduce the time spent in further inpatient rehabilitation (37). The benefits are that patients are better able to engage in their rehabilitation programme and therapy can be commended at an earlier stage, thus potentially shortening its duration.
- Acute PRM can only operate effectively in the presence of sufficient facilities and staff. In addition, it requires the active participation of colleagues in both the hospital and in rehabilitation units and the community, to where patients will be sent following their treatment programme. It also needs to be actively promoted by the hospital management as an integral part of the hospital's acute service provision. It is in both the patient's interests and good clinical practice to transfer patients to specialist rehabilitation, when this is the priority of care (28).
- Many PRM specialists are active in applying basic research and this can be applied to patients in very early settings. The benefits also allow staff in acute facilities to get feedback on the outcome of the patients' care and this increases staff satisfaction. More importantly, patients receive the treatment they need from suitably trained staff.
- A proportion of patients will not require transfer to a stand-alone rehabilitation facility, as they will able to be managed as outpatients. PRM teams have the necessary networking to direct the patient to the most appropriate competent follow-up treatment and this will ensure that the rehabilitation plan is continued.
- Health-based rehabilitation goes hand-in-hand with social and vocational rehabilitation and an early rehabilitation programme will improve the chance of getting people back to productivity (38, 39).

FUNDING OF ACUTE PRM SERVICES

Financial support for acute PRM will be based on the evidence of its benefit, and the process of attracting funding for its facilities will vary from country to country.

Payment systems for PRM are already very complex, and are characterized by the differences in payments between acute hospital programmes and post-acute/maintenance rehabilitation programmes. In state-supported health systems, the amount of treatment depends on the number of professional experts (PRM doctors, therapists), and PRM has to compete for funding with other clinical services. PRM is subject to the same payment systems as other medical activities, which may be either a prospective payment or a diagnosis-related group.

The principles of a prospective payment system are:

- Per discharge prospective payment system.
- Distinct groups based on clinical characteristics and expected resource needs.
- Separate payments calculated for each group, including the application of case and facility level adjustments.
- System uses a streamlined patient assessment instrument.

The advantages of the prospective payment system have been mixed and studies have reported decreased lengths of hospital stay, but increased rates of readmission, the integration of more complex case mixes, but increasing numbers of patients discharged in unstable condition (40).

Many countries use the diagnosis-related group (DRG) system to classify hospital cases for payment. This is a system to classify hospital cases into one of approximately 500

diagnosis-related groups, which are expected to use a similar level of hospital resources. The system was developed for US Medicare as part of the prospective payment system, but is not applicable throughout Europe because of the heterogeneity of the national health care systems.

Health-related group systems (HRGs) are also used, but the creation of a separate funding system for acute PRM may be apposite and a functional-related group may be more appropriate for the payment of patients going through PRM programmes. This could be based on the Functional Independence Measure (FIM) (41) and would cover the separate ICF domains (42). In essence, the same system covers acute PRM as for other acute services and most UEMS countries adopt the DRG system. HRGs may be appropriate for many rehabilitation institutions because they can be converted to a contract per case and can apply to inpatients and outpatients, which can cover the time and complexity of the various interventions. More recently, a concept of functionalrelated groups hold an attraction for PRM because they judge the payment on the basis of a patient's activities. Costs are therefore stratified on the complexity of a patient's impairments and limitation of activities, which will give PRM services the recognition they deserve. However, there is a danger that provider units will not see PRM services as too expensive to set up to retrieve their investment.

The *White Book on Physical & Rehabilitation Medicine* (2) has identified the potential savings to be made from establishing PRM over *ad hoc* rehabilitation services, and this probably also applies to PRM in acute settings. Although there is good evidence for this in inpatient settings, there is no specific work for acute PRM *per se*.

The budget for an acute PRM service will depend on its scope and on the country's payment system, but should cover staff salaries, facilities, etc. This should be cheaper than a similarly situated acute bed, for which hospitals should see acute PRM as an attractive alternative.

CONCLUSION

PRM facilities in acute settings make sense for the reasons set out above. The first 2 options are the most effective in making best use of the acute facilities and PRM services. The benefits of dedicated PRM beds appear to outweigh those of the other options, but no cost-effectiveness studies have yet been undertaken between the first 2 models. The cost-effectiveness of stroke units is greater than that of mobile PRM teams and, while the former is rehabilitation facility *per se*, there is a clear analogy in terms of activity. Certainly, acute PRM beds are cheaper and therefore more likely to show a benefit. Prospective trials are required to show this benefit, but a number of units need to be set up to do this, as the true cost-effectiveness can be determined only where set-up costs are not required.

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A POSITION PAPER ON PHYSICAL & REHABILITATION MEDICINE PROGRAMMES IN POST-ACUTE SETTINGS

Union of European Medical Specialists Section of Physical & Rehabilitation Medicine (in conjunction with the European Society of Physical & Rehabilitation Medicine)

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Physical & Rehabilitation Medicine (PRM) programmes in post-acute settings cover interventions for the rehabilitation of people with a variety of disabling health conditions. The setting of the intervention is more important than the timing and these programmes can be carried out in a variety of facilities. This paper describes the role of PRM services and of PRM specialists in delivering rehabilitation programmes to people, who have initially been admitted to hospital. The emphasis is on improving patients' activities and addressing participation issues. PRM programmes in post-acute settings provide a range of treatments and have a major influence in the long-term on the pace and extent of return of function and recovery from ill-health. This paper will define the meaning of post-acute settings and will describe the patient's journey through the post-acute setting. In particular, it addresses the standards of care across Europe that patients should expect.

This paper also examines the general principles of funding such programmes within the context of different health care systems across Europe. Coordinated care improves outcomes and economic profiles for both payers and providers of services.

This paper describes the value of PRM interventions and PRM specialist-led teams in promoting better outcomes for people with disabilities with complex needs.

Key words: rehabilitation; post acute settings; physical & rehabilitation medicine programmes; clinical pathways.

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INTRODUCTION

This paper describes a person's rehabilitation experience in Physical & Rehabilitation Medicine (PRM) programmes following illness or injury. Dealing with patients during the early phase following admission to hospital has already been described (1) and this document covers a range of PRM programmes in post-acute settings. This is in the context of great changes in health care both at European and at national levels. It is thus important to describe what PRM is, what it can offer, how it can best provide its services and expertise and what standards of service delivery and specialist training should be demanded from the public. The scope of services have been taken from several national documents, such as the Royal College of Physicians of London Working Party Report, "Rehabilitation Medicine, 2011 and Beyond" (2). This will be updated in data obtained from the Italian National Plan for Rehabilitation, 2011 (3). It should also be stated that there is a good body of evidence in the literature to show the effectiveness and cost-efficiency of coordinated multidisciplinary rehabilitation, in which PRM specialists work. These are described in the Royal College of Physicians report (2) and the raw evidence has not been duplicated for this paper.

PRM programmes in post-acute settings provide more than just a follow on from those in acute settings. They also set up systems for picking up the needs of people living in the community and have a variety of aims, which will be discussed below. This paper will describe the concepts of PRM interventions for a variety of health conditions within the context of the different national and regional health settings. It will also address the needs of a person with a disability resulting from an acquired health condition, so that he or she may respond to a PRM programme in post acute settings to assist in his or

her rehabilitation. The context of the paper relates more the setting of the PRM programme and what goes into it rather than its input at a certain phase of a health condition. It also shows that PRM is a vibrant specialty, through which doctors can positively contribute to a person's rehabilitation, but can also ensure higher quality care through specialist multi-professional interventions (3). The UEMS Section of PRM highlights that, within the challenges that face health services, people with disabilities have, through good standards of PRM care, a better chance, not only of survival, but also of an active participation in society. Its publications can be accessed through its website (www.euro-prm.org) (4–16). The purpose of this paper is to highlight the change in PRM services that are relevant for patients who are leaving acute hospitals earlier and are, as a result, more sick than before.

DEFINITIONS

Using a systematic approach to PRM service delivery (4) (Fig. 1), one may see the relationship between disease (through ICD), function (through ICF), interventions (through services and health interventions) and the classification of health accounts in the post acute setting.

Post-acute PRM programmes are perhaps best classified according to the referral pattern of the patient. A common route of entry is through a patient's transfer from an acute setting, such as a hospital. Rehabilitation in post-acute settings is not necessarily an inpatient activity, but most programmes start when patients are still in hospital. Patients are most commonly treated in stand-alone rehabilitation facilities or in ambulatory facilities in PRM departments. Both cover the same issues as many aspects of PRM in acute settings, but are different in both time and in situation, in which the whole range rehabilitation activities is covered from addressing impairments, promoting patients' activities and facilitating their participation in society with the context of the personal and environmental factors (15).

Rehabilitation in post-acute settings is governed by both the setting and activity. The timing and intensity of treatment and the focus on the achievement of short-term goals are important,

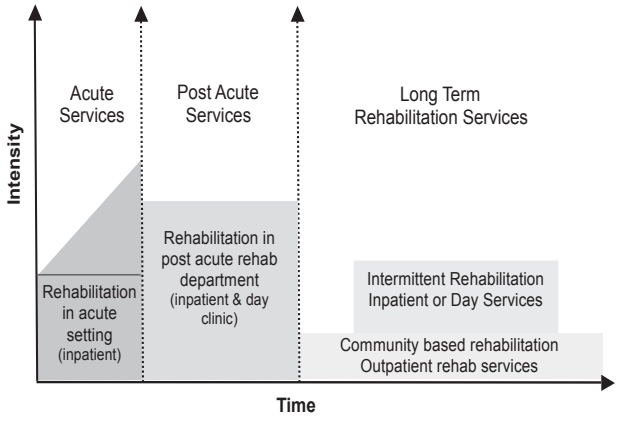

Fig. 1. Services of PRM within the framework of the WHO services matrix (6) (from Ref 6). Published from ref 6 with permission.

but should be included as part of the continuum of the rehabilitation process. It is not really governed by the location of physical setting, which can be various, but in the context of this paper, it is in a setting under the clinical governance of a PRM team. The definition of PRM programmes in post acute settings concerns activities that start when the patient is medically stable and no longer requires to be in an acute hospital. This is usually within the first month after a patient's acute admission for illness or injury, but may be longer in very severely injured patients following acquired brain injury (2). The patient's journey after a variable time would then lead on a longer term PRM programme, if required, which essentially cover activities taking place in the community. The patients' needs and the availability of treatment facilities and professional activity should control the intensity of the PRM programmes (16–19). The establishment of a specialised rehabilitation plan is thus crucial.

Patients enter a programme of goal-oriented multi-professional rehabilitation under the responsibility of a PRM specialist, which can result in greater gains through the interaction of the professionals' involved than that of the sum of the individual components (10, 20). A core team exists (see below), with whom the PRM specialist works in close proximity and its composition of professionals will depend upon the activities of the service (2). There is also a more extended team of professionals, whose input is invited for specific aspects of the rehabilitation plan. These may include among others, clinical engineers, wheelchair technicians, dietitians, etc.

POINT OF ENTRY IN TO POST-ACUTE PHYSICAL & REHABILITATION MEDICINE PROGRAMMES

The point of entry into an appropriate post-acute PRM programme depends not only on the location of the PRM service and its relationship to acute facilities, but also on its clinical activities (see below). A number of models and options were described in the paper on PRM in acute settings (1) and these are relevant to referrals from hospital inpatients. The majority of patients will have a period of inpatient treatment as part of their post acute PRM provision, but others, who are safe and able to return home, may be able to participate in this in ambulatory or community settings (21).

WHY ARE SPECIALIST PHYSICAL & REHABILITATION MEDICINE PROGRAMMES REQUIRED?

It is recognised that people with more complex needs need specialist services (22). Specialist rehabilitation services should be planned and delivered through co-ordinated networks to work both in hospital and the community to support local rehabilitation and care support teams. For example, the British Society of Rehabilitation Medicine (BSRM) standards (23,24) recommend that there should be a local specialist rehabilitation service led by a minimum of 6.0 whole time equivalents (WTE) trained specialists in PRM per million population, including 3.6 WTE for district specialist inpatient rehabilitation services and

their associated out-reach activities and 2.4 WTE for specialist community rehabilitation services.

A small number of people have very complex needs, and require a higher level of highly specialised PRM care (e.g. post-acute spinal cord injury patients or those with neuropsychiatric problems following brain injury). A larger number of people also require specialist rehabilitation in similar settings, but in less specialised units for conditions, such as some musculoskeletal trauma and problems. Very highly trained rehabilitation professionals are actually in short supply and it is not feasible or economical to duplicate these high cost/low volume services in every locality (2). Therefore, a 'hub and spoke' arrangement can exist, whereby patients are placed in the appropriate service for their needs over a defined geographical area. This requires the cooperation of health payers because the eventual pathway into longer term rehabilitation will require comprehensive arrangements to ensure that people with disabilities do not lose the gains they have made in rehabilitation, once they move out of the post-acute setting. In addition, the best way to define costs is by providing costing data on a day-by-day per person basis using the agreed measures of complexity and outcome (25, 26). Fig. 2 highlights the complexity of conditions and the relevant recommended provision for PRM services. The cost of PRM programmes invites a consideration of healthcare tariffs and these are being developed for specialist neurological rehabilitation services (26). The rationale and development of a case-mix model is based on the fact that patients with complex needs incur higher treatment costs and that fair payment should be weighted in proportion to costs of providing that treatment. Case complexity can be measured by the Rehabilitation Complexity Scale and five bands have been described (26, 27).

Tertiary 'specialised' rehabilitation services are high cost/low volume services, which provide for people with highly complex rehabilitation needs that are beyond the scope of their local and district specialist services. These are normally provided in co-ordinated service networks through collaborative (specialised) commissioning arrangements. Local specialist PRM services are led or supported by PRM specialist, working both in hospital and the community setting. The specialist multi-professional rehabilitation team provides advice and support for local general rehabilitation teams. In addition, some local services specialise in certain conditions, e.g. motor neurone disease and provide highly complex specialist expertise and management. These anomalies demonstrate a diverse pattern of rehabilitation service development with many interesting and expert community services developing. Providing the formula for funding to support these developments requires a dialogue between the PRM specialists and the payers/commissioners, but many cases are high cost and inevitably require longer lengths of stay. It is thus necessary to make the argument in terms of cost efficiency. In the UK, the argument has been highly persuasive in achieving funding of these services, as investing in rehabilitation is offset many times by long-term savings in the cost of care (28, 29).

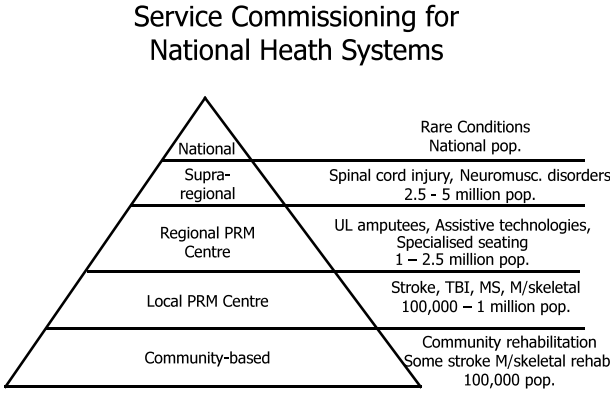

Fig. 2. Service Commissioning for PRM services (2, 26).

Example of PRM practice:
Following a bomb blast a 19-year-old soldier receives a right above-knee amputation. PRM assessment identifies ***impairments*** *such as limb loss, pain, a previously unsuspected moderate brain injury, unilateral deafness and post-traumatic stress;* ***limitations in activities*** *such as walking, sleeping, concentrating; and* ***restrictions in participation*** *including fulfilment of military and family roles.* ***Outcome*** *is enhanced by alterations in the* ***environment*** *beginning with the provision of a prosthesis, specialist treatment for the brain injury and stress-related symptoms, and should eventually include adjustments made for the process of re-employment with access to vocational rehabilitation services. Continued attention to his social environment, including his family life and relationships with others in his unit), and to the bereavement aspects of his situation is also a crucial aspect of his rehabilitation.*

ELIGIBILITY, ADMISSION AND DISCHARGE CRITERIA (24–26, 30)

Admission

PRM specialists admit patients to these specialised programmes when they require the activity of a trained specialist multi-professional team. Comprehensive ICF core sets for patients entering PRM programmes in post-acute settings have been described and validated (31–34). The entry criteria are governed by (*i*) the facilities of the centre, (*ii*) the competences, skills and interests of the professionals within the team and by (*iii*) the local health care needs. They thus vary from centre to centre, but essentially are as follows:

Patients who:

- ideally are medically stable and are fit to participate in a PRM programme;
- will benefit from the activities of a multidisciplinary PRM team and require, for inpatient programmes, the input of more than two professionals within the team;
- have defined goals for their rehabilitation; and
- understand and are motivated to participate in a goal-oriented rehabilitation programme or have the potential to do so.

It is difficult to describe exclusion criteria in this paper, as each centre needs to define their own depending on their assets and on the availability of alternative services. They become clear, if there are robust criteria for accepting patients to a PRM programme and a centre needs to inform referring clinicians of what other services are available and where. It is possible that some people are not yet ready to enter a programme in a post-acute setting and it is necessary for the PRM team to develop a system of reviewing these patients to identify their eligibility at a later date, e.g. a person in coma following a very severe brain injury, who may respond at a later date. Certain programmes are dedicated to particular pathologies, e.g. stroke, limb loss, etc., but they are also part of a global PRM approach to managing people with complex needs (2, 35).

Discharge

Moving out of PRM programmes in post-acute settings to those in longer term settings should be seen as a continuum. Where this involves a change from an inpatient setting to one in the community, discharge plans will create the further needs of the patient and a discharge process should be in place. As PRM programmes (no matter what the setting) involve goal setting, achieving the relevant goals for that part of the rehabilitation process will dictate where that is best carried out. Goals are negotiated with patient and their relatives and thus their agreement is an important part of finding the right setting to meet their needs. Fig. 3 highlights the clinical pathway for a patient going through the range of PRM settings.

KEY ROLES AND SKILLS OF THE PHYSICAL AND REHABILITATION MEDICINE SPECIALIST

The core roles of PRM specialists include the diagnosis and medical management of conditions causing complex disability (2, 36, 37). These are given in Appendix I, but one of the PRM physician's key contributions to the work of the multi-professional rehabilitation team is to provide a holistic description of the patient's situation from both a medical and a non-medical point of view, thus helping individuals and families to identify abilities, resources and possibilities as well as illness, disability and problems.

Disabilities can almost always be made more severe by omissions or ill-considered actions, and prevention is a fundamental principle of PRM. In many situations, a PRM specialist can make a vital contribution through anticipation and prevention of physical, psychological and social complications, based on knowledge of a condition's natural history and prognosis. The range and value of 9 aspects of a PRM specialist in the team is highlighted in Appendix I. Examples of the tasks and skills entailed are also given (2, 36, 37). The addition of a PRM specialist may be seen as expensive, but his or her training and contribution to the treatment programme do confer to teams a range of skills that is unique to them among other PRM service team members. In addition to medical investigation and treatment, some of the important contributions that the PRM specialist can bring to the team are (2):

a) Confirmation or refutation of diagnosis (the longer time scale of rehabilitation afford greater opportunity for observation over time and new diagnoses often become apparent over that period).
b) Prognostication – the PRM specialist's knowledge of pathology through his/her training is invariably greater than that found among nursing and other health professional staff. The PRM specialist has thus a greater understanding of the expected course of a condition – especially in the context of progressive disease, cancers etc. This is critical for forward planning of the rehabilitation programme.
c) The PRM specialist is comprehensively trained in communication, whether this concerns policy planning at service level, leading a multi-professional team or giving information to patients and relatives, such as breaking bad news etc.
d) Leading on service development and the negotiation of funding for established and new treatment strategies.
e) Team leadership and the responsibility for the conduct of service activities.

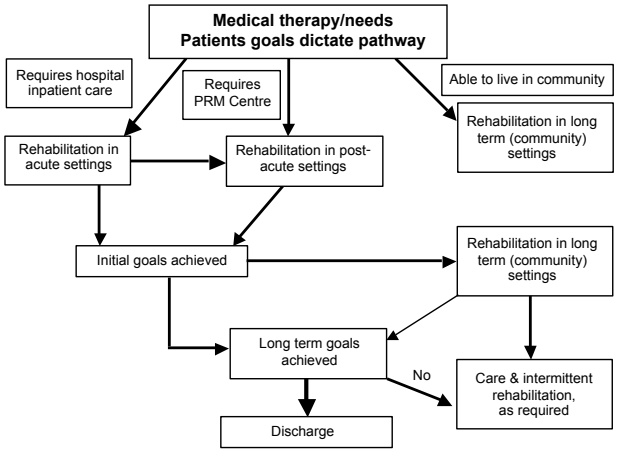

Fig. 3. Rehabilitation pathway (5, 30).

THE SCOPE OF PHYSICAL AND REHABILITATION MEDICINE PRACTICE

Physical and Rehabilitation Medicine specialists apply their medical rehabilitation interventions as appropriate throughout all phases of the rehabilitation process. The medical conditions treated come into 4 groups; sudden onset conditions, intermittent conditions, progressive conditions and stable conditions (Table I) (22, 31). These present to specialists in PRM in post-acute settings, as they are determined by need rather than by diagnosis. People with longer term conditions experience changing needs and PRM makes a contribution when changing needs call for medical reassessment and co-ordinated rehabilitative responses.

RELATIONS/LIAISON WITH OTHER SERVICES

One aspect of a PRM programme in a post-acute setting is the relationship with the services referring patients in and those

Table I. *Range of conditions*

Sudden onset conditions	E.g. brain or spinal cord injury, where a catastrophic onset is followed by a variable degree of recovery.
Intermittent conditions	E.g. relapsing remitting multiple sclerosis, where the condition itself may fluctuate, although the problem of unpredictability is ever-present.
Progressive conditions	Impairments and disability gradually increase over a timescale, which may vary from a few months (in the case of rapidly progressive conditions) to many years (e.g. in secondary progressive multiple sclerosis or Parkinson's disease).
Stable conditions	E.g. cerebral palsy or post-polio, where the condition itself is often static, but the additional effects of degenerative and other changes may be superimposed over time, producing new disability and new rehabilitation needs.

who will continue the healthcare or rehabilitation process thereafter. It is thus important that specialists in PRM build up a network of cooperation with other medical disciplines, with whom they work, as well as therapists and nurses. This allows better working during the rehabilitation process, but developing close relationships with primary care teams of general practitioners and community therapists and nurses ensures that treatments can continue following discharge from the PRM centre and that patients and families can maintain their skill levels and activities. Table II highlights the interactions between members of the PRM team and other medical disciplines and services (2, 5, 21, 36–40).

CLINICAL CONDITIONS SERVED BY PHYSICAL AND REHABILITATION MEDICINE

The range of this widely based medical specialty is shown in Appendix II. Its practice depends on the facilities available and the expertise/background of the professionals involved in service delivery. Each UEMS member state also has different requirements and the specialty's field of competence has been described (17). Appendix III give a brief overview of the areas of practice in PRM and some examples of conditions seen by PRM consultants.

OUTCOMES AND MEASUREMENT OF THE IMPACT OF PHYSICAL & REHABILITATION MEDICINE SERVICES

It is difficult to recommend the outcome criteria for PRM services or ideal measurements, as they will obviously be specific to the health care environment, to the activity of the provider unit and to the patients' individual goals. Rehabilitation research is well advanced in the systematic recording of functional outcomes. Standard outcomes in post-acute settings are aligned to functional determinants, as described in the WHO's International Classification of Functioning, Disability and Health (41). In trying to justify the higher cost specialist services, there is now a hierarchical dataset of 3 inter-related standardized global disability measures ranging from the Barthel Index of Activities of Daily Living (42) for the lower cost high volume services to the Functional Independence Measure (FIM) (43) and then on to FIM and FAM (Functional Assessment Measure) (44) for the higher cost inpatient specialist services associated with brain injury rehabilitation. Currently, there is work going on in several countries in using the Barthel Index as a common tool for all services, but adopting the other two to reflect the nature of greater intervention complexity. A basket of commonly approved measures has been created, from which individual services could chose the appropriate item for their particular service model or user group. It is not within the remit of this paper to go into outcome measures in great detail, but to mention the importance for defining individual rehabilitation goals for each patient. Goal attainment should be recorded for each patient and there are several ways of building this into an evaluation of outcome within the framework of collecting standardized measures as well. This has already been applied in the several countries for PRM programmes among people with neurological conditions, but can equally apply to other health conditions, given their specialist nature (45–49).

COSTS OF PHYSICAL & REHABILITATION MEDICINE SERVICES IN POST-ACUTE SETTINGS

Costs differ according to the facilities provided, but the cost of the PRM team is the important feature in PRM programmes in post-acute settings. They are also difficult to equate over

Table II. *Admission and discharge liaison (21, 23)*

Liaison	Medical specialists/ Professionals involved	Systems required
Referrals in	PRM specialist in acute setting Acute care physicians, (e.g. neurologist and others) Acute care surgeons (e.g. neuro and orthopaedic surgeons) Psychiatrists	Direct from PRM service in acute setting Establishment of referral team, e.g. rehabilitation coordinator, specialist nurse, PRM specialist (see similar system for rehabilitation specialist in acute settings)
Liaison out	Primary care team (general practitioner) care services, institutional care (nursing homes, etc.) Vocational and employment services Other health services	PRM services including Resettlement officer/service Occupational therapy, rehabilitation engineering, etc. PRM services including vocational and occupational therapists Depending on individual service facilities

the different healthcare systems throughout Europe, but a recent UK cost analysis of specialist inpatient services for neurologically compromised patients showed that any expected variations in cost are largely due to differences in staff costs (50). Staff pay made up 66% of total costs and, therefore, a projection of 150% for total staff costs over those of standard inpatient services provides a reasonable estimate of the total costs of a unit. Children's services were almost twice that (51). Why should payers/commissioners of health care pay for PRM programmes as opposed to non-specialist rehabilitation? There are several reasons, but the most important is that a PRM team treating people with complex needs due to a disabling health condition is the most efficient way of bringing together all the required services to allow better outcomes in terms of functional activity and participation in society (2). The costs of care for these people is great with overall mean first-year charges for spinal cord injured patients of US$523,089 and mean annual charges over the remainder of life were US$79,759 (2009 data) (52). Similar costs were reported in Belgium (53), but there is good evidence that coordinated PRM programmes can substantially reduce these and justify their activities (2, 53).

STANDARDS OF PRACTICE

Standards of rehabilitation practice and PRM practice have been published in many countries, but are written in their local languages (46–49). An example of one, published by the British Society of Rehabilitation Medicine is shown in Appendix IV (54). Mapping of services to ensure that practice standards are maintained is important and the current work of the specialty is focused on this (54, 55). Finally, research must be embedded into service designs to allow the development of PRM to respond to changing patient and societal needs. The UEMS Section has described the standards, to which specialists in PRM work and the extent of their competencies and work (4). In addition, there is a need to address treatment pathways for people not considered eligible for admission to a PRM programme in post acute settings. Care pathways for them have been described in several countries, but reference is given to some of those in France, Italy and the UK (2, 46, 56–58).

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Appendix I. Key roles and skills of Physical & Rehabilitation Medicine (PRM) specialists (2, 20, 23)

Role	Tasks	Skills	Examples of problems addressed
Diagnosis & prognosis	Diagnosing pathology, identifying impairment and assessing prognosis	Generic and specialist clinical skills	Identifying opportunities for interventions Meeting information needs of patients and team members
Risk assessment	Identifying and managing risks	Understanding disease progression Managing uncertainty Education and negotiation	Accidents Pressure sores Contractures Malnutrition Relationship breakdow
Medical management	Analysis of impairments in relation to disabilities	Treatment of problems, e.g. pain, spasticity, respiratory failure, incontinence, disorders of mood and behaviour, plus others	Inadequate symptom relief Depression, suicidal behaviour Continence, pressure ulcers Contractures
Leadership	Influencing, leading or managing multi-disciplinary teams	Managerial and leadership skills	Helping a team to maintain a common purpose, often involving conflicts between multiple lines of accountability
Advocacy, mentoring	Listening Advance care planning Family liaison Managing expectations	Assessment of capacity and understanding of legislation Communication techniques Negotiation	Conflict Inappropriate services Inappropriate treatments
Education	Education of patients and their significant others Education of team members	Teaching skills Communication skills	Dealing with prognostic issues with relatives Developing concept of functioning with patients & relatives Developing plans for post-acute and longer term rehabilitation
Enabling	Access equipment Arrange adaptations Coordinate therapy	Coordination Advocacy Consultation skills Techniques such as motivational interviewing	Loss of autonomy, loss of participation in chosen activities and roles Utilisation of enabling technology
Counselling	Understanding and supporting individuals and families in the context of specialist medical knowledge	Counselling skills Consultation skills Continuity of care Understanding of MDT working Understanding of family dynamics	Despair Isolation Loss of therapeutic relationships
Public health	Advising commissioners and trusts on disability-related issues	Community perspective Political awareness of influence of health service changes on PRM provision	Inequity of access to services, e.g. health screening for disabled people

MDT: multidisciplinary team.

APPENDIX II. Clinical conditions served by Physical & Rehabilitation Medicine (PRM). PRM is a widely based specialty and its practice depends on the facilities available and the expertise/background of the professionals involved in service delivery. UEMS member states also have different requirements and the specialty field of competence has been described (2, 4, 6, 13). A brief overview of the areas of practice in PRM is given below.

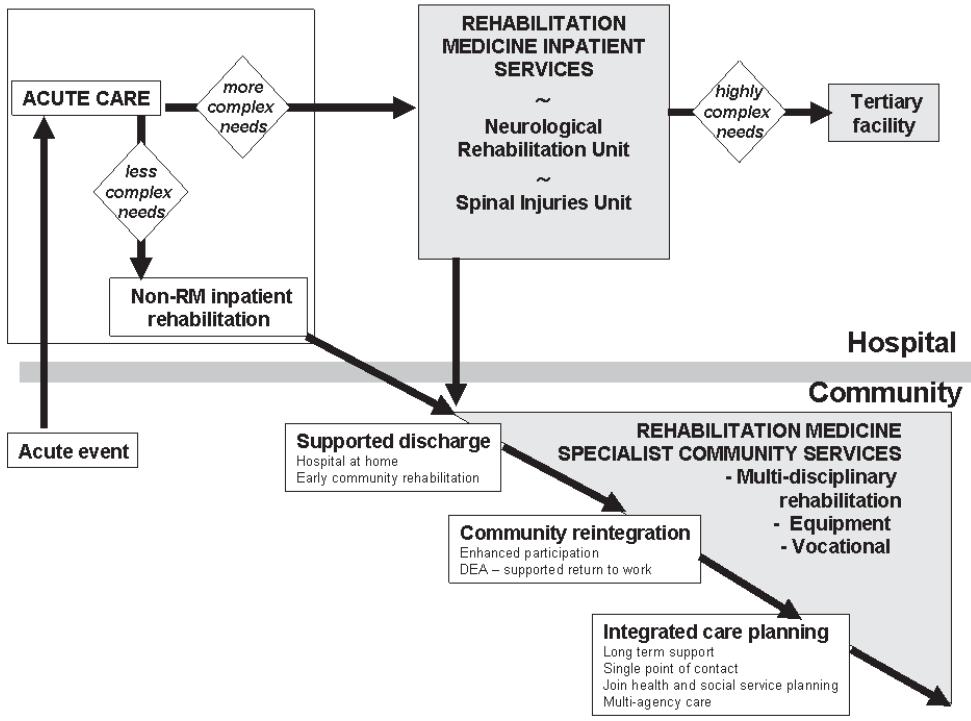
Area of practice	Description
Neurological rehabilitation	PRM serves those with all forms of complex neurological disability, including spinal cord injury, whether sudden-onset, progressive, intermittent or stable.
Musculoskeletal rehabilitation	Includes physical medicine and musculoskeletal services for people with physical impairments usually affecting the spine and limbs and may support the surgical recovery period for these.
Amputee rehabilitation	Services for people with congenital or acquired limb deficiencies.
Cardiorespiratory rehabilitation	This is a distinct clinical activity in most UEMS member states. Services have been developed on the evidence that exercise therapies and good control of physiological parameters makes a significant impact on both life expectancy, activity and quality of life.
Others	There are several examples of the development of services for cancer survivors and people with gynaecological health conditions. These will be addressed at a future dates and are not within the remit of this paper.
Pain rehabilitation	All areas of practice include the management of pain. Pain rehabilitation services a specific activity in PRM practice.

The prevention and management of complications is a major role of PRM specialists in all of the above areas of practice that may arise from acute medical and surgical treatments for the underlying health conditions.

APPENDIX III. An example of a model of PRM practice in post-acute settings

Several models of practice exist, but exemplified below is one from the Royal College of Physicians of London report, "Rehabilitation Medicine, 2011 and Beyond" (2). The pathway from the acute setting to community rehabilitation, in the format of the "Slinky Model" below, depends on the role of the PRM service.

General Principles of PRM Services



Similar, but specific, models exist for traumatic and acquired brain injury, stroke and other acquired brain injury, spinal cord injury, sudden onset neuromuscular disease, intermittent and progressive neuromuscular disease, rapidly progressive conditions and stable conditions. Their description is covered in more detail the Royal College of Physicians Working Party Report, "Rehabilitation Medicine, 2011 and Beyond" (2).

APPENDIX IV. British Society of Rehabilitation Medicine Standards of Practice (53)

1. Rehabilitation must be a 24-h process, with agreed goals and activities, which are followed through out-of hours by the nursing rehabilitation team
2. All major decision-making meetings, e.g. assessment, goal planning, case conferences, discharge planning should be undertaken by the inter-disciplinary team, in conjunction with the individual, and their family and carers where appropriate
3. The individual and/or their family should:
   a. Be provided with appropriate, accessible and timely information to allow them to make/participate in decisions regarding their treatment and care
   b. Participate as actively as possible in agreeing and reviewing their rehabilitation goals, which should include both long- and short-term goals
4. There should be clearly defined systems for ensuring co-ordination of effort between the various different disciplines, which include:
   a an agreed common set of goals which are reviewed at frequent intervals – and the programme adjusted accordingly
   b multi-disciplinary patient record system which includes recording of agreed outcome measures
   c a designated team member (e.g. key-worker, case manager)* responsible for
   overseeing and co-ordinating the individual's programme
   supporting the individual and communicating information to them and their family
   acting as their 'advocate' in team discussions
   * It is recognized that this role is time-consuming, and this is currently possible only in teams of sufficient critical mass to support this practice)
5. Discharge planning should begin as soon as possible during the rehabilitation programme
   At an early designated stage in admission, a prediction should be made of the expected outcome of the programme and time scale, even though this may subsequently be reviewed
   Programme planning should include an action plan to prepare for discharge, which should involve all relevant agencies including:
   Community healthcare and social service providers and purchasers
   Community nursing and care teams
   Housing, education, employment, insurers, voluntary services, etc.
6. People discharged from specialist in-patient services should have:
   a. A written report summarising their further requirements, and recommendations for on-going care to accompany the patient at discharge or follow within 24 h
   b. Access to continued therapy on an out-patient, day-case or domiciliary basis, and/or future re-access to inpatient services as appropriate to their clinical problem and circumstances
   c. Clear information about who to contact should further needs arise, e.g. for equipment review
7. Follow-up and longer term outcome evaluation. Contact should be made with the patient 12-18 months following discharge from a rehabilitation service, either by visit or phone:
   a. At least one standardised outcome measure should be applied at discharge and at 12-18 months
   b. An assessment should be made as to:
      Whether gains made during rehabilitation have been maintained
      Whether recommendations made at discharge were implemented, and whether there are other unmet needs
   c. People who have complex needs and are subject to annual integrated care planning review, should have this assessment as part of their annual review
   d. A brief summary of this contact, including any recommendation, should be sent to the GP or other appropriate agency

It is recognised that there are logistical challenges to this principle which include:
Constraints on staff time – current caseload may consume all availability
Large geographic area constrains travel, especially for regionally based services
Itinerant population (especially brain injury), which can be difficult to trace

Physical and Rehabilitation Medicine and persons with long-term disabilities.

http://www.ncbi.nlm.nih.gov/pubmed/25061984

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Position Paper on PRM and persons with long term disabilities

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Abstract

In the current population we observe a rise of chronic health problems often with multiple character. This results in growing number of people who are experiencing long – term disabilities or difficulties in functioning because disability. These conditions require a complex response over an extended time period that involves coordinated inputs from a wide range of health professionals. This paper argues the central role and benefit of rehabilitation and describes the rehabilitation as an integral component in the management of people with chronic disabilities. There are also presented the most important related definitions: long term care, rehabilitation for chronic disease and disability, the aim of PRM (Physical and Rehabilitation Medicine). An interdisciplinary team is ideal for effective implementation of rehabilitation for chronic disease and disability. In the article however the greatest emphasis has been putted on defining the role and contribution of PRM physician in rehabilitation of persons with long term disabilities. Described are his/her key roles and competencies particularly with regard to medical and functional status and prognosis, the ability to comprehensively define the rehabilitation needs of the patient/ person with respect to ICD-WHO classification domains, cooperation with other specialists, determining of the rehabilitation potential, developing the rehabilitation plan tailored to specific needs, contribution of PRM physician in the follow-up care pathways as well.

Key words

long term disabilities, interdisciplinary team, rehabilitation for chronic disease and disability, role of PRM physician in disability management

Introduction

The world is experiencing a rapid rise in chronic health problems to the extent that chronic conditions now account for over half of the global disease burden (1). There are more people with disabilities partly because people live longer and are more likely to become disabled, as they get older (2). People with chronic health problems are more likely to utilise healthcare, particularly when they have multiple problems.

The total number of the population with a long-standing health problem or a disability (LSHPD) in 25 European countries is estimated to account for more than 45 million citizens (3). This means that one in six persons (15.7%) of the working age population (aged 16 to 64) has either a long-standing health problem or a disability.

The World Health Organisation (WHO) estimates that people with disabilities comprise 10 percent of any given population (2, 4). In a recent study the prevalence of disability levels in a

Spanish elderly population using WHO-DAS II (12 items) as a screening tool, WHO-DAS II (36 items) as the basis for a multi-faceted assessment of disability, and ICF disability severity ranges to define cases of mild, moderate, and severe, prevalence rates for disability (age ≥75) based on the WHO-DAS II summary index were: 39.17 ± 2.18% (mild disability); 15.31 ± 1.61% (moderate disability); and 10.14 ± 1.35% (severe/extreme disability) (5).

Chronic conditions are defined by the World Health Organisation - WHO (6) as requiring "ongoing management over a period of years or decades" and cover a wide range of health problems that go beyond the conventional definition of chronic illness.

While others have offered different definitions for chronic illness (7, 8), the common theme is that these conditions require a complex response over an extended time period that involves coordinated inputs from a wide range of health professionals (6).

Over the next 15 years the number of people who need long-term care is expected to increase by 30 percent (9). Estimates of the long-term care population suggest that the number of people with long-term care needs will more than double between 2000 and 2050 (10).

Definition of Long term care

Long term care (LTC) in general is an amorphous concept. It is more readily defined by what it is not than by what it is. One definition that seems to serve well is the following (11) : Long-term care is assistance given over a sustained period of time to people who are experiencing long –term disabilities or difficulties in functioning because disability. Several implications flow from this definition:

- Functioning is the central theme of LTC.
- LTC is often linked to chronic disease: Much of the disability that underlies it, is the result of such disease, often more than one acting simultaneously.

Rehabilitation for chronic disease and disability

The World report on disability (WRD) acknowledges the central role of rehabilitation with all its facets emphasising the capacity of rehabilitation to eliminate potential barriers to unrestricted participation in everyday life. The WRD underlines that rehabilitation must be provided in acute care hospitals (mainly rehabilitation medicine and therapy) as well as in follow-up medical rehabilitation (2).

It has been highlighted that rehabilitation is an integral component in the management of people with chronic disease (12).

The aim of PRM (Physical and Rehabilitation Medicine) for chronic disease is for people to achieve optimal physical and psychological function, to self-manage their disease and be active partners with their clinical teams in decisions regarding their health care.

Rehabilitation for chronic disease is defined as " the coordinated sum of interventions required to ensure the best physical, psychological and social conditions so that patients with chronic or post-acute disease may, by their own efforts, preserve or resume optimal functioning in society and, through improved health behaviours, slow or reverse progression of disease" (13) .

In its definition of disability, the WRD leaves behind the restrictive view of the medical dimension of disability by making clear that the medical and the social model are not dichotomous or mutually exclusive. It argues that disability is a complex, multidimensional concept, fundamentally dynamic in nature that engages both intrinsic features of human physiology and functioning and features of the physical and human-built, social and attitudinal environment (14).

For purposes of rehabilitation intervention has been recommended no longer designate the disabled person and his limitations in participation as a " patient ", but as a "person with rights " (Madrid Conference of 2002, European Year of Disabled) as declared also The document Rehabilitation Plan: an Italian Act published in 2011 (15).

People with disabilities are particularly vulnerable to deficiencies in health care services. Depending on the group and setting, persons with disabilities may experience greater vulnerability to secondary conditions, co-morbid conditions, age-related conditions, engaging in health risk behaviours and higher rates of premature death (16).

There are more benefits of long term rehabilitation. Rehabilitation provided along a continuum of care ranging from hospital care to rehabilitation in the community can improve health outcomes, reduce costs by shortening hospital stays (17 ,18), reduce disability and improve quality of life (19, 20, 21, 22). There is a considerable literature indicating that people with long-term unrelated health conditions die earlier/more frequently from common health problems e.g. heart attacks, common cancers because they are less likely to access health screening programmes, less likely to participate in sports, etc and they can't access these facilities.

Successful rehabilitation services have **five key elements**: easy and early access to services, comprehensive assessment, holistic goal setting, individually designed, multi-disciplinary and interdisciplinary interventions and links to maintenance and support. It has been shown to reduce readmissions and subsequent length of stay, reduce morbidity and mortality, and improve patient outcomes including exercise tolerance and quality of life (12).

There are described sectors for PRM practice (23). Long term services can be provided in the form of intermittent rehabilitation (inpatient or day clinic) usually with higher intensity and as community based rehabilitation (home based or outpatient rehabilitation services) with lower intensity.

The ICF (The International Classification of Functioning Disability and Health, World Health Organisation, 2001), adopted as the conceptual framework for World report on disability, understands functioning and disability as a dynamic interaction between health conditions and contextual factors, both personal and environmental (24). The ICF provides the basis to develop disease-specific disability profiles (25). Moreover, the ICF facilitates the identification of targets in rehabilitation, assessment of intervention outcomes, and social and health service planning (26). The clinical feasibility of the ICF has been facilitated through development of the ICF Core Sets, which have been developed for 12 chronic health conditions (chronic widespread pain, low back pain, osteoarthritis, osteoporosis, rheumatoid arthritis, chronic is chemic heart disease, diabetes mellitus, obesity, obstructive pulmonary diseases, breast cancer, depression, and stroke (26, 26, 27).

It was also found that implementation of the ICF in rehabilitation settings improves the quality of interdisciplinary work process (28, 29, 30) and contributes to goal setting (31).

Example of long term rehabilitation issues in stroke

Most stroke research has focused on acute and post-acute care, with less attention given to the more chronic recovery phases. However, research indicates that stroke patients can continue to make gains for years after onset. Thus, continued management of these individuals in chronic care settings is recommended (32). There is strong evidence that relatively greater functional improvements are made by patients rehabilitated on specialised stroke units when compared to general medical units and the effects are maintained over both the short-term and long-term. There is strong evidence that functional outcomes achieved through stroke rehabilitation are maintained and actually improve for up to one year. There is moderate evidence that by five years post-stroke functional outcomes plateau and may decline (33). According by the same evidence based review (33) by ten years, overall functional outcome scores significantly decline although it is unclear to what extent the natural ageing process and comorbidity may contribute to these declines.

There is also strong evidence that organised, interdisciplinary stroke care will not only reduce mortality rates and the likelihood of institutional care and long-term disability but also may enhance recovery and increase ADL independence the comprehensive preventive strategies also recurrence of CVD (34).

Members of the expert panel, of the European Stroke Organisation prepared the document (35) which offers a comprehensive review of post-stroke rehabilitation, incorporating discussion of optimal timing, setting and duration of therapy as well as individual sections on the role of professions allied to medicine; use of assistive technologies and dealing with the common complications encountered during the rehabilitation period.

The WHO ICF model acknowledges that recovery after stroke (as well as other health conditions) is a multifaceted process that encompasses the interplay of (1) the pathophysiological processes directly related to the stroke and its associated comorbidities, (2) the impact this condition has on the individual, and (3) contextual variables such as each survivor's personal and environmental resources (36).

Within the ICF, the impact of stroke is described according to the following dimensions:

loss of body functions and structures, activities limitations, participation restrictions, contextual factors include the unique personal and environmental variables, personal factors include internal attributes (e.g., sex, comorbidities, ethnocultural background), environmental factors (e.g., family support, social attitudes, architectural barriers, healthcare resources).

Relevant ICF categories for stroke were identified in a formal consensus process by international experts (37).

Recent trends in stroke rehabilitation research have concentrated on incorporating outcome measures that reflect all ICF dimensions (38). The failure to consider all dimensions may result in overestimation or underestimation of the effects of stroke on a given survivor and his or her significant others and consequently may lead to the provision of inappropriate treatment services. In some of these may be the competencies of a physician less than other specialist for each particular field (e.g. physiotherapist, occupational therapist, speech and language therapist etc.). However, the medical management of the rehabilitation team, the individual's health, its maintaining and improving, is the PRM physician's responsibility.

Key roles and skills of the Physical and Rehabilitation Medicine Physician

PRM in acute settings and the activity and responsibility of PRM physician was defined in a previous position paper of UEMS. It delivers a programme of specialist medical rehabilitation for patients during an acute hospital admission following injury, illness or in response to complex medical treatment or its complications (39). Key roles and skills of PRM physicians in post-acute settings consist of determination of diagnosis and prognosis, risk assessment, medical management, leading or managing multi-disciplinary teams, advocacy, mentoring, education, enabling, counselling, and public health issues (40).

PRM programmes in long term follow up settings provide more than just a follow on from

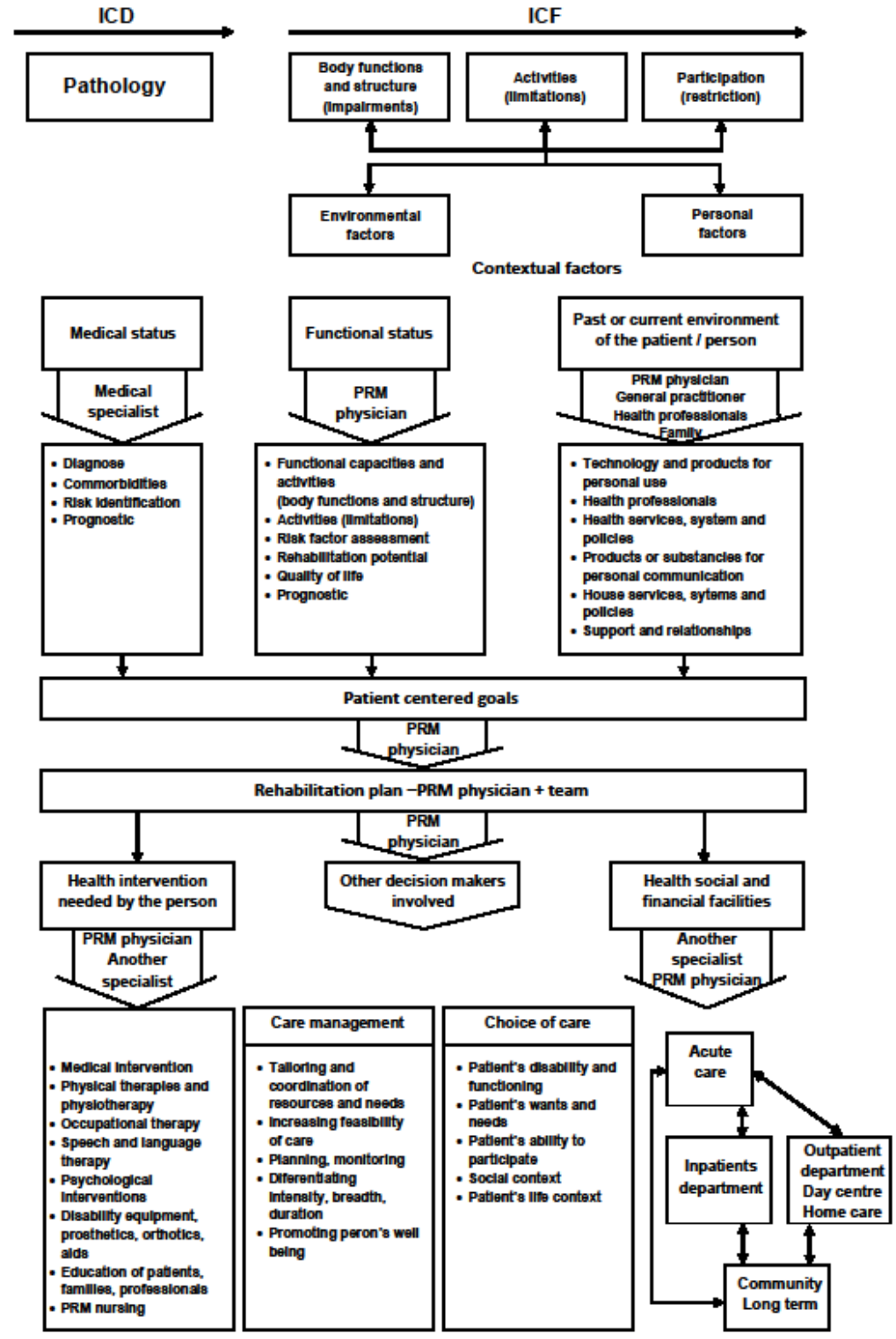
those in acute and post acute settings.

The background as well as the skills and aptitudes and the role of PRM physicians in the rehabilitation process are described in the White Book on Physical and Rehabilitation Medicine in Europe (41). The key roles and competencies of PRM physician in long term rehabilitation care have been defined in a recent paper (42):

- Assessment of long-term disabilities, activity limitations and participation restrictions as well as of rehabilitation potential
- Long-term follow-up of people with disabilities including adaptation of treatments to the progress or decrease of the patients functional capacity and progress of therapies and technologies
- Analysis of contextual factors influencing the patients' functioning
- Setting-up a long-term PRM-plan
- Prescribing PRM-interventions including technical aids and coordination of multi-Professional team work
- Education of patient and relatives
- Supporting participation including return to work and leisure activities and social support.

The role of the PRM physician is summarised in the diagram.

The **diagram** represents on one page:



c

The PRM physician has to evaluate:

the **medical status of a patient** and medical "prognostic" with respect to ICD, for example old person with a stroke, symptoms of infection, vascular lesions of the brain and other multi morbidity. Here the decision of discharge belongs, in most cases, to another specialist (internal medicine, specialist in infectious diseases etc),

- the **functional status of a person**, and functioning "prognostic" with respect to ICF, the PRM physician is the key person to evaluate,
- the **past or current environment of the patient/person**. and its expected evolution in a short and medium term, (is it adapted for the new and expected medical status?). The PRM physician is involved but not alone, cooperation with other professionals, general practitioner, social workers, occupational therapist and others is needed,
- the **health interventions needed by this person**, listing all the manpower, tools for diagnostic (MRI, CT Scan, biology a. o.) the treatments etc. and the interventions on his/her environment, the PRM or other types of facilities, needed. The list has to be written by the PRM physician in close cooperation with other specialists,
- the **health facilities (manpower, coordination, health care network), social and financial facilities** which are available for these persons, with respect to their personal insurance and national insurance system.

From these 5 items, we PRM physicians, can choose and propose to the person & family the best medical or/and PRM programme to improve the situation (medical, social, quality of life etc).

Discharge decision making from acute unit, is based on the medical status and made under the responsibility of the physician heading the acute unit.

Orientation decision making, with respect to the rehabilitation procedure, can be coordinated by a PRM physician. The PRM physician has to be aware of the medical status, the expected medical evolution and the scheduled medical follow-up. The medical liaison between these two physicians is of importance.

PRM physicians are concerned by the increase of the number of "bed-blockers" in EU (43).

These patients accumulate unjustified acute-care hospitalisation (and also unjustified post-acute care hospitalisation) due to the difficulty to address them to facilities adapted to their medical and functioning status.

On the basis of these evaluations and his/her knowledge of health and social system, the PRM physician will orientate the patient/person towards different programmes including or not rehabilitation procedures.

Physical and Rehabilitation Medicine when involved in the follow-up of persons with long term conditions has to participate in health care networks, health care pathways and health information systems.

The second situation which PRM are dealing with, during the follow-up of persons with long term conditions, is when they have **to (re)assess and evaluate persons in long term conditions**, benefitting from long term facilities, whatever they are, and whose medical, functional and environmental status did worsen. In cooperation with other physicians, the PRM physician will have to re evaluate the situation on the same basis that for a discharge procedure, in order to re orientate the patient/person to a more adapted facility, after a comprehensive assessment, including or not rehabilitation procedures.

Diagnostics and identification of problems and needs

The ability to comprehensively define the rehabilitation needs of the patient/ person and to request specific, individualised, and appropriate therapeutic interventions distinguishes the PRM physician from all other medical specialties. Significant contributions of PRM physician to the rehabilitation of persons with long term disability include functional assessment (including evaluation of underlying impairments contributing to functional loss and disability) with realistic goal setting, interdisciplinary team care, and efficacious adjustment of therapy interventions (e.g., timing, setting, intensity) to prevent, reverse, or minimise disability. The medical diagnostic procedure is performed exclusively by physicians because they are taught and assessed on this intervention. PRM physician in this part can contribute to a more accurate diagnosis or in time recognise complications or exacerbation of the basic or intercurrent illness as well. Scope of the PRM physician is also the assessment of risk factors of disease, prognostication in terms of further development of the disease. PRM physician can make a contribution through anticipation and prevention not only of physical, but also psychological and social complications. Identification of problems and needs and the evaluation of impairments, functional capacities, activities and other domains based on ICF classification may be a competency of broader interdisciplinary team. In addition to PRM physician can play an important role the physiotherapists, occupational therapists, speech therapists, psychologists a. o. who conduct evaluation of specific functional deficits. Comprehensive assessment of multiple contextual factors can often be possible through consultation with family members, caregivers or other healthcare or social care providers. The contribution of PRM physician even in these cases is his ability to select the most relevant information, which can be used in the follow up rehabilitation programme.

From practical point of view the PRM physician have to asses:

• Current impairments (clinical features) and their functional impact.
• Current medications, their indications and effects.
• Relevant past illnesses.
• Recent and impending life changes.
• Objective measure of overall personal and social functionality.
• Current and future living environment and its appropriateness to function and prognosis.
• Family situation and availability.
• Current caregiver network including its deficiencies and potential.
• Objective measure of cognitive status.
• Objective assessment of mobility and balance.
• Rehabilitative status and prognosis of ill or disabled.
• Current emotional health and substance abuse.
• Nutritional status and needs.
• Disease risk factors, screening status, and health promotion activities.
• Services required and received.

The person must be evaluated in relation not only to the disease but also to the way the disease affects and is affected by the person's family and social environment, vocational responsibilities and economic state, vocational interests, hopes, and dreams (44). The concept of the quality of life should be taken into account (15). After investigating the physical findings that help to establish the medical diagnosis, the PRM physician still has two principal tasks (44):

To scrutinise the patient for physical findings that define the disabilities that emanate from the disease.

To identify remaining physical, psychological, and intellectual strengths to serve as the base from which to re-establish functional independence.

With chronic disorders, impairments often are not reducible; hence, intervention must address the activity limitations and participation restrictions. The identification of intact functional capabilities is essential to successful rehabilitation. When intact capabilities can be augmented and adapted to new uses, functional independence can be enhanced. After obtaining the history, performing the physical examination, and recording the results, the PRM physician should summarise the findings, construct a problem list, and formulate a plan of rehabilitation (45).

The rehabilitation can have several forms: in day hospital - a comprehensive rehabilitation program in optimal cases conducted by PRM physician ; in an outpatient setting ambulatory

care (outpatients) discipline specific therapy provided in an outpatient setting , program of PRM intervention therapy should also be prescribed by PRM physician ; ambulatory care (home based) rehabilitation services provided to a patient in the home – advantage of this form is that the patient can be rehabilitated in his environment, the disadvantage is usually less complexity of rehabilitation.

Among the most important criteria of the decision is consideration of the rehabilitation potential. Rehabilitation potential are the reserves and possibilities that are at disposal for an individual patient. Restitution of function can be achieved by activating the rehabilitation potential especially at these levels:

- treatment and prevention of secondary changes accompanying the underlying disease
- training of compensatory mechanisms of affected organs (systems)
- training of substitution mechanisms of unaffected organs (systems)
- restoration of fitness (ability) to the level needed for optimal quality of life.

Between low and high intensity of rehabilitation intervention it is not ease to estimate the exact boundary, the solution partially is related to above mentioned items. Some authors answer this question that when the patient can tolerate 3 hours of rehabilitation per day we have to provide intensive rehabilitation, when not we should provide low intensity rehabilitation (46). More important as the arbitrary time limit, is a comprehensive assessment of all the contributory factors.

An example of indication of PRM treatment has been presented in Italian Rehabilitation plan according to Italian Rehabilitation plan (15) : for this purpose should be three dimensions taken into account: 1. clinical complexity: assessment and stratification of high clinical risk, 2. disability, 3. multimoridity : a set of comorbidities that can influence the clinic, treatment and prognosis. Important are also environmental factors especially social condition and family context. The clinical complexity resulting from the functional alterations of organs and disability, associated to the multimorbidity, represent an important element for the formulation of the rehabilitation plan. In the same document has been used the term of highly complex person with systematic problems and many comorbidities who must find a rehabilitative response in relation to the phases of his malady. The conventional approach to this type of patient may be incomplete or inappropriate because of organisational and management models that are not be centred on the person but on the pathology, determining a discontinuity in the assistance.

The form and complexity of rehabilitation care depends on the functional deficit of individual patient, the degree of independence and the need for supervision, stability or instability of the health condition. It is optimal then the decision especially about admission to an

institution can be a result of consensus of medical professionals, social experts, family members and also the patient. PRM physician role in this process of decision about form and place of further management of patients' needs is to argue the benefits or disadvantages of some form from PRM point of view.

The main criterion in the decision-making process should be primarily the need of specialised rehabilitation and not a supplementation of rehabilitation by other medical or non medical procedures in cases in which the specialised rehabilitation should be lege artis indicated.

The team for long term rehabilitation

Effective team working plays a crucial role in PRM. An interdisciplinary team is ideal for effective implementation of rehabilitation for chronic disease and disability. Key members of interdisciplinary teams in PRM, their qualifications and roles have been described (47). To successfully identify and accomplish the goals of rehabilitation, the physical medicine and rehabilitation specialist works closely with the allied health professionals and other medical specialties. Within the interdisciplinary team, the PRM physician brings a distinctive holistic perspective to the patient care process.

In long term rehabilitation general practitioners or paediatricians are very important reference point with the rehabilitation team. PRM physician should be consulted by general practitioner or paediatrician always at the beginning of long term rehabilitation and as required.

Whereas members of other disciplines treat particular ICF body structures and functions, the PRM physician focuses on the person as a whole, thus providing continuity and integrity to patients' and families' rehabilitation experience. Using the domains within the ICF would demonstrate the underlying clinical reasoning for different professions working in collaboration on the same activity (48). Many of the individuals treated in the long term rehabilitation settings have comorbidities that affect the design of a rehabilitation program and their responses and adaptations to this programme. The interaction between modalities of physical and rehabilitation medicine e.g. exercise and the given medical condition is important to understand so that the potential adverse effects may be avoided. In general, the rehabilitation program must not interfere with the standard medical treatment of a disease state and must be individualised in accordance with the presence and severity of the medical condition (49).

Each discipline has a unique contribution, but the teamwork and unified evidence-based approach facilitates short- and long-term goal achievement.

Rehabilitation plan

Rehabilitation plans are influenced by health and social service structures in each country.

In most countries, the health authority demands that the person in need of rehabilitation should have an individual rehabilitation plan. This rehabilitation plan should be developed jointly by the person and the health and social care workers and should be considered a living document and revised appropriately. This reflects an admission of the authorities that the need for follow up/health interventions including PRM interventions can be very long and consist of different components depending on the person needs, wishes and context.

The plan currently should be developed according to the ICF model. The impairments in body function and structure is often necessary to document for statistics (refunds etc.) and then by talking to the person, its consequences in activities and participation can be identified. Also the environmental factors, both barriers and facilitators should be noted. After this is done, it is easier for the person to decide what the major goal for the next period of time should be and then the health care workers can identify which persons/staff categories are needed. Rehabilitation plan should involve at a same time optimal timing, setting and duration of therapy as well as individual sections on the role of professions. This is often complicated procedure and hence is very important for the clinical practice have standards approved by the national or international PRM societies. The French Physical and Rehabilitation Medicine Society (SOFMER) and the French Federation of PRM (FEDMER). 'published the document 'Care pathways in PRM" designed to enable the reader including PRM physician to quickly apprehend the needs of the patients and the available therapeutic care structures for proper organisation for patients with spinal cord injury". These "care pathway" documents generally describe patient needs by patient type and PRM treatment pathway objectives. The patients are divided in five categories and each category is analysed according to six personal or environmental complexity parameters that justify specific skills and resources. There are specified the treatment objectives in a medical, surgical and obstetric facility, treatment in a referral physical and rehabilitation medicine facility, life at home or in an institution and follow-up (50).

The timing of rehabilitation intervention strategies should correspond with expected dynamics of the disease. According to Langhorne et al. is for instance the hypothetical pattern of recovery after stroke with timing of intervention strategies with target settings for particular periods (51): hours: medical needs, hours–days: early mobilisation, days–weeks: restoring impairments in order to regain activities, days–months: task-oriented practice with adaptive learning and compensation strategies, days–months: specific rehabilitation interventions (including physical fitness) to improve extended activities of daily living and

social interaction, weeks–months: environmental adaptations and services at home, months–years: maintenance of physical condition and monitoring quality of life.

The main shortcomings that sometimes occur in clinical practice are too narrow focus of rehabilitation treatment targeted exclusively on the impairment and not sufficient broad spectra of rehabilitation, early absence of interconnection of the phases of rehabilitation , early inpatient rehabilitation is often initiated late because of the lack of rehabilitation wards.

A good example of how to organise the rehabilitation process, the so-called phase model of neurorehabilitation, which is practiced for many years in the Federal Republic of Germany (52). Comprehensive neurorehabilitation begins in the acute phase of the disease and continues in special centres until it is appropriate to implement therapy at home. Phase model here has helped optimise the structure of rehabilitation services, and enable transparency rehabilitation process. Definitions, in which phase of rehabilitation the patient should be admitted, there are fixed and the inclusion of patients within each phase follows the Barthel Index. Is also determined by the length and intensity of treatment, according to which govern the height of the daily cost of rehabilitation of the patient. This ensures continuity and quality of rehabilitation process in terms of the rehabilitation chain.

The main criteria that should be defined in each rehabilitation program are (15): criteria for access and coverage of the network for persons who have true necessity for rehabilitation interventions; criterion of timeliness with respect to the type of need and time of intervention; criterion of continuity which enables integration of various types of interventions and settings depending on the phases of the morbidity; criterion of appropriateness with focus on all inclusive rehabilitation intervention. Additional criteria are: all –inclusive acceptance, measurability of effectiveness of intervention, criteria of effectiveness and Evidence Based Medicine, criterion of active involvement of the user and the problem of suitable physical activity.

Organisational models for long term PRM follow up rehabilitation

The model of organisation depends on the existing traditions of country. Role of PRM physicians among the medical providers may also vary. For instance in the Italian rehabilitation plan (15) is the rehabilitation treatment distributed in phases of: intensive rehabilitation, highly specialised intensive rehabilitation, extensive rehabilitation and in a regimen of assistance during ordinary or diurnal hospitalisation (day hospital, day service), continuous cycle home assistance outside of the hospital. semi-residential or diurnal services, ambulatory assistance, home assistance. But according to this very precise formulated document (15) the volumes of activity and the distribution of services are unbalanced among

the various regions and at times, between different areas in the same region. On the present to formulate the Pan European organisational norm axioms would be inappropriate.

Activities or PRM physician vary according to the clinical settings, but they adopt the same general principles of PRM in all (53).

In various facilities in which is provided the long term PRM care, the role of the PRM physician depends on actual requirements. In facilities with dominant medical care can the PRM physician play a key role as leader of the multidisciplinary team, coordinator of patient centred care , evidence based care, appropriate care setting, evaluator of clinical and outcome process. In facilities with dominant nursing or social care the PRM physician can also be an important consultant in various problems of persons with chronic disabilities.

The long term PRM follow up can be provided in inpatient institutions. In these many patients begin their chronic disease rehabilitation. The core component of care is improve function, mobilisation, providing basic information to enable the individual and their family or carer the process of management, which will continue in the outpatient and community setting.

In outpatient institutions the rehabilitation can be made for a longer periods of chronic disease, moreover when the functional abilities are not progressing as well as expected, or when disease progression, exacerbations and readmissions prevent achievement of functional gains.

The intensity of rehabilitation intervention need not be always dependent on in or out patients form of institution by himself. Intensive rehabilitation can be provided in hospitals and also in specialised extra hospital facilities. It is characterised by rehabilitative health interventions designed to recover from important and complex disabilities, which can be modified and which require a high level of assistance, nursing care over a period of 24 hour (15).Upon achievement of clinical stability and availability of rehabilitation in the territory can be the patient recommended to extra hospital rehabilitation.

Extensive rehabilitation this term defines the document of Italian rehabilitation plan for patients who are not self- sufficient with potential for functional recovery, who cannot benefit or sustain intensive rehabilitation treatment requiring hospitalisation, inasmuch as they are clinically unstable. It is distributed within the ambit of hospital and extra hospital environments. It is recommended for patients with concomitant comorbidity that interacts with rehabilitation prognosis who need specialist rehabilitation competence in management of disabled person in critical condition.

Outpatient services - the Italian rehabilitation plan differentiates between two types of users : the complex case with important impairment and/ or disability, often multiple in nature, high degree of ADL disability and requires multi-professional team, non –complex

case are users affected by impairment and/ or disabilities of any origin, plan require single therapeutical programme for rehabilitation. The access is granted through examination by PRM physician.

Day rehabilitation

In special cases, day rehabilitation could be useful for assessing the person and family and maybe define a short term programme and revise the long term programme. Day rehabilitation is specifically used in children with chronic disabilities. In European countries, inpatient or day-clinic rehabilitation plays an important role in the management of chronic conditions, e.g. chronic musculoskeletal or neuromuscular disorders, chronic circulatory, respiratory and metabolic diseases as well as skin diseases and urological or gynaecological conditions (41).

Out-patient rehabilitation at a rehabilitation centre

Out-patient service provision allows the rehabilitation facilities rehabilitation team caring for long-term program for appropriate patients in acute and sub-acute rehabilitation phase to continue to assume responsibility for patient rehabilitation in long term.

Community based rehabilitation

Community based rehabilitation(CBR) is very important which raised a strategy planning access services of rehabilitation in the country or its territory- for example set out in the suburbs, rural areas, tundra or otherwise. The original version, that CBR is attributable mainly to developing countries has been replaced by an understanding of CBR as a very effective way of organising rehabilitation services in any society, which is sufficiently developed understanding of universal human rights as generally acceptable society, which let us save all kinds of public resources, including the professional rehabilitation.

Rehabilitation in the home setting

Rehabilitation in the home setting is essentially related to the CBR concept or tele-rehabilitation, but it can also be the part of the primary health care service as an alternative to institutional services in areas with high population's density. In the case, rehabilitation activities are particularly focused on problems in the real functioning of the patient's environment, which rehabilitation services makes it particularly targeted. In home the rehabilitation may be the continuation of treatment realised in previous phases of treatment, or when the patient cannot gain access to ambulatory services. The "interdisciplinary team

care" is not always used for persons at home, if necessary various other health and social professionals are involved in a team care.

Freestanding rehabilitation facilities (within the country or in other countries)

Freestanding rehabilitation facilities is a traditional long- term rehabilitation service delivery mode in many countries, which is to provide different groups of patient's long- term care and rehabilitation. Usually the costs are relatively lower than other above- mentioned long-term rehabilitation facilities, that the same time these institutions generate patient disintegration from the society, which is contrary to universal human rights. PRM physician's role in this long term Rehabilitation setting is sometimes not defined and the medical services provided by family doctors, geriatrists and other specialists, whose knowledge of the functioning are often inadequate.

Conclusion

In long term disabilities the PRM components of care become the main focus of management. The rehabilitation process for patients with complex problems requires a carefully planned and integrated program. The role of the PRM physician includes provision of medical care. Many patients have comorbidities that require appropriate monitoring and therapy. The PRM physician must provide advice on diagnosis, likely prognosis, treatment options and their potential benefits and risks to patient and family. The multiple problems of a patient require active participation of a team of professionals. The PRM physician must also give leadership to the team and assist in developing treatment protocols and setting treatment expectations. In chronic conditions psycho-social issues are obviously very important. Because holistic perspective PRM physician has in management of long term rehabilitation a unique contribution.

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New technologies designed to improve functioning: The role of Physical and Rehabilitation Medicine physician.

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New technologies designed to improve functioning: the role of Physical and Rehabilitation Medicine Physician

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Introduction

The growth in rehabilitation practice in all its fields, applications and settings, is showing increasingly strong interaction with the general increase in the potential of technology and its innovative applications. (1)
Nevertheless, it should be stressed that the use of machinery has always been a fundamental mainstay of rehabilitation practice (Physical and Rehabilitation Medicine, involving the whole environment around disabled people), as it was in the past with physical exercises, physical modalities, and many other activities that employed physical and technological means such as Aids, Prostheses and Orthotics.(2-3-4)
Currently the new possibilities offered by technologies support continuous development for these traditional rehabilitation tools and continuous extension of their applications toward the better recovery of functioning and health for any person with disability. (5-6-7)
On the other hand, the peculiarity of new technological equipment and methodologies for evaluation, but mainly for treatments, is interacting actively and profoundly with rehabilitation

practices, very often modifying very deeply many previously shared theoretical, clinical and management paradigms.
So, the many different applications of technologies in therapeutic interventions are the "core" of the prospects for this Position Paper.
Another difficulty arises from the current imperfect classification of the types and categories of these devices and apparatus with regard to the variability and so many differences in characteristics, utilisation, aims, etc.
Until now there has not been full consensus on which machines can be qualified as robots, but there is general agreement among experts and the public that "robots tend to do some or all of the following: move around, operate a mechanical limb, sense and manipulate their environment, and exhibit intelligent behaviour, especially behaviour which mimics humans or other animals". (4)
We may summarise as follows: robots have actuators and sensors, the action they perform is based on sensed status or environment and there is an intelligent reaction to this status or environment. Without intelligence it is "only" an automated object. In any case, they are used more and more in clinical activities in regard to daily care. This attention in the world of Robotic Rehabilitation is also demonstrated by the steady increase of publications on this topic, it is possible to select more than 900 articles in this scientific field in pub med in the last five years. In June 2013, 33 studies regarding this topic were recorded on the website Clinical Trial.Gov.
On the other hand, Assistive Technology (AT) or better recently Assistive Product is defined as "any item, piece of equipment, or product system whether acquired commercially off the shelf, modified or customised, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. It is a broad range of devices, services, strategies, and practices that are conceived and applied to ameliorate the problems faced by individuals who have disabilities." (8)
AT devices are tools for enhancing the independent functioning of people who have disabilities. They range from low-tech aids, such as built-up handles on eating utensils, to high tech devices such as computerised communication systems, alternative access systems or powered wheelchairs. The ultimate objective of AT is to contribute to the effective enhancement of the lives of people with disabilities and elderly people by helping to overcome and solve their functional problems, reducing dependence on others and contributing to integration into their families and society. (9)
This definition has several important elements. It emphasises the functional capabilities of individuals with disabilities as a result of the successful use of AT and is highly significant in terms of quality of life. It underscores the importance of assessing and supporting the unique needs of each individual and the context in which they will be applying AT.
If we wish to support and expand Physical and Rehabilitation Medicine it is fundamental to face these new aspects and show how these parts (new but completely incorporated into the scientific and practical role of PRM) are involved in our discipline evolution, the number of other professionals and technicians who could cooperate under the guidance of PRM doctors in the team to achieve the common aim of enriching scientific results and outcomes for people in treatment, and demonstrate how evaluation for research and certification regarding these new technologies and their clinical applications is at the heart of Physical and Rehabilitation Medicine.
The purpose of this European Position Paper is exactly to define a common all-round view of these problems, recognising and understanding the main points regarding the Physical and Rehabilitation Medicine Specialist competences and activities .
-Tools are scientific evidences (really very few at this time and needed to be expanded by our actions) but mainly our professional, clinical and management experiences and tasks.

-Contents are about how rehabilitation facilities, programmes and interventions must be guided, about how education and research must be addressed and about how relationships with other professionals and with persons in care must be managed.
The document aims to underline the main key problems to propose a sort of common "agenda" at european level that can be carried out in any country, according to the different local situations, to support Physical and Rehabilitation Medicine in facing and guiding this evolution in the next years.

Key issues for Physical and Rehabilitation Medicine

This field takes concrete form in particular with projects and experiences for the use of innovative equipment and technological systems as supports, interaction or instruments for the realisation of various types of treatment for different purposes.
This interaction discloses great positive aspects, but also strong critical points due to the objective difficulty in correlating the actual needs of rehabilitation practices with appropriate responses on the part of technological research, as well as verification of the efficacy and efficiency of these innovations.
Really strong and rapid are the development and diffusion of these instruments in any country ; scientific literature and in the same time any common information mean (Internet, TV, newspapers, etc.) are diffusing expectations among health systems, patients, families and disabled people's associations.
So these positive or critical aspects must be faced and solved as soon as possible.

A) Lack of complete clinical instructions

The first highly critical point is often (and for much of the equipment on the market) that there are no specific clinical elements of rehabilitation evidence to support the proposals companies introduce. Often there is only basic simple kinesiological, static-mechanical or neuro-functional evidence; in other cases there are only cognitive, behavioural, sensorial and relational elements, which are however very simple and elementary and are definitely not correlated to overall processes of understanding, learning and functional acquisition for recovery in functioning and participation. (10-11-12-13-14)
The increasingly prolific references do not yet offer suitable evidence for the many different applications.
In this sense, there is a great need for overall rehabilitative verifications on existing equipment, as well as rehabilitative research to better orient companies' technological applications in future (to modify existing or create new ones.
Moreover, some great positive prospects (to be developed) also emerge:

- –firstly, the possibility to have new tools with which to study and clarify modalities of therapeutic interventions, learning recovery and evidence in our clinical activities;
- –the possibility to guarantee greater homogeneity and measurability of treatments, as well as the relative effects and functional results;
- –the possibility, therefore, to realise wide-ranging significant clinical studies and bring out evidence of a biomechanics and functional nature and on individual performance.

B) Needs for new form of organisation and economic recognition

Other critical elements in this phase turn up in the field of management and organisation in any facility, in any individual rehabilitation programme of treatment, and mainly regarding the needed Physical and Rehabilitation Medicine Specialist medical detailed prescription to apply these instruments, but also to obtain the right resources that this development requires. (15-16-17)

As a matter of fact, very often these new modalities for treatment do not have specific recognition, just as if they were the same as other "traditional" methods: one of the most important causes is previous point A, but the financial crises in Health Services in many countries are also important.

Therefore limitations and differences arise among Rehabilitation Centres that can or cannot equip themselves with this innovative machinery, giving rise to doubts about disparities in treatment among the many types of persons with disabilities and their productive use of treatments. (17)

Moreover, some great positive aspects (to be developed) also emerge:

–The possibility to implement the different forms of distance /home -rehabilitation on a large scale, understood as an appropriate form of continuity and effectiveness of treatments, integrating them with the environment, individual and motivational lifestyles of persons who are deeply and actively involved .(18-19-12)

– A real possibility to increase care in relation to the multiplication of demand on the part of persons with disabilities, without excessive conflict regarding the costs that the use of personnel only would produce.

C) Inclusion of items concerning new technologies in educational programmes (basic and continuous)

Another critical element that emerges is the objective need to modify the contents of training for rehabilitation team personnel to promote appropriate and widespread use of technological equipment in rehabilitative treatment, as well as the organisation of various activities in the different temporal phases of treatment. Educational programmes (universitary or not) in PRM unfortunately in many countries should not pay great attention in order to include in the curriculum arguments concerning new technologies. This field of study for students should also include phases of direct clinical experiences in areas where technological systems are used both for evaluation and treatment in the patients.

The relationship between PRM and patients is also modified with respect to the substantial aspects of accepting patients for care and therapy and conducting the treatment between patient and health professionals. The change for PRM is mainly in research and defining new clinical paradigms, protocols and guidelines to add to previous knowledge. (18-20-21)

The question now arises as to whether this equipment can replace specific categories of operational personnel (Physiotherapists, Speech and Language Therapists, Occupational Therapists), perhaps partially regarding some traditional activities, or maybe partially substitute (Tele-rehabilitation) rehabilitative settings where therapeutic programmes were traditionally carried out.

In analysing relations between operational personnel and equipment, the theme of the "difficulty" of performing work is also posed. This tends to occur with Physiotherapists, Speech T., Occupational T., etc and is also one of the elements of adaptation for patients (due to their difficulty) in their progress in performing exercises.

Machinery, on the other hand, is not subject to these adaptations and we should imagine further "intelligent" evolution to enable it to adapt productively to reactions of persons undergoing therapy.
Another aspect (only a brief note but the point has broad scientific contents for patients and professionals) is the “fatigue” involved in training and the single exercises which modify repetitions, strength, character, etc. Fatigue can underline or involve aspects regarding attention (not only on the patient’s part), participation and motivation.
Obviously machines do not feel fatigue! But it could be necessary to adapt the activity programmes on the machinery to avoid problems connected with risks of fatigue for patients during training.
So the problem is precisely the specific (new) competence of operational personnel, who can supervise and guarantee the precision of these therapeutic procedures. Certainly this is something quite new regarding the previous traditional role of professionals, i.e. providing treatment directly “by hand”.
These professionals need new education of a quite different nature , a new role in the global management of treatment programmes, times, measurements and responsibilities, a different cooperation in the Team and with other professionals more technical as programmers and engineers.

D) Care relationship

Nowadays, due to the effects of this equipment, the position and attitude of patients towards their recovery programme and the proactive behaviour they must endeavour to implement in its realisation is very often substantially modified as well.
The primary need is therefore confirmed for global and individual care for the person in the Individual Rehabilitation Project, in order to bring every intervention to a therapeutic and evaluation synthesis. This situation is much more complex and requires a solid role for responsibility in the hands of Physical and Rehabilitation Medicine Specialists, obviously regarding prescriptions for technological treatments, evaluations of results and coordination with other interventions in the recovery program. (9)
Another important role for them is also related to the importance of its constructive relationships with those who design technological systems (Bioengineers, Engineers and other Technicians). The challenge of these years is precisely the construction of new devices that arise from the daily clinical needs.
The equipment is sometimes included as a "support and multiplier" to extend activities and treatments at every level, maintaining a relation with the “traditional” care program regarding different clinical situations. On the contrary, machines can show results over time, for example, by creating a sort of “positive game” for patients, directly communicating to them and thereby excluding professionals.
In other occasions the equipment is introduced as an entirely new potential (which would otherwise not be possible) to perform rehabilitative training that must in any case be included in organic care programmes, under the prescription and guide by the Physical and Rehabilitation Medicine Specialist and with the cooperation of adequately prepared operators. (18-2-20-22)
Therefore, in both cases the equipment immediately creates a new situation in which information, involvement and communications about results must be up-graded towards patients, family and care-givers: it is also better with regard to the active role of the person in care. (23)
Obviously, this last point, like the previous one, is also strongly connected to and based on the first point regarding the lack of clinical evidence on rehabilitation.

Conclusions

As previously explained the purpose of this European Position Paper is to synthesise a common all-round view aiming to underline the main key problems, regarding the development of Physical and Rehabilitation Medicine Specialist role.
The document suggest a sort of common "agenda" that can be carried out at european level and in any country, according to the different local situations, to support Physical and Rehabilitation Medicine in facing and guiding this evolution in the next years.

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Role of the Physical and Rehabilitation Medicine specialist regarding of children and adolescents with acquired brain injury

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Role of the physical and rehabilitation medicine specialist regarding of children and adolescents with acquired brain injury

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Acquired brain injury (ABI) is one of the most common causes of mortality and severe disability in children and adolescents. Those with ABI may suffer any of a wide range of disorders that may limit their activity, their participation in family and school life, and their involvement in society in general. This paper describes the different stages of recovery - hospitalisation, preparing for discharge, and long term follow-up, in which PRM specialists are involved. Although the involvement of the PRM specialist is important in all three stages, it is during the latter two stages when his or her expertise is particularly important. An interdisciplinary care team – which the PRM specialist is well placed to lead - is required if the best results are to be achieved.

KEY WORDS: Brain injuries - Child - Disability evauation - Physical therapy modalities - Occupational therapy - Speech therapy - Rehabilitation.

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Physical and rehabilitation medicine (PRM) is a medical specialty that deals with the restoration of function in people with disability. The rehabilitation and curative paradigms differ in that, rather than focusing on the treatment of the underlying disease, PRM centres on reducing patient disability and limitations to activity, and improving participation in different walks of life. Rehabilitation ranges from the assessment and treatment of the acute condition to achieving the most complete recovery possible in the face of obvious disability.[1, 2]

The role of the PRM specialist in paediatric and adolescent settings has changed over recent decades due to reductions in mortality and parallel increases in disability, activity limitation and participation restriction.[3] Certainly, PRM specialists should be aware that the consequences of ABI in children are commonly not well known outside this specialist field; because of "invisible disability" sequelae may go unrecognised or underestimated by other specialists. Further, there is a need to maintain communication between paediatric and adult care facilities as patients move from one to the other during this complex period of life. In all these respects, the PRM specialist plays a crucial role in preventing complications and in facilitating patient social participation from the acute to the long-term stages of recovery.[4] The ultimate goal of the rehabilitation process is the reintegration of the patient into the community, though many factors contribute to the degree of success achieved.

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Epidemiology

ABI is defined as a brain insult acquired in the postneonatal period; there is no lower age limit. It is the leading cause of mortality and lifelong acquired disability in children. Overall, males are more affected than females (ratio 2:1) at all ages. ABI can be mild, moderate or severe. The majority of injuries are mild (60-80%).[5]

Traumatic brain injury (TBI) is the most common cause of ABI in children and adolescents. It is the cause of death in some 80% of fatal accidents. Those who sustain severe injuries can suffer severe disabilities [6] that represent a significant public health problem as well as a rehabilitation challenge for both patient and carers.[7] The incidence of TBI is estimated at between 180 and 250 per 100000 children under 15 years of age in the USA. It may be even higher in Europe and South Africa: estimates based on emergency room attendance suggest an incidence of 369-865 per 100000, with an even higher incidence among those aged 15-25 years.[9, 10] Around 15-20% of cases registered are moderate to severe. In Spain, some 80000-100000 new cases of TBI are reported each year, almost 50% of these involving patients under 15 years of age.[11] In France, the incidence of severe TBI in patients under 14 years of age has been estimated at 9.6 per 100000.[6] In severe cases of TBI the overall mortality rate is about 30%.[12] Cases of TBI in adolescents (*i.e.*, in children under 18 years of age) are generally more severe than those registered in young children; road accidents are the biggest cause of severe TBI in adolescents while falls are the most common cause in younger patients.[13]

Non-traumatic ABI, including stroke, brain tumours, cerebral anoxia, encephalitis, etc., is less common. The incidence of childhood stroke has been estimated at between 2.73 and 13 per 100000.[7, 14, 15] It should be noted that cerebral palsy (CP) is beyond the scope of this position paper.

Outcome of childhood ABI, and the needs of children and adolescents with ABI

Health conditions can be generally classified as congenital or acquired and as either intermittent (*e.g.*, epilepsy), static or progressive. ABI is an example of a static disorder. However, while an injury itself may represent a static health condition, children grow and the sequelae of ABI may improve or deteriorate during growth. As ABI-associated mortality has diminished over recent decades, there has been a parallel increase in the prevalence of motor, neuropsychological and behavioural sequelae.[16]

In children, motor disability associated with congenital brain lesions can lead to weight and stature problems, as well as limb growth abnormalities. ABI-associated motor impairments can cause the same kinds of problem. It is therefore of great importance to assess the impact of ABI on motor and orthopaedic development, which will depend on the age of the patient when the casual event occurred and the clinical progress of the lesion. Even though motor function often improves after the acute stage, children may suffer longer-term deficits in sensory-motor function.[17]

When an ABI is severe and occurs at a young age, cognitive and/or behavioural impairments can be a major problem; these impairments can include deficits in language, memory, working memory, learning, attention, processing speed and executive functioning.[18-22] Some improvement in cognitive function may occur over time, but children with severe TBI show a slower rate of subsequent intellectual development, and the gap between them and their peers tends to widen over time.[23] Behavioural and emotional problems are also frequently reported in children with TBI, as are impaired social problem-solving skills and moral reasoning.[24] Cognitive and behavioural impairments are often viewed by parents and school staff as the most disabling deficits, and certainly they can have a severe impact on everyday functioning, on the social and educational aspects of patients' lives, on vocational outcomes, and on participation in society.[25-27] Some deficits may be immediately obvious, but others may only become apparent when developmental demands and environmental expectations increase. Given this very wide range of potential problems, PRM specialists need to have a broad range of skills if optimal outcomes for children affected by ABI are to be achieved.[11]

Predictors of outcome after childhood abi, and the impact of ABI on social interactions and family life

Knowledge about the long-term outcome of childhood ABI, and of the predictors of different outcomes, might allow for the undertaking of specific,

targeted interventions. In a recent review, the many factors that predict the outcome of an ABI were classified into three categories:[28]

1) injury related factors. These include the initial or lowest Glasgow Coma Scale score (GCS), the duration of unconsciousness and post-traumatic amnesia, medical markers of injury severity and of secondary or associated injuries, aetiology of the injury and the extent of anatomical damage to the brain, and the dose of therapeutic radiation received by the brain in the treatment of tumours. More severe and larger brain lesions are consistently associated with poorer outcomes in all assessment domains.

2) Demographic factors. Younger age at injury is consistently associated with a poorer outcome, as are lower levels of pre-injury intellectual ability, academic achievement and behavioural status, socioeconomic status (SES), parental education, parental coping, and family functioning.

3) Postinjury factors. These include specific neuropsychological deficits (executive ability, attention and memory), behavioural problems and poor school performance (all of which are related to long-term social functioning and quality of life and all of which strongly predict parental stress and burden). Severe injuries have an important impact on the whole family, as well as a social impact, first at the economic level, and then in terms of family stability. A recently published systematic review [29] reported that interventions that train parents may help to alleviate behavioural and emotional disturbances after paediatric TBI. Some evidence suggests that these interventions improve parenting skills and adjustment. However, all the studies identified involved interventions with multiple treatment components; the effects attributable to parent training alone therefore remain uncertain.

PRM intervention: management and treatment

The PRM team managing children with ABI has three key roles:[30]

— preventing complications;

— treating complications that arise via targeted interventions, *e.g.*, mobilisation, medication with botulinum toxin, local injections, the use of orthoses to manage contractures, and sensory stimulation during coma;

— education of the patient and his/her family/carers regarding how to avoid complications and how to circumvent residual problems such as memory impairment;

Doing this properly represents an important challenge for the PRM specialist - the person usually designated to coordinate the rehabilitation program – who must work closely with other health professionals. Some of the latter will be physicians (paediatricians, neurosurgeons, psychiatrists, etc.), while others will be nurses, physiotherapists, occupational therapists, speech and language therapists, orthotists, clinical psychologists, dieticians, educators, etc. The background, skills and aptitudes required of the PRM specialist during the rehabilitation process are well described in the *White Book of Physical and Rehabilitation Medicine in Europe* [1] and the *Action Plan of the Professional Practice Committee of the UEMS-PRM Section*.[2]

The PRM-Section of the European Union of Medical Specialists (the UEMS-PRM Section) has stressed the importance of effective teamwork - with teams preferably being interdisciplinary rather than multidisciplinary - in achieving good clinical outcomes. Interdisciplinary teams include members from many professional backgrounds working together towards agreed aims, following an agreed and shared strategy. An interdisciplinary team has to work with the patient as well as with his or her family and carers.[31]

Role of the PRM specialist when dealing with patients in coma or minimally aware states

In agreement with the UEMS-PRM Section-approved position paper on physical and rehabilitation medicine in acute settings,[32] PRM specialists have an important role to play in the clinical care of patients during the acute stage of ABI.

The assessment and treatment of ABI in children and adolescents should begin as soon as possible, indeed, when the patient is still in the intensive care unit (ICU), even if the patient is in coma. The goals should be to maintain basic life functions, prevent complications, facilitate awakening, and the attainment of functional recovery. The most common complications during this stage are (Table I): pressure ulcers, increased intracranial pressure due to bleeding, soft tissue oedema or hydrocephalus, the limitation of joint movement due to increased

TABLE I.—*Most common complications in patients in coma or who are only minimally aware.*

Pressure ulcers
Raised intracranial pressure
Soft tissue oedema
Hydrocephalus
Joint limitation
Heterotopic ossification
Other fractures and injuries
Swallowing disorders
Tracheal stenosis
Aspiration pneumonia

TABLE II.—*PRM interventions in patients in coma or who are only minimally aware.*

Joint passive mobilisation
Postural management
Skin damage prevention
Postural splints
Basal stimulation
Respiratory care

muscle tone, heterotopic ossification, complications from other injuries such as fractures failing to fuse, swallowing disorders, tracheal stenosis, aspiration pneumonia and other infections. The PRM specialist should examine the patient as soon as possible, in collaboration with the ICU team, in order to minimise the risk of these problems and to arrange prompt management if they have already occurred. It is also important at this stage to enter into contact with the family in order to open discussions on potential sequelae, and on how these may be tackled during rehabilitation.[27]

Management of special medications

Although in this initial stage the patient may be under the care of another specialist physician, the PRM specialist should manage any medications that the patient may require, or at least supervise their effects. This is important in order to determine whether a problem, or the medication taken for it, might interfere with the rehabilitation process. Some antispasticity drugs for example, may produce drowsiness or hypotonia, which may interfere with the physical and neuropsychological aspects of recovery.

Spasticity can be treated with anti-spasticity drugs, but local injections of botulinum toxin can be used when the condition is localised. In severe cases of spasticity, implanted pumps may eventually be needed. Epilepsy may require continued management. It is important to detect the development of heterotopic ossification since this could interfere with joint movement. The therapeutic choices available include the administration of biphosphonates or anti-inflammatory drugs, or local excision, though there is no good evidence supporting the choice of any of these alternatives.[33]

PRM assessment and treatment

Treatment should be adapted to the patient's age, specific impairments and his/her clinical evolution. The need for passive mobilisation, postural management, skin damage prevention, postural splints to prevent joint deformities, and sensory stimulation during coma, should all be assessed and, when required, begun as soon as possible (Table II). The GCS should be monitored at regular intervals. In many countries this is performed by the ICU staff in order to detect and act upon any deterioration (*e.g.*, raised intracranial pressure). The presence of persistent muscular hypotonia at this stage can be a predictor of poor outcome.[34, 35] The Glasgow Outcome Scale [36] and The Coma Recovery Scale [37] can also be useful for monitoring responsiveness and the clinical severity of TBI.

Contact with other medical specialists and allied health professionals involved in the care of the patient is vital, and should occur regularly.[38]

In the case of prolonged coma, gastrostomy should be considered, as should the nutritional treatment required for the best rehabilitation outcome. It is important during the awakening phase that parents be informed of all the symptoms that might appear. It is also important to avoid harmful external stimulation (noise, light, an excessive number of visits, etc.) as much as possible.[39]

Although the PRM specialist does not usually have overall responsibility for the patient, it is important that he/she should participate in key decisions, *e.g.*, regarding the closure of a tracheotomy, and ensure that feeding is being performed safely and effectively.

PRM intervention in the postacute stage of recovery

Specific intervention programs have been conceived for children with ABI. These entail interdisciplinary rehabilitation starting in the hospital, entering into early and repeated contact with other professionals in the patient's care community (*i.e.*, those ultimately responsible for supporting the child), initiating family support programs, addressing educational issues, and planning for discharge. A smooth transition from hospital to school requires careful planning.[7, 40]

When patients with severe injuries but who are medically stable are discharged from the ICU, they may be transferred as in-patients to the rehabilitation unit or some other medical department (depending on the health system). However, it is common practice to send children with ABI home as soon as possible; they then continue their specialised care as out-patients. Daily treatment at the rehabilitation department is the gold standard, though this may not be available where resources are limited. Patients in a vegetative or minimally responsive state should be admitted to specific PRM programmes rather than being referred to a nursing home. Many children will emerge from a minimally responsive states after a few weeks, and can benefit greatly from interdisciplinary care.[7, 27]

During this postacute stage of recovery, the regaining of voluntary movement and personal independence, and the improvement of communication and cognitive skills are commonly sought. Multisensorial stimulation can be provided before passing on to more active physiotherapy and occupational therapy. Speech therapy and psychological interventions focus on cognitive, behavioural and emotional difficulties. PRM assessment and treatment should be individually tailored to the patient's age, specific impairments and clinical evolution, with goals set in consultation with the patient and his/her family. All members of the rehabilitation team must assume a very active role during this period if the patient's progress and functional independence is to be optimised. The ultimate goal is to enable the child to reintegrate into home and family life, return to school and be socially interactive, thus physiotherapy, occupational therapy, speech and language therapy, and neuropsychological interventions etc. may all be important parts of the treatment required during this period. There is a little evidence that any particular physiotherapy technique provides more benefit than any other during the rehabilitation process, although each professional should, if possible, use the evidence-based techniques in which he/she has clinical expertise.[32] Constraint-induced therapy,[41] virtual reality treatment and robot-assisted therapy, etc., have been reported helpful in the functional recovery of children and adolescents with ABI.[32-43]

Training with respect to movement coordination, posture, balance, standing position, walking, etc., must all be covered, and should be assessed from time to time by the PRM specialist. In some cases, different medications will have to be administrated to the patient (orally or by local injection) to reduce spasticity, alleviate pain or prevent epileptic seizures, etc. Walking and/or resting orthoses may be necessary to treat hemiparesis. Functional assessments using standard, validated, reliable measures should be regularly undertaken to monitor functional improvement.[44, 45]

Given that cognitive and behavioural issues are commonly the most disabling impairments, with negative effects on the child's reintegration into family, school and community life, it is crucial that specific cognitive and behavioural management treatment be implemented with the aim of improving long-term outcomes.[7, 27] The PRM team should early establish a programme designed to alleviate these disorders, employing teaching strategies such as the use of diaries and computer programmes.[46] Treatments should be tailored to the patient's age, characteristics and clinical evolution. A number of recent publications provide information on cognitive rehabilitation programs for children with ABI.[19, 22, 47,] They offer some evidence that cognitive rehabilitation is effective in children with ABI, but they do not always report long follow-up times. Neither can the results be too generalised.

Slifer and Amari (2009) [48] provided a review of behaviour management interventions for children with ABI. Most of the research in this field is based on case-studies or studies employing single-subject experimental designs. Overall, however, the literature supports the efficacy of such behavioural interventions in childhood ABI across all ages, injury severities and stages of recovery. The above authors provide recommendations and standards for behavioural interventions.

Patients' families should be involved from the out-

TABLE III.—*PRM interventions in the post-acute stage of recovery.*

Active physiotherapy and electrotherapy
Orthoses and standing and walking aids
Behavioural education
Occupational therapy
Speech and language therapy
Neuropsychological help
Robot-assisted therapy, virtual reality therapy, etc.

set and participate in goal setting, in treatment, and of course in the planning of the return home. Given that family functioning, parenting style, anxiety, depression and coping ability influence the cognitive and behavioural outcome in children with ABI, and that well-being influences outcomes after childhood ABI, these factors should be targets for improvement. Specific interventions have been designed to teach parents and families how to create an optimal environment for reducing the risk of post-injury problems. Of great interest is a recent review by Cole *et al.*[49] which provides theoretical clinical guidelines for family interventions in the context of pediatric ABI. Again, however, few controlled studies have been performed in this area.

Role of the PRM specialist near the time of discharge and in long-term follow-up

Depending on the results of neuropsychological, speech and language and school competence assessments, a discharge plan should be proposed and discussed with the family and child (Table IV). The child should be reintegrated into school as soon as his/her learning ability, neurological status and fatigue will allow. Discharge planning should take place when the patient no longer needs intensive interdisciplinary rehabilitation and specialised education. Adequate preparation for discharge is important, and should be organised during a care team meeting, involving the family, the child's teachers, and community patient health and social services. This discussion should facilitate decision-taking regarding the options that might best suit the child, *e.g.*, whether reintegration into his/her old school is possible or whether a special education setting is required, etc. In all cases, if the parents agree, this meeting should be held at the school so that teachers can be informed about the child's motor and cognitive/behavioural impairments, his/her possible strengths, and the need for any special environmental adaptations (*e.g.*, handrails, ramps) or assistance that might be needed to optimise learning and successful reintegration. The practice of sports should be recommended but with caution, avoiding those that pose specific risks (for example if the child has developed epilepsy). Specific rehabilitation should be continued after discharge according to the child's needs, including, if possible, visits from a mobile team that can provide treatment at school or at home.[47]

TABLE IV.—*Role of PRM near discharge time and during long-term follow-up.*

—To propose and discuss a discharge plan with the family and the child, taking into account the assessment of other health professionals
—To coordinate professional team meetings in order to provide the best chance of school and social/sport integration and participation in different areas of life
—To coordinate follow-up and review the long-term rehabilitation process, including periodic checking of the patient's medical conditions
—To detect and prevent possible new growth-/maturity-related problems
—To promote patient orientation with respect to social integration and participation in different areas of life, focusing on vocational rehabilitation

Given the sometimes delayed expression of deficits with a negative impact on school and everyday life, and on overall integration into the community, long-term interdisciplinary child- and family-based care must be implemented.[50] This should aim at reducing the consequences of brain injury on the patient's social integration, education, behaviour and psychosocial abilities.[7] Treatment programmes should be reviewed over time, and medical check-ups should be continued as needed. The PRM specialist should also look out for new growth/maturity-related problems (such as spinal skeletal deformity) that might develop during the adolescent growth spurt. Problems are mostly seen in children with severe or asymmetric neurological impairments. ABI, particularly if it involves the frontal lobes, may also be associated with a lack of social or sexual inhibition. This may become problematic when the child becomes a teenager.

There is evidence that adolescents with ABI miss out on vocational advice, as well as opportunities such as work experience. They therefore acquire an additional disadvantage when searching for employment.[51] In its chapter on disability and development, The World Report on Disability 2011 [52] stated that:

A/ *Children with disabilities are less likely to attend school, thus experiencing limited opportunities for human capital formation and facing reduced employment opportunities and decreased productivity in adulthood*

B/ *People with disabilities are more likely to be unemployed and generally earn less even when they are employed, it is harder for people with disabilities to benefit from development and escape from poverty due to discrimination in employment, limited access to transport and lack of access to resources to promote self-employment al livelihood activities.*

C/ *People with disabilities may have extra costs resulting from disability. For this reason, them and their households, are likely to be poorer than non-disabled people with similar incomes*

Recently, 27 European countries drew up and ratified a 2012 consensus document - The Fifth Disability High Level Group Report on the Implementation Of the United Nations Convention On the Rights of Persons with Disabilities - that provides an update of national and EU implementation of the rights of disabled people.[53]

Results and prognosis

Children usually recover well from their motor disorders, and reach good levels of functional independence with respect to daily life activities. Most of them can walk after an ABI and become independent adults.

Motor recovery usually begins early during hospitalisation, and may continue for 6 to 12 months. The duration of coma has been reported a predictor of final outcomes.[51] However, there are few reliable outcome predictors and the PRM specialists should remember this when discussing the prognosis. Even in mild cases of ABI, cognitive disorders may only recognised when the patient reaches maturity.

When injury is severe, a complete neuropsychological recovery may not occur. Symptoms may recede over the following years, but often they become chronic. Final neuropsychological outcomes should therefore be assessed when the patient reaches adulthood. In general, several years may pass before maximum recovery is reached (particularly if the brain lesions suffered are diffuse, such as those caused by encephalitis, severe TBI or radiation treatment for certain brain tumours) and a final assessment of overall autonomy and sequelae can be made.[51] Vocational rehabilitation is an aspect of the PRM specialist's role in the final stage of recovery.

Conclusions

The consequences of ABI are not well known by medical specialists outside of the area of rehabilitation, and are often underestimated by them due to the 'invisibility' of certain problems, such as lack of memory, attention disorders, abnormal fatigue etc.. Assessment of the patient should be made by different experts - from neuroradiologists to cognition specialists - on a regular and long-term basis. Complications, such as epilepsy, may appear in the long-term and should be recognized by medical/legal status teams as linked to the ABI-causing event. Once a child or adolescent with severe ABI is medically stable, he/she should benefit from the intervention of a PRM team focused on achieving functional improvement and the prevention of complications such as contractures. During the acute, post-acute and long-term stages of recovery, the PRM specialist should develop, manage and supervise different programmes of assessment and treatment with the aim of minimising disability, the limitation of activity and the restriction of participation in different walks of life. Such programmes and their goals will require regular review if they are to meet the changing needs of the child as he or she grows and develops.[7]

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INVITED COMMENTARY

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In Europe, rehabilitation in traumatic brain injury (TBI) is recognized as essentially a holistic, multidisciplinary, and educational process, which acknowledges that rehabilitation after head injury is a long-term process with many impairments, particularly in the cognitive domain, and may require 2 yrs or more to achieve maximum recovery.[1] Multidisciplinary team (MDT) interventions provide the essence and foundation of rehabilitation service delivery, and "team working" within rehabilitation practice in Europe is valued and indeed recognized as the preferred strategy essential to optimizing patient outcomes especially for those patients with complex impairments, activity limitations, and participation restrictions often associated with TBI.

The importance of MDTs and interdisciplinary teams (IDTs) in European physical and rehabilitation medicine (PRM) practices was highlighted at the Union of European Medical Specialist, Physical and Rehabilitation Medicine Section (UEMS PRM) meeting in Riga Latvia in 2008. The UEMS PRM is the representative body of PRM medical specialists concerned with rehabilitation medical specialist training, continuing medical education, medical specialty practice autonomy, and other aspects of professional practice. The UEMS PRM is organized through three component committees: the UEMS PRM of the board, the Clinical Affairs Committee, and the Professional Practice Committee (Fig. 1).

In addition to guiding and developing rehabilitation services at a national level, PRM specialists in Europe have an opportunity to influence rehabilitation service delivery and development across Europe through participation in the UEMS PRM. The UEMS PRM includes PRM physician delegates from each of the member states within the European Union (EU) and meets biannually. The UEMS PRM plays a key role in the development and harmonization of rehabilitation services in Europe, a considerable challenge given that the EU now includes 27 countries with diverse cultural, political, social, and economic backgrounds.

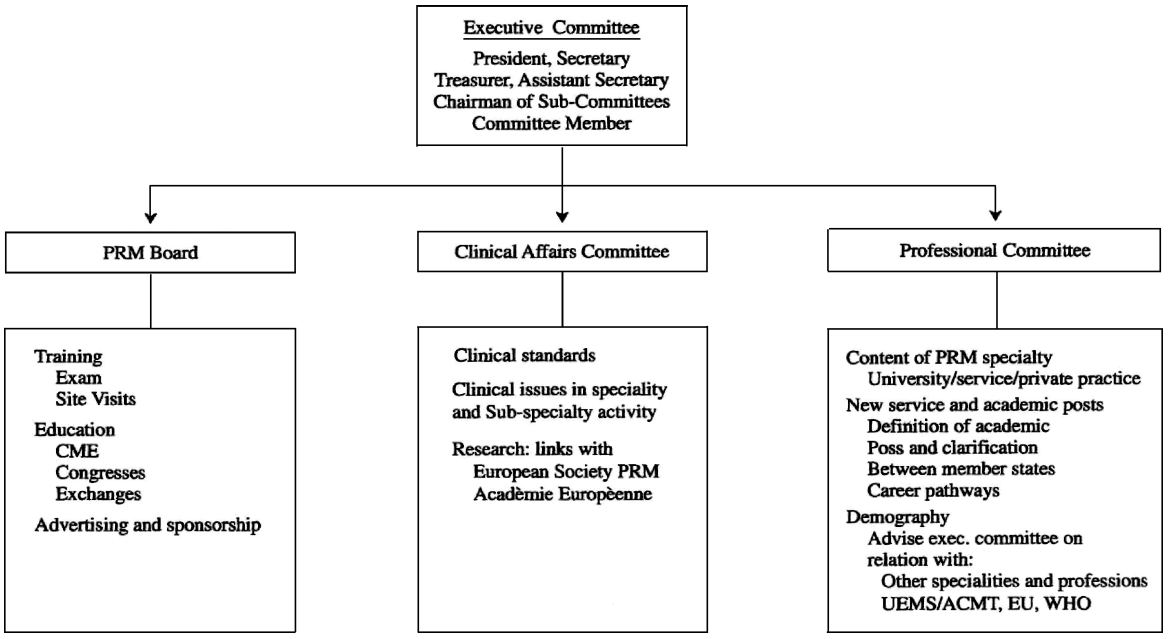

FIGURE 1 *The structure of the UEMS PRM. UEMS indicates Union of European Medical Specialist; PRM, physical and rehabilitation medicine; EU, European Union.*

As a follow-up to the UEMS PRM meeting in Latvia in 2008, the UEMS PRM Professional Practice Committee published a special report on IDTs working in PRM in the *Journal of Rehabilitation Medicine*.[2] The overwhelming view within this working group of European PRM specialists is that team working, especially "interdisciplinary working," is the preferred pattern and that "team working" plays a crucial role in PRM. Team working is considered essential for many reasons, including the need for a broad range of knowledge and skills required to diagnose and assess complex impairments, activity limitations, and participation restrictions; select treatment options; coordinate varied interventions to achieve agreed goals; and critically evaluate and revise plans/goals to respond to changes in the patients' health and function. In a review of the scientific evidence supporting the effectiveness of MDT working, Neumann et al.[2] also note that the evidence is strongest for cerebrovascular disease; however, two studies on MDT working and brain injury were noteworthy. In one randomized controlled trial study of community-based brain injury MDT working *vs.* information only,[3] the MDT intervention was better than information alone. In another quasi-random study by Semylen et al.,[4] MDT interventions for severe TBI compared with standard hospital care reported better clinical outcomes and less distressed carers. It was the opinion of the UEMS PRM Professional Practice Committee that the evidence from published scientific literature indicated that PRM programs with MDTs achieve better result and that there was a very strong case for recommending MDTs and IDTs working within PRM programs in Europe.

REHABILITATION MDT INTERVENTIONS ACUTE TO COMMUNITIES IN EUROPE

Ireland is good example of how MDT interventions are used effectively in European countries across the spectrum of healthcare delivery for the acute, postacute, and livelong management of complex impairment, activity, and participation restrictions associated with TBI.

There is limited trauma system development in Ireland, and in the acute phase, most TBI patients requiring neurosurgical services are transported to one of two centers and returned to a regional acute hospital, where the MDT rehabilitation interventions may be limited or variable. Those patients with severe TBI requiring acute inpatient rehabilitation are admitted to the National Rehabilitation Hospital. The National Rehabilitation Hospital is the only acute inpatient interdisciplinary rehabilitation program for TBI and serves the Republic of Ireland, a population of approximately 4 million people. The National Rehabilitation Hospital is a Comprehensive Accredited Rehabilitation Facility for its brain injury, spinal cord injury, and amputee programs. Rehabilitation care is delivered through IDTs and MDTs led by PRM consultants. The National Rehabilitation Hospital provides IDT and MDT inpatient,

outpatient, and vocational rehabilitation services, and telerehabilitation is used to liaise with services to other cities and rural areas.

Rehabilitation MDT interventions in Ireland are also available across a complex spectrum of patients and over extended periods in the community and include programs for vegetative and minimally conscious patients and neurobehavioral, residential, and vocational and community-based MDT brain injury rehabilitation and residential programs. Rehabilitation MDT service delivery in Ireland are mostly publicly funded, but private and voluntary organizations also play a role especially in community-based residential and long-term care.

Unfortunately, although Ireland PRM practicing clinicians have an opportunity to lead highly skilled and professional MDTs, the availability of and access to appropriate services for patients with TBI are limited. Ireland has the lowest number of PRM specialist per capita in Europe, with just six rehabilitation consultants for a population of more than 4 million. In addition, Ireland has no designated or resourced trauma 1 centers, and services for TBI patients are not yet organized around trauma system development. PRM specialists in Ireland continue to struggle with the Health Service Executive to advocate for TBI national service development.

In most countries in Europe, PRM specialists play a key role in the development of rehabilitation services. For example, the National Institute of Medical Rehabilitation in Hungary established three special rehabilitation services for stroke, spinal cord injury, and TBI in the seventies. These specialized centers are resourced with specialized teams for patients with multifactorial impairments associated with TBI. Zoltan Denes at the National Institute for Medical Rehabilitation in Budapest has noted that there has been significant improvement in the outcome of patients with severe TBI in Hungary in the last 20 yrs and that one-third of patients with severe TBI are now treated in these specialized centers.

FACTORS INFLUENCING REHABILITATION MDT SERVICE DELIVERY AND OUTCOME IN TBI IN THE CONTEXT OF THE EU

The motto of the EU is "United in Diversity," and historically, the EU is founded on an economic and political union of 27 member states (Fig. 2), and there are 23 official and working languages across the member states. The core objectives of the EU remain one of integrating Europe as an "economic community" with the development of a common or single market with the free circulation of goods,

FIGURE 2 *European Union, founded on an economic and political union of 27 member states.*

capital, people, and services. The EU's population is now 7.3% of the world total; however, the EU covers just 3% of the earth's land, making the EU one of the most densely populated regions of the world. One-third of people in the EU live in cities of more than a million people, and 80% live in urban areas.

In addition to cultural, language, and ethnic differences among the member states in Europe, there are considerable economic disparities and differences in health systems and health system infrastructure. In areas of research, education, and health, the EU has often a limited role in supporting national governments, and the substantial epidemiologic and economic disparities have been found to influence the quality of care and outcome in TBI populations in Europe.

EPIDEMIOLOGY AND TBI IN EUROPE

Epidemiologic studies in Europe have identified that there is a significant association between the economic status of the countries in Europe and the health system development and outcome of patients with TBI. Tagliaferri et al.[5] published a review article that included a compilation of 23 European epidemiologic studies from 1980 to 2003. Fourteen European countries were included, including national studies from Denmark, Sweden, Finland, Portugal, and Germany and regional studies from Norway, Sweden, Italy, Switzerland, Spain, Denmark, Ireland, and the United Kingdom. An aggregate hospitalized plus fatal TBI rate within these studies was estimated at 235 per 100,000, with a derived average mortality rate of about 15 per 100,000 and case fatality rate of 11 per 100. The authors report that it was difficult to reach a consensus across the European studies because there were critical differences in research methodology, the external cause of the TBI varied considerably in line with the economic and political factors, and the health system of different countries affected the quality of care and outcomes for patients in different countries in Europe.

ECONOMIC FACTORS, TRAUMA SYSTEMS, AND OUTCOME OF TBI IN EUROPE

Mauritz et al.,[6] in a prospective multicenter study, tested the hypothesis that the economic status of regions across Europe would influence the quality of care and outcome of patients with severe brain injuries. In this study, treatment and outcome data relating to 1172 patients with severe TBI were collected from 13 centers in Europe. The centers were classified as "high income" (HI; five centers in Austria), "upper middle income" (UMI; six centers in Croatia and Slovakia), or "lower middle income" (LMI; two centers in Bosnia and Macedonia). Data on accident, treatment, outcome, and quality of care were collected and compared across the high, middle, and lower economic group classifications.

There was a significant difference in epidemiologies, treatments, and outcomes between the HI and LMI centers. Patients treated through the HI and UMI centers were older, and more women were admitted to the HI and UMI centers than to the LMI centers. The HI centers admitted fewer students and more retired people. Low-level falls and motor vehicle accidents contributed to more than two-thirds of the trauma-related TBI in each of the centers; however, violence, both blunt and penetrating, was a significantly more frequent cause of TBI in UMI and LMI centers. The rate of patients transported by helicopter was highest in the HI centers, and the HI centers received most of their patients directly from the scene of accident, whereas the other centers had a significantly higher rate of secondary transfers. With regard to quality of care, the number of available nurses per intensive care unit bed decreased significantly with decreasing wealth; also, LMI centers most frequently reported no funding for intracranial pressure monitoring catheters, although the necessary monitors were available. The expected mortality rate was lower in HI centers and the UMI centers but 13% higher than expected in the LMI centers. International and European Brain Injury Consortium guidelines[7] were most closely adhered to in the HI and UMI centers compared with the LMI centers; however, adherence to guidelines was nearly impossible in regional health systems that lacked the economic support to provide efficient prehospital care, rapid transport, and high-level hospital care.

In summary, in Europe as in other countries, a well-funded healthcare system at a national level is necessary for successful implementation of the guidelines for TBI management, and this study is similar to other international studies in that outcomes after TBI depended on age, neurologic status, trauma severity, and quality of care. Furthermore, this study demonstrated a significant association between the economic status of the countries in Europe and the outcome of patients with severe TBI.

EUROPEAN MODELS OF MDT REHABILITATION IN TBI

Despite the diversity and differences in economic and political climates within European countries, the value and effectiveness of MDT working within

rehabilitation service delivery for TBI are valued and recognized as effective in rehabilitation service delivery for patients with TBI. The disparate economic and healthcare systems in different countries in Europe have been shown to influence the quality of care and outcomes in TBI, and PRM specialists in Europe play a key role in influencing and advocating for rehabilitation TBI service development within their national health systems; in addition, as delegates to the UEMS PRM committee, PRM specialists have opportunities to participate in leading and harmonizing the future development of rehabilitation services across the European community, including the development of health systems that ensure that all patients with TBI have the benefit of effective MDT and IDT rehabilitation interventions.

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The role of physical and rehabilitation medicine specialist in lymphoedema☆

Le rôle du médecin de médecine physique et de réadaptation dans la prise en charge du lymphœdème

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1.1. Introduction

This paper discusses lymphology and the role of the Physical and Rehabilitation Medicine (PRM) specialist in the management of people with lymphoedema. PRM specialists have a defined role on managing these people and are particularly interested in those with primary and secondary lymphoedema [41]. The aim of the paper is to assist PRM specialists inform their colleagues and payers of services as to their role and to the range of patients, who will gain most advantage from their clinical care.

Lymphoedema is a chronic and progressive condition resulting from an abnormality of, or damage to the lymphatic system. It contrasts from simple oedema due to conditions, such as limb immobilisation or hypoalbuminaemia and is the most readily recognizable attribute of lymphatic vascular incompetence in the presence of the characteristic swelling of tissues, which arises as a consequence of insufficient lymph transport. The accumulation of interstitial fluid in interstitial space leads to swelling, most often in the arms, legs, and other parts of the body.

Lymphoedema is a problem more and more current because its incidence is increasing, linked to the improvement of the survival after breast neoplasm, which represents the first etiology. The early physical treatment is recommended as first-line treatment (HAS, Actualités et Pratiques 2011, n° 28). The PRM allows a global approach of this problem, by integrating the physical problems (the oedema, its functional repercussions, its complications) but also the psychological dimension (always present), the problem of the social and professional integration and finally the quality of life.

1.1.1. Pathophysiology

The main function of the lymphatic system is to drain protein-rich fluid, macromolecules and cells from the interstitium to lymph collectors, then to larger collecting lymph vessels, to the lymph nodes and into the venous circulation. Chronic lymph stasis typically stimulates an increase in the number of fibroblasts, adipocytes, and keratinocytes in the skin as well as a large infiltration of neutrophils. The profound stimulus to collagen deposition in

the integument seems to be unique to chronic lymphatic oedema, although this biology remains largely unexplained. Mononuclear cells (chiefly macrophages) often demarcate the chronic inflammatory response.

1.1.2. Primary lymphoedema

Poorly developed or missing lymph nodes or lymphatic channels may be the cause of primary lymphoedema. Primary lymphoedema can occur at birth, at the onset of puberty or in the adulthood.

1.1.3. Secondary lymphoedema

Secondary lymphoedema may remain a significant, long-term problem for many cancer survivors secondary lymphoedema [24]. The incidence of lymphoedema after breast-cancer surgery varies across studies from 6 to 70% depending on the criteria used for diagnosis and the follow-up interval [3]. Classically, it develops due to filariasis.

Lymphoedema is deeply disturbing for patients' physical and mental health, involving loss of function and psychological distress, resulting in diminished quality of life. Loss of function can be caused by decreased range of motion and heaviness of the affected limb, impaired wound healing predisposing the patient to infection, and pain. Psychological morbidity includes anxiety, fear, depression, loss of body-image and self-esteem, and decreased sexual drive. There is a current deficiency of the clinical research in the domain and there was thus no recent progress concerning the care of lymphoedema. There are only 11 randomized and controlled studies on this topic. The recommendations are based thus on experts' advice.

1.1.4. Treatment

Treatment is tailored to the individual patient's presentation of the condition and the underlying disease. Early diagnosis and treatment are essential to prevent worsening of the condition and to prevent the psychologic consequences of the disease. Specific type, amount and combination of these treatments continue to be debated. Psychological distress can impact on compliance with physical treatments.

The broad training enables the PRM specialist to diagnose, assess and manage the severity of health problems in lymphoedema [31,33,36].

1.2. Management of Lymphoedema by Physical and Rehabilitation Medicine specialists

1.2.1. Diagnosis

The diagnosis of lymphoedema in PRM predominantly is a clinical diagnosis. The PRM doctor takes the patient's history and performs the clinical investigation [17]. In some cases, imaging techniques have to be applied [60,67,68]. Additionally, the impact of lymphoedema on functioning (referring ICF-domains of body functions, activities and participation) and quality of life needs to be assessed by PRM specialists.

1.2.1.1. History taking. History taking of patients with lymphoedema has to include the dynamic (slowly, fast), the localization and size and texture of oedema. The history of causally connected diseases (trauma, inflammatory diseases, radiotherapy and others) as well as other conditions inducing oedema also are of major importance (cardiac insufficiency, renal diseases, venous disease, and others) [21]. Symptoms possibly related to malignant disease have to be investigated very carefully. Rapid development, pain and nerve lesions as well as the known general signs (weight loss, fever, and others) are red flags to diagnose malignant disease.

The evaluation of pain by visual analog scale is particularly important. The psychological context must be addressed: anxiety and especially depression, fear of cancer recurrence, sleep disorders, sexuality problems, asthenia and even sometimes cognitive abnormalities [22]. Moreover, the social and professional consequences have to be evaluated.

1.2.1.2. Clinical Investigation. Clinical investigation includes inspection of localization and size of lymphoedema as well as changes in skin and palpation of lymph nodes. Palpation also looks for mechanical properties of skin and subcutaneous connective tissue e.g. to diagnose fibrosis. A special tool is the so called Stemmer sign that proves if a skin fold in fingers or toes can be lifted or not (the latter being a sign of lymphostasis) [16] Systematic search for a truncal neurological suffering (median and ulnar nerve), as well as for skin complications: fibrosis, lymphangitis, erysipelas, intertrigo, ulcer with lymphorrhoea, papillomatosis, rare malignant transformation are part of clinical investigation [82].

For the purpose of prognosis and defining a treatment strategy, it is important to stage the lymphoedema [14,27,59]:

- stage 1: reversible, no fibrosis, oedema reduction in putting the extremity up, connective tissue is still plastic (e.g. by pressing with finger);
- stage 2: still reversible, but no significant oedema reduction by putting the extremity up, connective tissue is hard and not plastic any more, skin cannot be moved from subcutaneous connective tissue (Stemmer sign);
- stage 3: tissue characteristics as stage 2, but very big oedema (elephantiasis).

Still very useful is the measurement of circumference in extremities with lymphoedema, in comparison to the contralateral side and to look for changes during therapy. It has to be done on standardized sites (e.g. distance from finger tip or sole of foot) and avoiding compression to the tissue. A minimum of two measurements is recommended [15].

The methodology to measure the volume of lymphoedema has been refined by several approaches [15,65]:

- measurement of circumference of the whole leg or arm in 4 cm intervals (method according to Kuhnke). This method is easy to apply, very sensitive to changes in volume but time consuming;
- calculating oedema volume from at least two measurements of circumferences on both sides using a calculator (method according to Herpertz);

- measurement of volume using plethysmograhy (volume change in water by immersion of the arm or leg) that is a simple but exact method [61];
- measurement of volume by opto-electronic measurements that in principle are based on measurement of circumference but provide the possibility of exact measurements in shorter distances and therefore result in more exact data. Of course the electronic calculation of volume is of practical advantage [49];
- in order to have a more objective documentation of the fibrosis of connective tissue, the skin fold thickness can be measured objectively using calipers.

PRM investigation of patients with lymphoedema includes testing of the impact of lymphoedema on other functions, e.g. range of motion of joints, muscle strength, motor control, sensitivity and others. These methods are described elsewhere (e.g. Textbooks on Physical and Rehabilitation Medicine).

1.2.1.3. Imaging techniques. To diagnose lymphoedema and casual disease a number of imaging techniques are available some of them performed by the PRM specialist (e.g. Ultrasound, Doppler) others mainly done by radiologists. The most important techniques are [14,21,72,84]:

- ultrasound volume of oedema, pathologies of lymphatic nodes, other tissue pathologies;
- duplex ultrasound pathologies of arteries and veins (e.g. in combined oedema);
- indirect lymphography (water soluble contrast medium injected under the skin). Function of peripheral parts of lymph system can be diagnosed, e.g. initial drainage insufficiency (''dermal back flow'') and hypo- or aplasia of lymphatic vessels;
- direct lymphography (oily contrast medium injected into lymphatic vessels). This method has the risk to induce fibrosis of lymphatic nodes and therefore, should not be applied;
- quantitative functional lymphatic scintigraphy (injection of tracers). The function of all sectors of the lymphatic system can be shown (for an overview see [80,83]);
- fluorescence microlymphography (intracutaneous injection of fluorescent markers). Imaging of superficial lymphatic capillaries.

New methods are magnetic resonance imaging lymphography but this method is not yet a standard (for an overview see [45]).

In order to diagnose causal diseases or co-morbidities, laboratory testing and imaging (magnetic resonance tomography, computed tomography and others) have to be applied. This is especially important in the case of red flags for malignant diseases.

1.2.1.4. Quality of life assessment. Specific assessments for quality of life of patients with lymphoedema are not available; however, the significance of lymphoedema on functioning is at least part of the ICF core set for breast cancer [13]. Additionally, functional problems occurring from lymphoedema are part of assessments widely used for the quality-of-life-evaluation of cancer patients as published by the European Organization for Research and Treatment of Cancer (EORTC) [10].

Regarding the impact of lymphoedema, other generic assessment tools can be used in patients with lymphoedema, e.g. the 36-Item Short-Form Health Survey (SF-36) [78,79] or World Health Organization Quality of Life assessment (WHOQOL) [81] for overall health status and quality of life or the Disability of Shoulder Arm and Hand Questionnaire (DASH) [20,30] for the functional impact of lymphoedema of the upper limb or the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [8] for the lower limb. For pain related to lymphoedema of course pain assessment questionnaires (e.g. Pain Disability Index [PDI]) [58,74] including Visual Analogue Scales (VAS) can be used.

1.2.2. Therapy

1.2.2.1. Complex physical therapy (CPT) or Complex Decongestive Therapy (CDT) or Decongestive Lymphatic Therapy. One of the most common forms of treatment consists of a multimodality multidisciplinary approach called complex decongestive therapy. Complex decongestive physiotherapy is an empirically derived, effective, multi-component technique under the guidance of a PRM specialist or another medical doctor experienced in lymphology. It is designed to reduce limb volume and maintain the health of the skin and supporting structures. The International Society of Lymphology Executive Committee in 1995 developed a consensus document that offered an integrated view of the various approaches currently utilized for the treatment of lymphoedema [37].

This therapy involves various techniques such as external compression devices, manual lymphatic drainage (MLD), exercises administered by well-trained therapists, scrupulous skin care and intensive patient education.

Treatment options are selected for each patient based on a number of factors, including the patient's medical and status of the cancer, the amount and presentation of oedema, the patient's activity and participation and environmental factors.

Risk assessment by the PRM doctors is an essential component in managing the lymphoedema patient. Relative contraindications to treatment include significant congestive heart failure, acute deep vein thrombosis, acute or untreated infection or inflammation of the affected limb, local massage over irradiated soft tissues, and active malignancy. Some have postulated that in the presence of active malignancy, physical treatments for lymphoedema may promote spread of that malignancy. The patient's primary oncologist or surgeon should be consulted to discuss possible contraindications to treatment in the unique context of each patient's disease. Treatment may proceed with palliative intent.

In a prospective trial, Mondry et al. [53] investigated the effect of complex decongestive therapy on lymphoedema volume in 20 lymphoedema patients who underwent breast-cancer therapy. The authors found that lymphoedema can be treated effectively by complex decongestive therapy, applied 2 to 4 weeks, with a 1-year follow-up. Decreasing girth correlated significantly with decreasing VAS scores for pain.

MLD, multilayer bandages and intermittent pneumatic compression (IPC) have been applied by Leduc et al. [43] in 220 patients after breast surgery. The patients were treated five times per week, 2 weeks long (10 treatments). Already in the first week, the most significant lymphoedema reduction was obtained.

Seventy-eight patients with postmastectomy lymphoedema and 128 with lymphoedematous legs have been treated by CPT, involving skin care, a special lymphatic massage, compression bandaging and (later) garments, special exercises which supplement the massage. The intensive therapy went on for 4 weeks. Volume of the limbs and circumference measurements were investigated. Lymphoedema is reduced most in the first 7 to 10 days. For the arms there has been a reduction of 60% in the amount of oedema, whereby for the legs only 50%. The observation lasted for approximately 1 year. The authors encouraged the patients to wear their compression garments, particularly also at night. The authors further underline the importance of patient compliance, and the continuation with special exercises and skin care [18].

The number of weeks of treatment is usually dependent on the severity of the patient's lymphoedema. Transition from the intensive to the maintenance phase is preferably made sometimes after the patient's progress has reached a plateau. This has to be decided by the PRM doctors. The intensive treatment protocol has been shown in numerous studies to be an effective treatment for lymphoedema.

In the first phase, the PRM doctor takes the responsibility of the patient's management. In the maintenance phase, self-management of the patient and relative predominate independence of the amount of lymphoedema and activity and participation restriction. Regular check-up visits by the PRM specialist are important to prevent aggravation of the symptoms in the maintenance phase. If necessary the PRM doctors prescribes different components of CDP intermittently.

1.2.2.2. Education of patients. Education is important as part of a comprehensive survivorship care plan to increase awareness about lymphoedema [56]. It goes with the routine that patients are made aware of their risk of developing lymphoedema and how to act in case of appearance of signs and symptoms [57].

Precautions are discussed with each patient. Skin care is an important aspect of the treatment program. Patients are instructed to avoid cuts or breaks in the skin and to protect the skin during daily activities. Medical procedures on the affected extremity, including blood pressure readings, blood draws and injections, muscle fatigue during resistive activity as well as light repetitive activity, exposure to heat, bumps, bruises, vigorous massage, tight clothing or jewellery that may restrict lymphatics should be avoided. To prevent further accumulation of lymphoedema patients are advised to elevate the arm frequently in the acute phase as well as in the maintenance phase.

The compliance of the breast cancer related to lymphoedema patient is the key factor determining the results of the treatment.

Andersen et al. [2] showed the effect of education. Outpatients were educated about lymphoedema treatment. For each patient 2 or 3 h were allocated at the first appointment and 1 h was allocated for each follow-up visit [2].

In their prospective investigation, Vignes et al. [63] underline that education of the patients for implementing self-management was a crucial aim in breast cancer-related lymphoedema patients. The patient, and occasionally family members, was instructed the self-bandage technique throughout the intensive phase, and was advised to avoid infectious complications [75]. This is the first study that emphasizes the importance of different therapy components in the maintenance treatment of breast cancer-related lymphoedema.

Education includes modification lifestyle of:

- control of excess weight which increases the risk of lymphoedema after breast cancer [51];
- smoking cessation;
- control of blood pressure [52];
- regular physical activity aiming to reduce the functional consequences of the lymphoedema and to secondary prevent recurrence of cancer [62]. French experts recommend aerobic exercises, at least half an hour a day, 5 days a week [39].

1.2.2.3. Compression therapy. In the initial phase, the aim is the reduction of oedema. Unstretchable multilayer bandaging is applied [6]. After stabilizing the results, a compressive garment is manufactured [42]. Compression is always graded, applied from the tip to the root of the limb, varying from 60 to 20 mmHg [40].

A variety of types of compressions options are currently available, with each method having advantages. The PRM specialist chooses the compression adapted to the individual needs of the patients. Compression garments represent the most widely used form of compression. Both prefabricated and custom-made garments are available. Proper fitting of these garments is crucial to their efficacy. Wrapping the limb with low-stretch bandages in conjunction with padding and foam provides the ideal type compression in many ways.

In their randomised study on the treatment of breast cancer-related lymphoedema, Andersen et al. [2] demonstrated the essentiality to begin with compression therapy in the early stage of lymphoedema. The compression sleeve must fit and the patient should understand why and how to apply it [2]. The fitting of compression sleeve or bandaging has to be checked by the PRM doctor.

In their 5-year follow-up study, Berlin et al. [11] have found that compression therapy is of advantage in controlling postmastectomy arm swelling and preventing further swelling.

The first prospective study of 537 patients investigated the role of the different components of complex decongestive physiotherapy, after intensive treatment [75]. Vignes et al. demonstrated that low stretch bandages in the 1-year long-term treatment of breast-cancer related lymphoedema lead to a 90 ml additional volume reduction during maintenance therapy, compared to no use of bandages [75]. The use of elastic sleeve in the same investigation reduced volume by 118 ml during maintenance therapy, compared to no use of elastic sleeve [75]. Effects of self-bandages and elastic sleeve did not depend on one another. Lymphoedema volume was taken prior to and at the end of intensive treatment, and at month 6 and month 12 follow-up visits [75].

In a randomised, controlled, parallel-group clinical trial, Badger et al. [4] compared multilayer bandaging followed by hosiery versus hosiery alone treating 90 patients with upper and lower limb lymphoedema. Lymphoedema volume was reduced at 24 weeks by 31% for multilayer bandaging versus 15.8% for hosiery alone. All the patients were advised on the positioning of the swollen limb, exercises to support lymph drainage, self-massage (based on the principles of manual lymph drainage) and daily skin care. Badger et al. found that multilayer bandaging as an initial phase of treatment for lymphoedema patients, followed by hosiery, leads to greater and more sustained limb volume reduction than hosiery alone [4].

The compliance to bandaging during complex decongestive treatment is crucial in determining the success of the therapy [28]. More severe lymphoedemas have a worse response to treatment and bandages should be prescribed in early stages by the PRM doctor.

The presence of peripheral arterial disease justifies adjusting the pressure therapy. Compression is contraindicated in case of systolic pressure index lower than 0.5. The compression therapy must be lower than 25 mmHg, if this index is between 0.5 and 0.8 [48]. Microcirculatory disorders of the skin – such as diabetic microangiopathy controlled by the transcutaneous oxygen tension – can be contraindicated to pressure therapy.

1.2.2.4. Exercise. The physiological activation of the muscle pump is essential in the whole therapy of the lymphoedema. Quantitative lymphoscintigraphy shows that lymph drainage is slowed in the subcutis, where most of the oedema lies, and in the subfascial muscle compartment, with much higher lymph flows than the subcutis. Although the muscle does not swell greatly, the impaired muscle drainage correlates with the severity of arm swelling, showing a likely key role for muscle lymphatic function. One can say the swelling is greater, the weaker the active lymphatic pump [66].

Physical exercises play a crucial role in the rehabilitation of lymphoedema. These therapeutic options must be integrated into daily life. Exercises enhance the mobility and muscular activity, and lead to the internal compression of (lymph) vessels. Lymph drainage is being promoted by intermittent pressure changes between muscles and external compression (bandages or hosiery). Breathing exercises activate the lymph flow through the thoracic duct as a result of intrathoracic pressure changes.

Bendz and Fagevik Olsen [9] have demonstrated that early postoperative upper limb exercises produced no significant difference in breast-cancer-related lymphoedema (BCRL) incidence in the first 2 weeks postoperatively compared to delayed commencement of exercise at 2 weeks postoperatively.

The effect of structured exercise compared to usual care/comparison was examined in a recent Cochrane review [50]. Structured exercise programs in the postoperative period significantly improved shoulder flexion range of movement in the short term. Physical therapy treatment yielded additional benefit for shoulder function post-intervention and at 6-month follow-up. There was no evidence of increased risk of lymphoedema at any time point.

In a review [47] that evaluated physical exercise in breast cancer patients, the authors demonstrate the benefit of exercise on physical fitness and thus the capacity for performing activities of daily life, which may otherwise be impaired due to inactivity during treatment. Since exercise interventions require behaviour change, strategies for behaviour change should underpin these interventions.

A randomised controlled trial of breast cancer survivors showed that participation in a 6-month resistance program did not significantly increase the risk of BCRL onset or progression [1].

Schmitz et al. [63] performed a randomised, controlled trial of twice-weekly progressive weight lifting including 141 breast-cancer survivors with stable lymphoedema of the arm. The authors have found that in breast-cancer survivors with lymphoedema, slowly progressive weight lifting had no significant effect on limb swelling and resulted in a decreased incidence of exacerbations of lymphoedema, reduced symptoms, and increased strength.

Decrease of lymphoedema incidence after surgery (+ radiotherapy) have been reported after early practice of MLD and exercise [73].

Tidhar et al. [71] reported in their single-blind randomised clinical study that the patients with breast cancer treatment-related mild and moderate lymphoedema had a mean reduction of 16% (53 ml) of the affected arm volume, after the first aqua-lymphatic therapy (ALT) session, and a reduction of 29% (98.2 ml) after the last session. The ALT (intervention group of 16 patients) has taken place at a weekly session for 3 months in a hydrotherapy pool, and a temperature of 32 to 33 °C in addition to the self-management therapy. The control group had 32 patients. A significant immediate and insignificant long-term effect on limb volume was observed [71].

However, Johansson et al. found no effect of warm water (34 °C) on exercising in the pool, but in the water of 28 °C temperature an immediate reduction of 12% (32 ml) was noted.

Despite the lack of consensus, all schools of therapy agree that exercise must be tailored to individual patient tolerance. According to the individual stage of disease and amount of lymphoedema and the individual needs of the patient the PRM doctor defines the aim of exercise.

Usual advice is moderate resistance training, while wearing compression garments [47], several times a day. These exercises increase the lymphatic flow rate [42]. Exercises must be associated with slow breathing rate and deep respiratory movements [54].

1.2.2.5. Manual lymphatic drainage. Andersen et al. [2] investigated in a prospective randomised study the addition of MLD to the standard therapy in the treatment of BCRL. Fourty-two outpatients with mild and moderate lymphoedema were randomly assigned to receive standard therapy or standard therapy plus MLD eight times in 2 weeks and a training in self-massage. The standard therapy included a custom-made sleeve and glove-garment providing 32 to 40 mmHg, education on lymphoedema, instruction in physical exercise to increase the lymph flow, education in skin care and safety precautions. The patients underwent a follow-up at 1, 3, 6, 9 and 12 months. The

efficacy was evaluated by reduction in lymphoedema volume, i.e. by calculating the circumference measurements of both arms. The analysis demonstrated that the use of compression sleeves in both groups significantly influenced the effect of treatment of lymphoedema. This effect did not change over time. MLD did not contribute greatly to oedema volume reduction.

MLD one to three times a week during the maintenance therapy in a 1-year observation after intensive decongestive therapy in 537 patients with secondary breast cancer-related arm lymphoedema did not influence lymphoedema volume reduction [75].

MLD is a massage with low pressure (< 40 mmHg) targeting only the surface of skin and according to the anatomical route of the lymphatic network [25]. The moderate character of the applied pressure is essential because the objective is to drain the lymphatic vessels. Smooth muscles, without provoking a vasospasm reflex or a damage of the fine stowing fibers of endothelial cells are activated [25]. MLD tries to increase the lymphatic flow rate and to facilitate the opening of lympho-lymphatic shunts [23,44]. A session of MLD lasts between 30 and 60 minutes [42]. Proximal, bilateral manual pressures are combined with peripheral massages, first to clear the main lymphatic vessels, and then to reduce oedema (Tribe K 1998).

Patients are sometimes taught a gentle form of self-massage that is designed to stimulate lymphatic flow. When possible, family members or friends are included in the training.

In severe lymphoedema PRM doctor prescribes MDL during the first weeks. In the maintenance phase only severe lymphoedema patients need MLD to maintain the treatment results achieved in the acute phase. This has to be decided by the PRM specialist.

1.2.2.6. Intermittent pneumatic compression. One study indicated that controversy about their use exists today. This is due to the fact that the adjacent trunk quadrant drains towards the same group of lymph nodes as the limb itself and therefore, has similarly compromised lymphatic drainage. Despite this risk, the utilization of pumps followed by the application of compression garments or bandages continues to be a component of treatment.

When IPC is used adjunctively with other established elements of decongestive lymphatic therapy, it provides an enhancement of the therapeutic response. IPC is well tolerated and remarkably free of complications [70].

Nevertheless, IPC should only be prescribed when MLD is indicated and there is no alternative to MLD.

1.2.2.7. Drug therapy. Benzopyrones and coumarins represent the class of drugs used most frequently to treat lymphoedema. They only can be used as adjunct to CDT.

Benzopyrones are used some times in lymphoedema, however, the scientific evidence is not clear [5,12,46].

For the treatment of lymphangitis and erysipela a guideline recommends amoxiciline 500 mg each 8 h during 14 days (in case of lymphangitis), even associated or not to flucloxaciline. In order to avoid further complications, these drugs have to be prescribed as soon as possible (when lymphangitis starts to appear).

In case of prevention, if the patient has to travel to some areas (third world countries, etc.), peniciline–benzatine (once a week) can be recommended, starting 2 weeks before the journey [12].

Other therapeutic propositions like electrostimulation, laser, cryotherapy are insufficiently [19] evaluated and cannot recommended [38]. Ultrasound, suspected to activate a possible cancerous process, is contra indicated [64].

1.2.2.8. Vocational rehabilitation. The PRM specialist is also essential in vocational rehabilitation. Professional activities may be noxious for lymphedema (exposure to heat or repetitive movements). Workplace adaptation in collaboration with occupational medicine can be necessary.

1.3. Conclusion

The PRM specialist is responsible for the diagnosis of lymphoedema and assessment of the patient. Pre- and postoperative measurements of both arms are useful in the assessment and diagnosis of lymphoedema. He sets up strategies for the rehabilitation management of the patient.

Treatment goals include:

- to educate patients about lymphoedema and encourage participation in a home program;
- to stimulate the lymphatic system in order to promote a reduction of oedema;
- to prevent further accumulation of oedema;
- risk assessment;
- to reduce or prevent the recurrence of infection;
- to help patients cope with the psychologic sequelae of lymphoedema;
- when possible to involve friends and family in the patient's care.

The PRM doctor prescribes the CPT. The intensity and relation of various components of treatment is adapted to the patient's needs. In the treatment of lymphoedema it is crucial that:

- CPT is backed by longstanding experience;
- multilayer wrapping should be carried out only by professionally trained personnel;
- a prescription for low stretch elastic garments is essential for long-term;
- massage alone has limited benefit/may damage lymphatic vessels;
- thermal therapy role and value of thermotherapy in the management of lymphoedema remain unclear;
- elevation often reduces swelling;
- psychological support with a quality of life assessment-improvement program is an integral component of any lymphoedema treatment;

- PRM doctors should elicit symptoms of heaviness, tightness or swelling in the affected arm. A difference of more than 2.0 cm at any of the 4-measurement points may warrant treatment of the lymphoedema, provided that tumour involvement of the axilla or brachial plexus, infection and axillary vein thrombosis have been ruled out.

In conclusion, lymphoedema is a chronic condition, which requires lifelong multidisciplinary treatment strategies under the supervision and responsibility of a PRM doctor [55].

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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2. Version française

2.1. Introduction

Cet article traite de la lymphologie et du rôle du médecin MPR dans la prise en charge de patients avec un lymphœdème. Les médecins de médecine physique et de réadaptation (MPR) ont un rôle bien défini dans la prise en charge de ces patients avec un intérêt tout particulier pour les lymphœdèmes primaires et secondaires. L'objectif de cet article est d'aider les médecins MPR à informer leurs collègues et tutelles sur leur rôle dans la prise en charge du lymphœdème et de définir le profil de patients pouvant bénéficier de cette prise en charge.

Le lymphœdème est une condition chronique et progressive résultant d'une anomalie ou dysfonctionnement du système lymphatique. Il se différencie d'un simple œdème par ses comorbidités telles que l'immobilisation du membre ou hypoalbuminémie et témoigne d'une insuffisance vasculaire du système lymphatique se traduisant par le gonflement des tissus dû à une mauvaise élimination du liquide lymphatique. L'accumulation de fluide dans les espaces interstitiels entraîne un gonflement, la plupart du temps dans les bras, les jambes et autres parties du corps.

Le lymphœdème est une pathologie de plus en plus courante car son incidence est proportionnelle à l'augmentation du taux de survie après un cancer du sein, ce dernier étant la première étiologie du lymphœdème. Le traitement de première intention reste la prise en charge masso-kinésithérapique (HAS Actualité et Pratiques 2011, n° 28). La MPR permet une approche globale de la pathologie, en intégrant la dimension physique (l'œdème, ses répercussions fonctionnelles, ses complications) mais également la dimension psychologique (toujours présente), le problème de l'intégration sociale et professionnelle et enfin, la qualité de vie.

2.1.1. Physiopathologie

La fonction première du système lymphatique est de filtrer le fluide riche en protéines, faire circuler les macromolécules et cellules de l'interstitium jusqu'aux collecteurs lymphatiques vers les larges vaisseaux lymphatiques, ganglions lymphatiques et enfin la circulation sanguine. La stase lymphatique chronique stimule une augmentation du nombre de fibroblastes, adipocytes et kératinocytes dans la peau ainsi que l'infiltration des tissus par les polynucléaires neutrophiles. Le stimulus profond résultant du dépôt de collagène dans le tégument semble propre à l'œdème lymphatique chronique, bien que ce mécanisme biologique reste inexpliqué. Les cellules mononucléaires (majoritairement les macrophages) différencient souvent la réponse inflammatoire chronique.

2.1.2. Lymphœdème primaire

Le lymphœdème primaire semble être causé par une anomalie du développement des ganglions lymphatiques ou des voies lymphatiques. Le lymphœdème primaire peut se manifester à la naissance, au début de la puberté ou à l'âge adulte.

2.1.3. Lymphœdème secondaire

Le lymphœdème secondaire reste un problème significatif pour beaucoup de patients après un cancer. L'incidence du lymphœdème après une chirurgie du cancer du sein varie en fonction des études de 6 à 70 % selon les critères utilisés pour le diagnostic et l'intervalle de suivi [3]. Généralement, ce lymphœdème secondaire se développe à cause d'une filariose.

Le lymphœdème est très perturbant pour la santé physique et psychologique des patients, avec une limitation fonctionnelle et une détresse psychologique conduisant à une qualité de vie diminuée. La limitation fonctionnelle fait suite à une réduction de l'amplitude articulaire et lourdeur du membre œdématié, à un retard voire défaut de cicatrisation des plaies prédisposant le patient aux infections et à la douleur. Les comorbidités psychologiques comprennent l'anxiété, la peur, la dépression, perte de l'image de soi et de l'estime de soi et diminution de la libido. Il existe très peu d'études cliniques dans ce domaine et donc il y a eu peu de progrès dans la prise en charge du lymphœdème ces dernières années avec seulement 11 études contrôlées et randomisées traitant de ce sujet. Les recommandations sont donc basées sur des avis d'experts.

2.1.4. Traitement

Le traitement est individualisé en fonction du tableau clinique du patient et des pathologies associées. Un diagnostic précoce est essentiel pour mettre en place un traitement au plus vite afin d'éviter une aggravation de la maladie et ses

conséquences psychologiques. Le débat reste ouvert sur les types de traitement, dosage et association de plusieurs thérapeutiques. La détresse psychologique des patients peut impacter l'observance des traitements de masso-kinésithérapie.

La formation complète du médecin MPR lui permet de poser un diagnostic, d'évaluer et prendre en charge les lymphœdèmes et la sévérité des problèmes de santé associés.

2.2. Prise en charge du lymphœdème par le spécialiste de médecine physique et de réadaptation

2.2.1. Diagnostic

Le diagnostic de lymphœdème en MPR reste avant tout basé sur la présentation clinique. Le médecin MPR récolte les antécédents du patients et procède à un examen complet [17]. Dans certains cas il est nécessaire de recourir aux techniques d'imagerie. De plus, l'impact du lymphœdème sur le statut fonctionnel (en se référant aux domaines de la Classification internationale du fonctionnement, du handicap et de la santé (CIF) des fonctions corporelles, activités et participation) et sur la qualité de vie doit être évalué par un médecin spécialiste en MPR.

2.2.1.1. Antécédents médicaux. Il est essentiel de colliger les antécédents médicaux du patient en incluant la progression de l'œdème (lent, rapide) sa localisation, sa taille et sa texture mais également les antécédents de pathologies antérieures pouvant avoir un lien de causalité avec l'œdème (traumas, maladies inflammatoires, radiothérapie et autres) ainsi que d'autres conditions favorisant l'œdème (insuffisance cardiaque, pathologies rénales, troubles veineux et autres) [21]. Les symptômes pouvant être liés à des maladies graves doivent être étudiés avec précaution. Une progression rapide, douleurs et lésions nerveuses associés à des symptômes généraux (perte de poids, fièvre et autres) sont des indicateurs de la sévérité d'une pathologie associée.

Il est également important d'évaluer la douleur à l'aide d'une échelle visuelle analogique (EVA). Le contexte psychologique doit être également pris en compte : anxiété et tout spécialement la dépression, la crainte d'une récidive du cancer, les troubles du sommeil, les troubles de la sexualité, l'asthénie et même parfois des troubles cognitifs [22]. Les conséquences sociales et professionnelles doivent également être évaluées.

2.2.1.2. Examen clinique. L'examen clinique recherche la localisation et taille du lymphœdème et les changements cutanés, suivie par une palpation des ganglions. La palpation permet de vérifier les propriétés mécaniques de la peau et du tissu conjonctif sous-cutané, pour diagnostiquer une fibrose par exemple. Il est important d'utiliser le signe de Kaposi-Stemmler, considéré comme pathognomonique du lymphœdème, il s'agit d'effectuer un pincement des orteils ou des doigts pour voir si la peau se décolle ou pas (le dernier cas indiquant une stase lymphatique) [16]. L'examen clinique doit également s'attacher à conduire une recherche systématique d'une souffrance du tronc (nerf médian et ulnaire) et de complications cutanées : fibrose, lymphangite, érysipèle, intertrigo, ulcère avec lymphorrhagie, papillomatose et tout autre changement cutané sévère [82].

Afin d'établir un pronostique et de définir une stratégie thérapeutique de prise en charge il est important de classifier le lymphœdème [14,27,59] ;

- stade 1 : réversible, pas de fibrose, réduction de l'œdème en levant le membre concerné, le tissu conjonctif est encore souple (en pressant avec le doigt) ;
- stade 2 : toujours réversible, mais aucune diminution significative de l'œdème en surélevant le membre concerné, les tissus conjonctifs sont durs, la peau ne peut être décollée du tissu conjonctif sous-cutané (signe de Kaposi-Stemmer pathognomonique) ;
- stade 3 : l'état des tissus est caractéristique et similaire à celui décrit dans le stade 2, mais l'œdème est énorme (éléphantiasis).

Il est également utile de mesurer la circonférence du membre œdématié afin d'effectuer une comparaison avec le membre controlatéral et ainsi mesurer les effets de la thérapie. Ces mesures doivent être effectuées à des endroits précis (par exemple distance du bout des doigts ou plante des pieds) et éviter la compression des tissus. Il est recommandé d'effectuer au minimum deux prises de mesures [15]. La méthodologie de la mesure du volume du lymphœdème consiste en deux approches [15,65] :

- mesure de la circonférence de la jambe entière (ou du bras) à 4 cm d'intervalle (méthode de Kuhnke). Cette méthode est très facile à appliquer et se montre très sensible au changement mais nécessite malheureusement beaucoup de temps ;
- calcule le volume de l'œdème à partir de deux mesures de la circonférence et cela des deux côtés (méthode d'Herpertz) ;
- mesure du volume en utilisant une exploration pléthysmographique (mesures objectives de la différence de volume dans l'eau par immersion du bras ou de la jambe) qui est une méthode simple mais fiable [61] ;
- évaluation du volume par mesures optoélectroniques qui sont en principe basées sur la mesure de la circonférence mais donnent également la possibilité de mesurer de façon exacte des distances plus réduites et donc d'obtenir des données plus fiables. Bien sur, le calcul électronique du volume est également un avantage pratique [49] ;
- afin d'obtenir une documentation plus objective de la fibrose du tissu conjonctif l'épaisseur du pli peut être mesuré en utilisant une pince à plis cutanés.

Les évaluations MPR spécifiques s'attachent également à mesurer l'impact du lymphœdème sur d'autres fonctions : amplitude articulaire, contrôle moteur, force musculaire, sensibilité et autres. Ces méthodes sont décrites en détail dans de nombreux ouvrages (manuels de médicine physique et de rééducation).

2.2.1.3. Techniques d'imagerie. Il existe de nombreuses techniques d'aide au diagnostic de lymphœdème et des maladies causales, certaines sont pratiquées par le médecin MPR (échographie, Doppler) et d'autres par un radiologue. Les techniques les plus courantes sont [14,21,72,84] :

- échographie : volume de l'œdème, pathologies des ganglions, autres pathologies tissulaires ;
- échographie Doppler : pathologies veineuses et artérielles (pour un œdème complexe) ;
- lymphographie indirecte (produit de contraste soluble à l'eau et injecté sous la peau). Les troubles des fonctions périphériques du système lymphatique peuvent être ainsi diagnostiqués, par exemple une insuffisance de filtrage initial (*dermal back flow*) et hypoplasie ou aplasie des vaisseaux lymphatiques ;
- lymphographie directe (produit de contraste huileux injecté dans les vaisseaux lymphatiques). Cette méthode pouvant induire une fibrose des ganglions lymphatiques son utilisation est déconseillée ;
- lymphoscintigraphie fonctionnelle et quantitative (avec injection de traceurs). À l'aide de cet examen, on peut visualiser le fonctionnement de tous les secteurs du système lymphatique (pour plus d'information sur cette technique voir [80,83]) ;
- microlymphographie à fluorescence (injection intradermique de marqueurs fluorescents). Imagerie des capillaires lymphatiques superficiels.

De nouvelles méthodes d'imagerie se développent, parmi elles la lymphographie IRM, mais cette dernière ne fait pas encore partie des gold standards (pour plus d'information sur cette méthode voire [45]).

Afin de diagnostiquer les maladies causales de ce lymphœdème ou les comorbidités associées, il est important de faire appel aux examens de laboratoire et techniques d'imagerie (IRM, tomodensitométrie et autres), tout particulièrement quand il y a une suspicion de lésions cancéreuses ou autre pathologie grave.

2.2.1.4. Évaluation de la qualité de vie. Il n'existe pas d'évaluations spécifiques permettant d'apprécier la qualité de vie des patients avec un lymphœdème ; cependant l'impact significatif de ce dernier sur le statut fonctionnel fait partie du core set du cancer du sein de la CIF [12]. De plus, les problèmes fonctionnels dus au lymphœdème font partie des outils couramment utilisées pour l'évaluation de la qualité de vie des patients atteints d'un cancer, comme publié par l'Organisation européenne pour la recherche et le traitement du cancer (EORTC) [9].

Concernant la mesure de l'impact du lymphœdème, d'autres outils d'évaluation génériques peuvent être utilisés tels que les questionnaires 36-Item Short-Form Health Survey (SF36) [78,79] ou World Health Organization Quality of Life assessment (WHOQOL) [81] pour l'évaluation globale de l'état de santé et de la qualité de vie ou encore le questionnaire Disability of Shoulder Arm and Hand Questionnaire (DASH) [20,30] pour l'impact fonctionnel du lymphœdème sur le membre supérieur ou l'indice Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [7] pour le membre inférieur. Pour les douleurs liées au lymphœdème des questionnaires spécifiques sont disponibles tels que le Pain Disability Index (PDI) [58,74] qui comprend une EVA.

2.3. Thérapie

2.3.1. Thérapie physique combinée (TPC) ou thérapie décongestive complexe (TDC) ou thérapie décongestive lymphatique

Une des formes de traitement les plus courantes consiste en une approche multidisciplinaire et multimodale appelée TDC. La TDC est une méthode multimodale, empirique et efficace, qui doit être conduite par un médecin MPR ou autre médecin ayant une expérience en lymphologie. Ce traitement vise à réduire le volume du membre œdématié et à maintenir la santé de la peau et des structures adjacentes. En 1995, le Comité exécutif de la Société internationale de lymphologie a développé un document de consensus qui offrait une vision globale des différentes approches couramment utilisées dans le traitement du lymphœdème.

Cette thérapie comporte plusieurs techniques telles que les vêtements compressifs, le drainage lymphatique manuel (DLM), des exercices conduits par des kinésithérapeutes entrainés, une surveillance et hygiène scrupuleuse de la peau associés à une éducation thérapeutique intensive du patient.

Les options thérapeutiques sont sélectionnées en fonction de chaque patient en prenant en compte un certain nombre de facteurs, comme l'état médical, la présence d'une tumeur cancéreuse, la sévérité et présentation de l'œdème, l'activité du patient et la participation de facteurs environnementaux.

L'évaluation des risques par les médecins MPR est un élément essentiel de la prise en charge du patient souffrant d'un lymphœdème. Les contre-indications au traitement sont l'insuffisance cardiaque chronique, thrombose veineuse profonde, infection sévère ou non-traitée ou inflammation du membre affecté, massage local sur les tissus mous irradiés et tumeur maligne évolutive. L'oncologue ou chirurgien référent du patient doit être consulté afin de discuter des contre-indications éventuelles au traitement dans le contexte unique de la pathologie de chaque patient. Le traitement peut également être envisagé dans une approche palliative.

Dans une étude clinique prospective, Mondry et al. [53] ont étudié l'effet de la TDC sur le volume du lymphœdème chez 20 patientes après traitement pour un cancer du sein. Les auteurs rapportent que la TDC d'une durée de deux à quatre semaines est efficace dans le traitement du lymphœdème, avec un recul d'un an. La diminution du volume était corrélée de manière significative à la baisse du score EVA de la douleur.

Le DLM, les bandages compressifs à couches multiples et la compression pneumatique intermittente (CPI) ont été utilisé par Leduc et al. [43] chez 220 patientes après chirurgie mammaire pour traitement d'un cancer. Le traitement était administré cinq fois par semaine pendant deux semaines (dix séances

thérapeutiques). Dès la première semaine, les auteurs rapportent une réduction très significative du lymphœdème.

Dans une autre étude, 78 patientes avec un lymphœdème post mastectomie et 128 patients avec un lymphœdème des membres inférieurs furent traités par TPC, comprenant soin de la peau, massage lymphatique spécifique, bandages compressifs suivis de vêtements compressifs, ainsi que des exercices adaptés pour complémenter le massage. Cette thérapie intensive d'une durée de quatre semaines évaluait le volume et la circonférence des membres œdématiés. La réduction la plus importante du lymphœdème était mise en évidence dans les sept à dix premiers jours. Pour les bras, les auteurs rapportent une réduction de 60 % du volume de l'œdème, alors que la réduction était seulement de 50 % pour les jambes. Le suivi de ces patients a duré un an. Les auteurs recommandaient aux patients de porter leurs vêtements compressifs également la nuit. Les auteurs soulignaient également l'importance de l'observance du traitement et de continuer les exercices spécifiques ainsi que la surveillance et hygiène cutanée [18].

La durée du traitement dépend généralement de la sévérité du lymphœdème du patient. La transition de la phase de traitement intensive à la phase de maintien intervient généralement une fois que l'amélioration du patient stagne. C'est à l'équipe MPR de décider du moment de la transition. De nombreuses études montrent l'efficacité d'un protocole de traitement intensif dans la prise en charge du lymphœdème.

Dans la première phase, le médecin MPR prend la responsabilité de la prise en charge du patient, puis dans la phase de maintien le patient se prend en charge, ensuite en fonction de la diminution du lymphœdème les patients peut retrouver une certaine indépendance et ainsi diminuer les restrictions à la participation aux activités de la vie quotidienne.

Les visites régulières de suivi chez le médecin MPR sont importantes afin de prévenir l'aggravation des symptômes dans la phase de maintenance. Si nécessaire, le médecin MPR peut prescrire certaines des composantes de la TDC par intermittence.

2.3.1.1. Éducation thérapeutique des patients. L'éducation thérapeutique à un réel intérêt dans la prise en charge des patients après un cancer afin de les sensibiliser au risque de lymphœdème [56]. Il est important que le patient soit éduqué sur les risques de développer un lymphœdème et comment se comporter devant l'apparition des signes et des symptômes [57].

L'équipe aborde les précautions à prendre avec chaque patient. La surveillance cutanée est un aspect essentiel du traitement, les patients doivent éviter les lésions ou coupures de la peau et la protéger pendant les activités quotidiennes.

De plus, il est nécessaire d'éviter les interventions médicales sur le membre concerné y compris la prise de tension, les prises de sang, les injections, la fatigue musculaire pendant un exercice de résistance ou de répétitions, l'exposition à la chaleur, les coups, bleus, massages trop vigoureux, vêtements serrés ou bijoux limitant le transport lymphatique. Afin d'éviter l'augmentation de volume du lymphœdème, il est recommandé aux patients de surélever le bras fréquemment durant la phrase aiguë ainsi que dans la phase chronique.

L'observance du traitement du lymphœdème par la patiente atteinte d'un cancer du sein est un facteur déterminant pour le résultat du traitement.

Dans leur étude, Andersen et al. [2] rapportaient l'effet de l'éducation thérapeutique sur le traitement du lymphœdème. Les sessions se tenaient en hospitalisation de jour. Pour chaque patient la première session durait deux à trois heures et ensuite une heure lors des visites de suivi [2].

Dans leur étude prospective, Vignes et al. [63] soulignent que l'éducation thérapeutique est essentielle pour que la patiente puisse être autonome en phrase chronique dans la prise en charge de son lymphœdème causé par le traitement d'un cancer du sein. La technique du bandage compressif est enseignée aux patientes et quelques fois aux membres de la famille, pendant la phase aiguë en même temps que la façon de prévenir les complications infectieuses [75]. C'est la première étude soulignant l'importance des différents éléments de la thérapie durant la phase chronique d'un lymphœdème après cancer du sein.

Cette éducation passe également par des modifications du style de vie :

- contrôle de la prise de poids qui augmente le risque de lymphœdème après un cancer du sein [51] ;
- arrêt du tabac ;
- contrôles fréquents de la tension artérielle [52] ;
- activité physique régulière afin d'éviter les conséquences fonctionnelles du lymphœdème et secondairement pour éviter une récidive du cancer [62]. Les experts français recommandent un exercice d'aérobie au moins une demi-heure par jour, cinq jours par semaine [39].

2.3.1.2. Thérapie compressive. Dans la phase aiguë, l'objectif est de réduire l'œdème. Plusieurs couches de bandages compressifs sont posées [6]. Après stabilisation des résultats un vêtement compressif est fabriqué sur mesure [42]. La compression est toujours graduelle, appliquée de l'extrémité du membre en remontant vers sa base et variant de 60 à 20 mmHg [40].

Il existe plusieurs options de thérapie compressive disponibles actuellement et chaque méthode a ses avantages. Le médecin MPR choisit la compression la plus adaptée aux besoins des patients. Les vêtements compressifs sont plus largement utilisés, on peut les trouver dans le commerce ou les faire faire sur mesure. Pour une meilleure efficacité, il est indispensable que ces vêtements soient mis en place correctement. La meilleure thérapie compressive consiste à envelopper le membre dans des bandages très peu élastiques associés à de la mousse et du rembourrage.

Dans leur étude randomisée sur le traitement du lymphœdème secondaire à un cancer du sein, Andersen et al. [2] montraient l'importance de démarrer la thérapie compressive dans les premiers jours du lymphœdème. Le manchon compressif doit être parfaitement adapté et le patient reçoit une formation à la mise en place et l'utilité de la compression

[2]. La bonne mise en place du manchon ou des bandages compressifs doit être évaluée par le médecin MPR.

Berlin et al. [11] rapportent dans leur étude de suivi de cinq ans que la thérapie compressive à l'avantage de contrôler le gonflement du bras post-mastectomie et de prévenir son aggravation. La première étude prospective sur 537 patientes étudiait le rôle des différents éléments de la TDC après traitement intensif [75]. Vignes et al. ont rapporté que les bandages compressifs dans le traitement au long terme (un an) du lymphœdème secondaire à un cancer du sein apportaient une réduction additionnelle de 90 mL du volume du lymphœdème au cours de la phase de maintien, comparé au non-port de bandages compressifs [75]. L'utilisation d'un manchon élastique dans la même étude, réduisait le volume du lymphœdème de 118 mL durant la phase de maintenance, comparé à l'absence de manchon élastique [75]. Les effets des bandages compressifs et des manchons élastiques n'étaient pas interdépendants. Le volume du lymphœdème était mesuré avant et à la fin du traitement de phase aiguë et ensuite à six et 12 mois au cours des visites de suivi [75].

Dans une étude clinique contrôlée, randomisée avec groupe témoin, Badger et al. [4] ont comparé l'utilisation des bandages peu élastiques multicouches suivis de vêtements compressifs à l'utilisation de vêtements compressifs seuls sur 90 patients avec un lymphœdème des bras et jambes. À la semaine 24, le volume du lymphœdème était réduit de 31 % dans l'utilisation de bandages peu élastiques multicouches versus 15,8 % pour les vêtements compressifs seuls. Tous les patients recevaient des consignes portant sur le positionnement du membre œdématié, les exercices à effectuer pour faciliter le drainage lymphatique, l'automassage (basé sur les principes du DLM) et soins quotidiens de la peau. Les auteurs ont montré que l'utilisation de bandages multicouches dans la phase initiale du traitement du lymphœdème, suivie du port de vêtements compressifs permettait une plus grande réduction du volume du lymphœdème et cela de manière plus durable que les vêtements compressifs seuls [4].

La compliance à l'utilisation des bandages au cours de la thérapie décongestive combinée est cruciale au succès du traitement [28]. Le traitement est plus difficile pour les lymphœdèmes sévères c'est pourquoi dans ces cas-là les bandages doivent être prescrits très tôt par le médecin MPR.

La concomitance d'une maladie artérielle périphérique justifie de passer à la compression ou pressothéraphie pneumatique. Celle-ci est contre-indiquée si l'un index de pression systolique (IPS) est au-dessous de 0,5. La compression pneumatique doit être conduite en dessous de 25 mmHg si cet IPS est entre 0,5 et 0,8 [48]. Les troubles circulatoires cutanés – comme la microangiopathie diabétique contrôlée par la mesure transcutanée de l'oxygénation tissulaire – peuvent représenter une contre-indication à la compression pneumatique.

2.3.1.3. Activité physique. L'activation physiologique du muscle est essentielle au traitement du lymphœdème. La lymphoscintigraphie fonctionnelle quantitative montre que le filtrage de la lymphe est ralenti dans l'hypoderme où se trouve la majorité de l'œdème et dans le compartiment du muscle sous-aponévrotique où l'on trouve plus de circulation lymphatique que dans l'hypoderme. Bien que le muscle ne gonfle pas vraiment, la dysfonction du drainage musculaire est corrélée à la sévérité de l'œdème du bras, ce qui montre que le muscle joue un rôle important dans la fonction lymphatique. On peut dire que plus le gonflement est important plus l'activité de la pompe lymphatique est faible [65].

L'activité physique est essentielle dans la rééducation du lymphœdème. Ces options thérapeutiques doivent être intégrées dans la vie quotidienne. L'exercice augmente la mobilité et l'activité musculaire induit une compression interne des vaisseaux lymphatiques. Le drainage lymphatique est favorisé par les changements intermittents de pression entre les muscles et la compression externe (bandages ou manchon). Les exercices de respiration activent la circulation lymphatique à travers le canal thoracique grâce aux changements de pression intrathoracique.

Bendz and Fagevik Olsen [9] montrent que la mise en place précoce d'exercices du membre supérieur post-chirurgie n'apporte aucune différence significative dans l'incidence du lymphœdème secondaire à un cancer du sein dans les deux premières semaines postopératoire en comparaison avec une mise en place à partir de la deuxième semaine postopératoire.

Une récente revue systématique de la Cochrane comparait l'impact d'un exercice structuré à la prise en charge habituelle [50]. En effet, ces programmes mis en place dans la période postopératoire améliorent considérablement l'amplitude articulaire de l'épaule au court terme. De plus, un traitement de rééducation fonctionnelle amenait également des améliorations de l'état fonctionnel de l'épaule après l'intervention et à six mois de suivi. Il n'existe aucune preuve d'une augmentation du risque de lymphœdème liée à cette prise en charge.

Dans une revue systématique [47] évaluant l'exercice physique chez des patientes ayant eu un cancer du sein, les auteurs montraient les effets bénéfiques de l'exercice sur la forme physique et donc la capacité à effectuer les activités de la vie quotidienne, pouvant être limitées à cause de l'inactivité pendant le traitement. Puisque l'exercice physique nécessite des changements de comportement, les stratégies pour mettre en place ces changements doivent précéder les programmes d'exercice physique.

Une étude contrôlée, randomisée sur des patientes en rémission d'un cancer du sein, montrait qu'un programme d'exercice de résistance d'une durée de six mois n'augmentait pas de façon significative le risque de survenue ou de progression d'un lymphœdème secondaire au cancer du sein [1].

Schmitz et al. [63] ont mené une étude contrôlée et randomisée sur 141 patientes en rémission d'un cancer du sein ayant un lymphœdème stable du bras avec deux sessions par semaine de renforcement musculaire progressif. Les auteurs rapportent que ce renforcement musculaire n'avait aucun impact significatif sur le gonflement du bras mais permettait en revanche une diminution des poussées inflammatoires du lymphœdème, une réduction des symptômes et une augmentation de la force musculaire.

Des études montrent une diminution de l'incidence de lymphœdème après chirurgie (+ radiothérapie) du cancer du

sein avec une mise en place précoce de DLM et exercices [73].

Tidhar et al. [71], dans leur étude clinique randomisée en simple insu, rapportent que les patientes ayant un lymphœdème léger à modéré secondaire à un traitement de cancer du sein présentaient une réduction moyenne de 16 % (53 mL) du volume du bras affecté, après la première séance d'aquadrainage lymphatique (ADL), et une réduction de 29 % (98,2 mL) après la dernière séance. Les 16 patientes du groupe ADL bénéficiaient pendant trois mois d'une session hebdomadaire dans une piscine d'hydrothérapie à une température de 32 à 33 °C en complément d'une auto-prise en charge. Le groupe témoin comprenait 32 patientes. Une réduction significative du volume du bras sur le court terme et non significative sur le long terme était observé [71].

Cependant, Johansson et al. montraient que l'eau chaude (34 °C) n'avait aucun effet sur les exercices d'aquadrainage en piscine, mais a contrario l'eau à 28 °C permettait une réduction immédiate de 12 % (32 mL).

En dépit d'une absence de consensus, les professionnels de la MPR s'accordent sur le fait que le programme d'exercice doit être adapté à la tolérance individuelle de chaque patient. Le médecin MPR définit le programme d'exercice en fonction du stade de la maladie, du volume du lymphœdème et des besoins du patient.

Les recommandations habituelles préconisent un programme de renforcement musculaire modéré associé au port de vêtements compressifs [47], plusieurs fois par jour. Ces exercices augmentent la vitesse du flux lymphatique [42] et doivent être associés à une respiration lente et des mouvements respiratoires profonds [54].

2.3.1.4. Drainage lymphatique manuel. Dans une étude prospective randomisée, Andersen et al. [2] étudiaient l'apport du DLM à une thérapie standard dans le traitement du lymphœdème secondaire à un cancer du sein. Dans le cadre de l'hospitalisation de jour, 42 patients avec un lymphœdème léger à modéré étaient randomisés dans deux groupes : l'un recevait une thérapie standard et l'autre bénéficiait d'une thérapie standard plus huit séances de DLM et formation à l'automassage. La thérapie standard consistait en un manchon et un gant faits sur mesure fournissant une compression de l'ordre de 32 à 40 mmHg, de l'éducation thérapeutique sur le lymphœdème, les soins cutanés et précautions à prendre et enfin des instructions concernant les exercices à faire pour augmenter le flux lymphatique. Les patients avaient des visites de suivi à un, trois, six, neuf et 12 mois. L'efficacité était évaluée en fonction de la réduction du volume du lymphœdème, c'est-à-dire en prenant les mesures de la circonférence des deux bras. L'analyse montrait que l'utilisation de manchons compressifs dans les deux groupes avait un impact positif direct sur le traitement du lymphœdème. Cet effet se maintenait au long terme. Le DLM ne contribuait pas grandement à la réduction du volume de l'œdème.

Au final, il était rapporté dans une étude observationnelle d'un an sur 537 patientes souffrant d'un lymphœdème secondaire à un cancer du sein, que des séances de DLM une à trois fois par semaine en phase de maintien après TDC n'avait pas d'impact sur la réduction du volume de l'œdème [75].

Le DLM est un massage à faible pression (< 40 mmHg) ne visant uniquement que la surface de la peau selon l'anatomie du réseau lymphatique [25]. La nature modérée de la pression est essentielle car l'objectif est de drainer les vaisseaux lymphatiques. Les muscles lisses sont activés sans provoquer de vasospasme réflexe ou de lésions sur les fibres fines des cellules endothéliales [25]. Le DLM a pour objectif d'augmenter le flux lymphatique et de faciliter l'ouverture des valves lymphatiques [23,44]. Une session de DLM dure entre 30 et 60 minutes [42]. Les pressions manuelles proximales et bilatérales sont associées à des massages périphériques, tout d'abord pour nettoyer les principaux vaisseaux lymphatiques et ensuite pour réduire l'œdème (Tribe K 1998).

Quelques fois les équipes forment les patients aux techniques d'automassage pour stimuler le flux lymphatique et quand c'est possible, les membres de la famille ou les amis profitent également de cette formation.

Dans le cas de lymphœdème sévère, le médecin PMR prescrit des séances de DLM pendant les premières semaines. Cependant, dans la phase de maintien, seuls les patients souffrant d'un lymphœdème sévère poursuivent le DLM pour maintenir les résultats du traitement obtenus durant la phase aiguë. Cette décision doit être prise par le médecin MPR.

2.3.1.5. Compression pneumatique intermittente. Une étude précise que cette thérapie fait encore l'objet d'une controverse. En effet, le quadrant tronculaire adjacent draine vers le même groupe de ganglions lymphatiques que le membre lui-même et donc son drainage lymphatique est également compromis. Malgré ce risque, l'utilisation de pompes suivie du port de vêtements compressifs ou application de bandages continue d'être un des éléments du traitement.

Quand la CPI est utilisée en association avec d'autres composantes de la TDC, elle augmente la réponse thérapeutique. La CPI est bien tolérée et remarquablement exemptée d'effets secondaires [65].

Néanmoins, la CPI doit uniquement être prescrite quand le DLM est indiqué et qu'aucune alternative à ce dernier n'est possible.

2.3.1.6. Thérapeutique médicamenteuse. Les benzopyrones et coumarines sont les molécules les plus fréquemment utilisées dans le traitement du lymphœdème. Elles peuvent être uniquement prescrites dans le cadre d'une TDC.

Les benzopyrones sont quelques fois utilisées dans le lymphœdème, cependant à l'heure actuelle il n'existe pas de preuve scientifique formelle de leur efficacité [5,12,46].

Pour le traitement de la lymphangite et de l'érysipèle, les recommandations actuelles consistent en une prise de 500 mg d'amoxicilline toutes les huit heures pendant 14 jours (pour la lymphangite), associée à la flucloxacilline. Afin de prévenir toute complication, ces médicaments doivent être prescrits le plus tôt possible, dès l'apparition de la lymphangite.

Par mesure de prévention, si le patient doit voyager dans certains pays (tiers-monde, etc.), une dose de benzathine–pénicilline par semaine peut être prescrite à commencer deux semaines avant le voyage [12].

Aujourd'hui, d'autres propositions thérapeutiques telles que l'électrostimulation, le laser, la cryothérapie restent insuffisamment évaluées [19] pour pouvoir les recommander [38]. La thérapie à ultrasons, suspectée d'activer un processus cancéreux, est contre-indiquée [64].

2.3.1.7. Rééducation en milieu professionnel. Le médecin MPR joue un rôle essentiel dans la rééducation en milieu professionnel, en effet certains métiers peuvent être délétères pour le lymphœdème (exposition à la chaleur ou mouvements répétitifs). Il est important de mettre en place une collaboration avec le médecin du travail afin d'adapter, si possible, le poste et les conditions de travail.

2.4. Conclusion

Le médecin MPR est responsable du diagnostic de lymphœdème et de l'évaluation du patient. Les mesures pré- et postopératoires des deux bras sont un des points importants de l'évaluation et du diagnostic du lymphœdème. Le médecin MPR met en place des stratégies de prise en charge pour la rééducation du patient.

Les objectifs du traitement sont :

- éduquer les patients sur le lymphœdème et encourager leur participation au traitement après le retour à domicile ;
- stimuler le système lymphatique afin de favoriser la réduction de l'œdème ;
- prévenir toute aggravation de l'œdème ;
- évaluation des risques ;
- réduire ou prévenir le risque infectieux ;
- aider les patients à faire face aux séquelles psychologiques du lymphœdème ;
- encourager la participation de la famille et des amis dans la prise en charge du patient, quand c'est possible.

Le médecin MPR prescrit la TDC. L'intensité et l'interaction entre les différentes composantes du traitement sont adaptées aux besoins du patient. Dans le traitement du lymphœdème, il est essentiel que :

- la TDC soit le fruit d'une longue expérience clinique ;
- les bandages multicouches doivent être mis en place par des professionnels formés à la technique ;
- il est essentiel de prescrire des vêtements compressifs pour le traitement au long terme ;
- le massage seul n'a pas d'intérêt thérapeutique/peut abimer les vaisseaux lymphatiques ;
- le rôle et la valeur de la thermothérapie dans la prise en charge du lymphœdème restent à définir ;
- la surélévation réduit souvent le gonflement ;
- le soutien psychologique avec un programme d'évaluation/amélioration de la qualité de vie est un des éléments essentiels de la prise en charge du lymphœdème ;
- le médecin MPR doit élucider les symptômes de lourdeur, constriction ou gonflement dans le bras concerné. Une différence de plus de 2 cm sur n'importe lequel des quatre repères de mesure peut conduire à un traitement du lymphœdème, si les risques suivants sont écartés : tumeur de la zone axillaire ou du plexus brachial, infection et thrombose de la veine axillaire.

En conclusion, le lymphœdème est une condition chronique nécessitant la mise en place sur le long terme de stratégies multidisciplinaires de traitement sous la responsabilité et la supervision d'un médecin MPR.

Déclaration d'intérêts

Les auteurs déclarent ne pas avoir de conflits d'intérêts en relation avec cet article.

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Eight papers from UEMS-PRM Section Professional Practice Committee

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Christodoulou N., Zampolini M., Berteanu M., Negrini S

MUSCULOSKELETAL DISORDERS MANAGEMENT AND THE ROLE OF PHYSICAL AND REHABILITATION MEDICINE PHYSICIANS. THE EUROPEAN PERSPECTIVE BASED ON THE BEST EVIDENCE

Guest Editor: N. Christodoulou

Eight papers from UEMS-PRM Section Professional Practice Committee

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This Special Section is the first of two that will present a general overview of the professional practice role that Physical and Rehabilitation Medicine (PRM) specialists should have when taking care of patients with musculoskeletal disabilities. The contents published in the Special Sections originated in the UEMS PRM Section (UEMS-PRM) and are published by the European Journal of Physical and Rehabilitation Medicine (EJPRM) because of the general agreement existing between the two.

The UEMS-PRM is divided into Section, that deals with professional medical matters and quality of care in PRM, and Board, that deals with educational matters.[1-6] The UEMS-PRM is a specialist part of the European Union of Medical Specialists (UEMS) and was founded in 1958. The aim of UEMS is to make the post-graduate medical training, the professional practice and the quality of care services homogeneous in the European countries. The Section of Physical and Rehabilitation Medicine (PRM) consists in delegates from almost all European countries and aims to harmonize all the above services within our specialty. One of its working committees is the Professional Practice Committee (PPC), which promotes the field of Competence and studies policies for protecting the profession of the PRM specialists.[1, 2] Among other activities, the participating delegates in PPC work upon producing papers for publication on specifying fields of competence of our specialty, collecting the best possible evidence for reaching a diagnosis, implementing the proper treatment and planning the rehabilitation program by using the WHO approved International Classification of Function, Disability and Health (ICF).[7] Our recent work has focused on a series of eight papers on musculoskeletal disorders management by a PRM specialist, as musculoskeletal disorders (MSKD) are very common and the resulting economic burden is considerable and rising as the population ages.[1] Many people experience painful musculoskeletal (MSK) impairments that interrupt work or leisure activities. Likely, most such impairments last a brief period of time. However, in a significant proportion of the population, such problems are sufficiently severe, disabling and persistent to lead to: loss of employment, long term pain and dependence. The UEMS PRM Section PPC represents doctors allover Europe, committed to supporting people with physical disabilities in all aspects of their life and work. These papers have been produced with the aim of providing guidance to PRM health professionals managing MSK problems and encouraging the development of appropriately linked PRM services for those affected by MSKD.

The EJPRM, born with the name Europa Medicophysica from the Italian Society of PRM (SIMFER) in

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1964, but with an immediate European perspective being the Official Journal of the European Federation of Physical Medicine and Rehabilitation (EFPMR),[8] is now the Official Journal of the European Society of PRM (ESPRM) [9] and, since 2012, also of UEMS-PRM;[10] it is also published in collaboration with the International Society of PRM (ISPRM).[9] The main focus of the EJPRM is clinical, and in this perspective the professional role of PRM doctors is a key point: for this reason the journal board was pleased to consider these series of papers and to propose a careful review to improve their contents in readability and general quality. Moreover, MSK disorders are among the most frequently treated by PRM doctors, and these contributions will serve as a concrete basis for clinical work, but also as an official European position to strengthen our specialty: this is definitively one of the roles of the EJPRM.

In order to guarantee the scientific quality, papers have been regularly peer reviewed by the Journal and resubmitted to the authors for the implementation of suggestions. In each paper there is a systematic narrative review of the issue and the indications of the role of PRM specialist in clinical practice, as well as a reference to the ICF framework, showing the ICF core sets when appropriate.

By publishing these eight papers for MSKD in the European Journal of Physical and Rehabilitation Medicine (EJPRM), we aim to help our colleagues in Europe and anywhere else in the world, to use the best evidence-based methods in diagnosing, treating and rehabilitating people with such problems. The role of PRM specialists and teams in this specific field of competence, where other specialists sometime claim for specific and exclusive competences, has been emphasized and clarified.

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Generalised and regional soft tissue pain syndromes

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Generalised and regional soft tissue pain syndromes. The role of Physical and Rehabilitation Medicine Physicians. The European perspective based on the best evidence

A paper by the UEMS-PRM Section Professional Practice Committee

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One of the objectives of the Professional Practice Committee (PPC) of the Physical and Rehabilitation Medicine (PRM) Section of the Union of European Medical Specialists (UEMS) is the development of the field of competence of PRM physicians in Europe. To achieve this objective, UEMS PRM Section PPC has adopted a systematic action plan of preparing a series of papers describing the role of PRM physicians in a number of disabling health conditions, based on the evidence of effectiveness of PRM interventions. Generalised and regional soft tissue pain syndromes constitute a major problem leading to loss of function and disability, resulting in enormous societal burden. The aim of this paper is to describe the unique role of PRM physicians in the management of these disabling conditions that require not only pharmacological interventions but also a holistic approach including the consideration of body functions, activities and participation as well as contextual factors as described in the ICF. Evidence-based effective PRM interventions include exercise and multicomponent treatment including a psychotherapeutic intervention such as cognitive behavioural therapy (CBT) in addition to exercise, the latter based on strong evidence for reducing pain and improving quality of life in fibromyalgia syndrome (FMS). Balneotherapy, meditative movement therapies, and acupuncture have also been shown as efficacious in improving symptoms in FMS. Emerging evidence suggests the use of transcranial magnetic or direct current stimulation (rTMS or tDCS) in FMS patients with intractable pain not alleviated by other interventions. Graded exercise therapy and CBT are evidence-based options for chronic fatigue syndrome. The use of some physical modalities and manipulation for myofascial pain syndrome is also supported by evidence. As for complex regional pain syndrome (CRPS), strong evidence exists for rTMS and graded motor imagery as well as moderate evidence for mirror therapy. Interventional techniques such as blocks and spinal cord stimulation may also be considered for CRPS based on varying levels of evidence. PRM physicians' functioning oriented approaches on the assessment and management, adopting the ICF as a reference, may well meet the needs of patients with soft tissue pain syndromes, the common problems for whom are loss of function and impaired quality of life. Availa-

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ble evidence for the effectiveness of PRM interventions serves as the basis for the explicit role of PRM specialists in the management of these health conditions.

Key words: Chronic pain - Fibromyalgia - Fatigue syndrome, chronic - Myofascial pain syndromes - Complex regional pain syndromes - Physical and rehabilitation medicine.

Soft tissue pain (STP) syndromes other than the localized soft tissue disorders such as bursitis, tenosynovitis, or enthesopathies can be classified as regional and generalised STP syndromes. While generalised STP syndromes include fibromyalgia syndrome (FMS), painful chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME) and painful hypermobility syndrome (HMS), the regional group includes myofascial pain syndrome (MPS) and complex regional pain syndrome (CRPS).[1] It is well known that pain is a significant burden in the society, chronic pain affecting approximately one fifth of the adult population in the European Union with dramatic unfavourable consequences in the health related quality of life (HRQoL) of individuals, impacting physical and psychosocial well-being and functioning as well as productivity to a great extent.[2, 3] The problems of patients with generalised and regional STP syndromes, eventually leading to loss of function and significant disability, may well be addressed by Physical and Rehabilitation Medicine (PRM) specialists, the medical specialty of PRM being described as the medicine of functioning.[4]

The aims of this paper are to describe the unique role of Physical and Rehabilitation Medicine (PRM) physicians in the management of generalised and regional soft tissue pain syndromes in adults (except for HMS) based on the European perspective and to highlight the contributions of PRM physicians in the management of these conditions with their unique approach focusing on the assessment and improvement of all components of human functioning as defined in the International Classification of Functioning, Disability and Health (ICF)[5] including body structures, body functions and activities and participation with a special emphasis on personal and environmental factors.[6-8] The evidence regarding the beneficial effects of interventions in the management of specific generalised or regional STP syndromes will serve as the basis for the rationale and justification of the explicit role of PRM specialists in the management of these conditions.

Fibromyalgia syndrome

FMS is one of the most common generalised pain syndromes with a prevalence varying between 0.66% and 10.5% in studies.[9] It is well known that patients with FMS have substantial impairments in their functional abilities, the extent of difficulties in the performance of activities of daily living placing them in need of support for social participation.[10] Therefore, patients with FMS seek help from also non-pharmacological interventions within the scope PRM for facilitating functioning and participation in the community in addition to pharmacological treatments. A recent German report of a large sample size found a very high use of non-pharmacological interventions for the management of FMS, the most frequently used being activity based self-management strategies (95.3%) (higher than prescribed pain medications used by 81.5% of the patients) followed by self-used physical modalities (67%), aerobic exercise (58%) and other physical therapies (52.7%).[11] Given the importance of non-pharmacological interventions/PRM interventions, PRM specialists see many patients with FMS. It is important to note that a study in the Netherlands revealed that 31.5% of general practitioners and 14% of rheumatologists referred patients with FMS to a PRM specialist on a regular basis as data for the year 2005 were assessed, with an increasing trend of 2.9% for rheumatologists referring patients with FMS to PRM specialists when compared to data in 1998.[12]

Assessment

PRM assessment of FMS deserves special attention in the way that it focuses on functioning of patients with FMS taking also account environmental factors based on the ICF as categorized in the ICF core sets for chronic widespread pain.[13] This tool covers many categories in the components of "body functions/structures", "activities and participation", and "environmental factors" that directs us to assess and intervene for many aspects of FMS including sensation of pain, exercise tolerance functions, energy and drive functions, muscle power functions, carrying out daily routine, walking, doing housework, and labour and employment services, systems and policies (covering the aspects of the influence of work tasks and work environment),[13] as the most pertinent ones to PRM.

Treatment

The symptoms of FMS can be effectively treated using both pharmacological and non-pharmacological treatment strategies.

As for pharmacological treatment, a large number of medications either alone or mostly in combination may be used for the treatment of FMS: Opioids (hydrocodone, tramadol), tri/tetra cyclic antidepressants (amitriptyline, trazodone), selective serotonin or serotonin-norepinephrine reuptake inhibitors (fluoxetine, duloxetine, escitalopram, venlafaxine), anti-epileptic drugs (gabapentin, pregabalin), N-methyl-D-aspartate receptor antagonists (ketamine, dextromethorphan) and α2-adrenergic agonists (clonidine, tizanidine).[14] The EULAR guideline of 2008 recommended the use of antidepressants including amitriptyline, pirlindole, milnacipran, moclobemide, duloxetine, and fluoxetine based on the likelihood of their favourable effects on function in addition to pain reducing effects as well as tramadol, pregabalin, pramipexole and tropisetron for pain reduction with suggestions for considering simple analgesics including other weak opioids and paracetamol. However, strong opioids and corticosteroids were not recommended.[15] The most recent German guideline of 2012 strongly recommended duloxetine based on 1a level of evidence for patients with FMS with concomitant depressive and/or anxiety disorder for a certain time period and provided an open recommendation for this drug also in a patient with FMS without these comorbidities if the patient was not able to use amitriptyline for some medical reason, amitriptyline having been recommended for a certain period based on 2a level of evidence. Regarding pregabalin, an open recommendation for this drug was provided based on 1a level of evidence, again for a certain period if amitriptyline use was not possible. Fluoxetine or paroxetine were indicated to be considered for a certain period in patients with the comorbities mentioned above. However, this guideline was strongly against the use of antiviral drugs, dopamine agonists, hormones (glucocorticosteroids, estrogens, testosterone, thyroid hormones, calcitonin, and growth factors), interferons, hypnotics, anxiolytics, neuroleptics, serotonin receptor antagonists (tropisetrone), local anesthetics, ketamine, sodium oxybate, and strong opioids. Cannabinoids, milnacipran, muscle relaxants, flupirtine, moclobemide, and nonsteroidal anti-inflammatory drugs (NSAIDs) were not recommended, either. It was indicated that neither a positive or a negative recommendation could be made for gabapentin, weak opioids (tramadol), paracetamol, acetylsalicylic acid, metamizole and esreboxetine.[16] Although evidence-based pharmacological options are available, due to the costs and potential side effects of some drug treatments, a considerable number of which rated as harmful by the patients,[11] it is advised to begin treatment of FMS with simple, less expensive nonpharmacological approaches.[14]

Regarding evidence-based nonpharmacological approaches PRM physicians utilize, exercise is an important part of the management of FMS. A Cochrane review evaluating the effects of aerobic, strengthening, and flexibility exercise on signs and symptoms, physical function, and global well-being in patients with FMS revealed gold level evidence that supervised moderate intensity aerobic exercise training of 12 weeks duration had beneficial effects on physical function and global well-being as well as possible positive effects on pain and tender points. Strength and flexibility training were also reported to have benefits on FMS symptoms and/or overall well-being.[17] A systematic review (SR) and meta-analysis (MA) showed a statistically significant improvement in global well-being of community-dwelling women with FMS with exercise (supervised or non-supervised aerobic and/or strength exercise performed at home or facility) with improvements approaching to 10%.[18] A recent MA suggested the efficacy of exercise on reducing tender point scores in female patients with FMS.[19] A very recent review on exercise therapy for FMS pointed to the expansion of exercise options such as lifestyle physical activity, Nordic walking, yoga, tai chi, qigong, and vibration with promising results. However, it was also noted that exercise prescription requires skilful handling in patients with FMS because of potential difficulties in performance and adherence in exercise programs that may increase symptoms, necessitating careful consideration of the individual patient characteristics.[20] The most recent SR, MA, and guideline developed by the German Interdisciplinary Association for Pain Therapy (DIVS) provided final (as of June 2012) comments on the use of exercise in patients with FMS by strongly recommending low to moderate intensity aerobic (in the form of rapid walking, Nordic walking, dancing, aqua jogging, and cycling) and strength training based on 1a level of

evidence with additional recommendations of callisthenics (land and water-based) and consideration of stretching and flexibility exercises based on 2a level of evidence.[21] Therefore, there is an important role for PRM specialists to prescribe exercise for their patients with FMS at a suitable intensity tailored to the condition of the individual patient that will not exacerbate FMS symptoms, an issue on which PRM specialists have substantial expertise based on their training.[8]

In an SR and MA assessing the effectiveness of multicomponent treatment consisting of at least two non-pharmacological approaches, one being educational or other psychological therapy and the other being exercise therapy, in FMS, strong evidence was found in terms of reductions in pain, fatigue, and depressive symptoms, and most importantly on the PRM specialists' side, in terms of improvements in HRQoL and self-efficacy pain as well as in physical fitness in the short term, beneficial effects on physical fitness being maintained also in the long term.[22] The value of multicomponent therapy in FMS was confirmed in the two most recent SR, MA, and guidelines developed by the DIVS with strong recommendation reached by strong consensus based on 1a level evidence for relaxation training or cognitive behavioural therapy (CBT) combined with aerobic exercise.[23, 24] The SR, MA, and guideline of the same association solely on psychotherapy for FMS additionally provided evidence for the use of biofeedback (at 2a level), guided imagery, and hypnosis (at 3a level), and CBT as monotherapy (at 1a level of evidence) with open recommendations.[24] Another very recent MA added to the evidence of effectiveness of nonpharmacological treatments in FMS by indicating aerobic exercise, multicomponent therapy, and CBT as the most promising nonpharmacological treatment options.[25]

Most importantly, regarding the evidence-based management of FMS, PRM specialists ranked the first in the application of emotional support/coaching, aerobics exercise/fitness, and multidisciplinary (combined) therapy, regular application rates of PRM specialists for these treatments being 35.1%, 35.1%, and 36.8%, respectively, when compared to general practitioner practices of 20.4%, 30.6%, and 20.4% and those of 20.9%, 28.2%, and 9.5% among rheumatologists for these evidence-based treatments.[12] Considering the strong evidence on the effectiveness of multicomponent (combined) therapy for the management of FMS,[22-24] PRM physicians' preference of multidisciplinary (combined) therapy in their approach to their patients with FMS much more often than other physicians and their attitudes of prescribing aerobic exercise, a treatment of choice supported by strong evidence,[17, 21] significantly more often make them well placed for the management of patients with FMS.

Education/self management education, indicated to be integrated into all aspects of rehabilitation as an integral part of PRM,[26] also plays an important role in the management of FMS. In addition to informing the patient about the diagnosis, symptoms and consequences of the disease based on the biopsychosocial model as well as treatment strategies and their safety,[27] telephone delivered motivational interviewing for the promotion of exercising may also be beneficial with favourable clinical outcomes as a self management educational intervention.[28, 29]

Regarding other interventions within the scope of PRM, a narrative review indicated modest support for the short term beneficial effects of massage therapy for FMS with suggestions of 1-2 times weekly sessions of painless massage while increasing the intensity of massage gradually based on patients' symptoms.[30] However, the most recent SR, MA and guideline developed by the DIVS did not recommend the use of massage in patients with FMS.[21] An SR pointed to two complementary and alternative medicine (CAM) treatments, balneotherapy and mind-body therapies such as meditation, hypnosis, and guided imagery, showing the most promising results for pain management in FMS, as well as acupuncture showing evidence of effectiveness.[31] It should be noted that thermal baths were also recommended by the DVIS guideline based on avaliable evidence supporting effectiveness.[21] Among CAM therapies, mind-body therapies (mindfulness) have also been shown to decrease the severity of depression,[32] the highest levels of which has been found as a predictor of poor outcomes for multidisciplinary treatment in FMS.[33] A Danish thesis work supported the usefulness of a mindfulness approach for improving symptoms, function, and quality of life and, thereby, preventing participation restrictions in social life in so-called bodily distress syndromes including fibromyalgia.[34] Regarding homoeopathy, in an SR, all RCTs evaluated were reported to suggest favourable results, however not with proven efficacy.[35] While the latest SR, MA and guideline of the DIVS provided high recommendation for

meditative movement therapies such as qigong, yoga, and tai chi based on 1a level of evidence and open recommendation for acupuncture for a restricted period, the recommendation for homeopathy was controversial, consideration of which was supported by minority and not supported by the majority of the opinion leaders.[36] Among meditative movement therapies, tai chi was found associated with favourable effects on sleep disturbances and only yoga was found significantly effective on key symptoms of FMS including pain, depression and fatigue as well as on HRQoL.[37] It should be noted that all aforementioned CAM therapies are within the interest of PRM specialists.[38, 39]

Recently, an SR suggested the use of repetitive transcranial magnetic stimulation (rTMS) or transcranial direct current stimulation (tDCS) for patients with fibromyalgia who are not able to obtain relief of pain from other therapies.[40] There is growing evidence for the use of rTMS in various areas of PRM, including chronic pain management.[41] However, the evidence for the effectiveness of rTMS for reducing chronic pain is low as revealed in an SR [42] and the use of tDCS for the management of FMS is still controversial with negative recommendation in some guidelines.[21]

Among guidelines on the management of FMS, the Ottawa Panel recommends both aerobic [43] and strengthening exercises [44] for the treatment of FMS with grades A, B, and C+ depending on the study and the outcome. EULAR developed nine recommendations for the management of FMS, the nonpharmacological ones being heated pool treatment combined with or without exercise based on level of IIa evidence with a B level strength of recommendation, aerobic exercise and strength training exercise and others such as relaxation, rehabilitation, physiotherapy and psychological support based on level of IIb evidence with a C level strength of recommendation in addition to CBT based on level of IV evidence with a D level strength of recommendation and education [15] which all fall into the scope of PRM.[6, 7, 45] The recommendations of the most recent guidelines of the DIVS have been previously mentioned in relevant sections as the latest evidence since these were also SRs and MAs.[21, 23, 24] While the previous DIVS guideline of 2008 listed a wide range of physical therapy/PRM interventions with open recommendations for the management of adult FMS including full body cold therapy, laser, ultrasound, magnetic field therapy, lymphatic drainage, osteopathy, and chiropractic interventions,[46] in the most recent version of this guideline (2012), there happened to be changes in recommendation levels as negative recommendations or lack of either negative or positive recommendations for these nonpharmacological/PRM interventions based on current evidence.[21] Nevertheless, the abundance of PRM approaches in the management of FMS, although some with not proven efficacy so far in the era of evidence-based medicine and thus encouraging good quality research, demonstrates the extent to which PRM specialists may intervene and the extensive role they may play in the management this highly disabiling syndrome.

Another important issue to be dealt with in FMS is the impact of work on FMS [47] and the *vice versa*, that is the impact of FMS in the work force and loss of productivity.[48] Considering the latest findings of reported missing days of work and the costs of patients with FMS, over 75% of which are caused by indirect costs from loss of productivity,[49] it is not difficult to perceive the substantial burden of FMS on the society. The interest of PRM physicians in promoting activities and participation as well as modifying contextual factors including environmental and personal factors with the aim of preserving autonomy and social integration in addition to the management of disability by treating the underlying pathology and by improving body structures and functions,[8, 50] their training that also covers industrial rehabilitation including workplace modification prescriptions [51] and their expertise in vocational rehabilitation [52] impose a responsibility and obligation on PRM physicians in the aspect of "work related problems" and "return-to-work" interventions in addition to other components of the management of FMS in order to decrease the societal burden of FMS in relation with loss of productivity.

Regarding evidence-based interventions on work outcomes, a recent SR on the effectiveness of "work place-based interventions" for the management of musculoskeletal disorder-related sickness absence and job loss (not specific to FMS but covering studies dealing with unspecified pain) revealed beneficial (although small) effects of interventions including exercise therapy, behavioral change interventions, workplace adaptations and provision of additional services on work outcomes.[53] However, studies specifically on FMS in the aspect of

"work place interventions" and "return-to-work" are rare. An SR was not able to provide evidence on the benefits of production systems or organisational culture interventions for managing upper extremity musculoskeletal disorders and fibromyalgia due to lack of studies.[54] While a study pointed to the effectiveness of an extensive outpatient multidisciplinary treatment program comprised of education, exercise and occasional workplace intervention in returning women to work,[55] another study revealed no additional benefit of a specific FMS rehabilitation programme over a non-specific rehabilitation programme in preventing work disability and pointed to the need of developing more specific effective rehabilitation programmes for decreasing the burden of work disability associated with FMS.[56]

It seems that effective "return-to-work" interventions for patients with FMS are not satisfactory at the moment. Considering the findings of significantly poorer "return-to-work" rates and work retention 1-year postrehabilitation in patients with FMS,[57] there is a need for rigorous research and urgent action in this area in the context of PRM.

In summary, a substantial number of evidence-based PRM interventions exists for treating symptoms and improving HRQoL in patients with FMS (although rare for work outcomes). To make a synthesis of the comprehensive scientific information given above and to underline best evidence with implications for providing best care for the management of individuals with FMS, evidence of effectiveness of PRM interventions provided by SRs and evidence-based guidelines are highlighted in Table I.

Chronic fatigue syndrome/ myalgic encephalomyelitis

CFS/ME, characterised by severe, disabling and debilitating chronic fatigue lasting for at least six months along with other symptoms including pain, sleep disturbance, problems in concentrating and headaches,[58] is associated with severe dysfunction and significant disability both in activities of daily living and in work with poor return-to-work outcomes.[59-61] Patients with CFS, being less physically active than asymptomatic controls as revealed in a very recent SR,[62] may have difficulties in performing their work duties and, indeed, may not be able to continue working.[60] Patients with CFS were found to have statistically significant differences in physical function, general health, health perception, fatigue and vigor, mobility, walking and activity when compared with controls as measured using several scales with a lower percentage of patients with CFS having impaired physical function and fatigue being employed when compared with controls having better scores on physical function and fatigue.[63] Qualitative studies based on the real life experiences of patients with CFS/ME also emphasise significant reductions in functioning involving personal, educational, occupational and social aspects.[64] Therefore, the major needs of the patients with CFS include developing strategies to manage impairments and activity limitations as well as strategies for maintaining or regaining social participation including work as identified in an SR [65] that explicitly points to the requirement of a biopsychosocial model as described in the ICF for evaluating and managing patients with CFS.[61] Accordingly, the management of patients with CFS poses a great challenge for PRM physicians who link medical treatments to rehabilitation interventions and apply a holistic approach to the problems of the patient focusing on the improvement of all components of human functioning as defined in the ICF.[8, 50] The idea of "helping patients with CFS better by focusing less on the intrinsic medical problems and more on the functional outcomes" as underlined by Ross *et al*.[63] seems to best match with the aims of the medical specialty of PRM.

Regarding evidence-based efficacious treatments for CFS, an SR pointed to the disappointing results of pharmacological therapies (hydrocortisone, fludrocortisones, moclobemide, fluoxetine, selegiline, galantamine hydrobromid, oral nicotinamide adenine dinucleotide, clonidine, phenelzine, sulbutiamine, dexamphetamine, growth hormone, melatonin, immunoglobulins, interferons and antiviral agents), some of pharmacological options with favourable effects and most of the drugs with no beneficial effects. However, graded exercise therapy and CBT were found to be associated with improvements in symptoms and function.[66]

Recently, adaptive pacing therapy, a therapy requiring participation of a therapist for monitoring activity and symptoms and matching activity levels to the available energy level of the specific patient with the aim of improving quality of life, has been suggested as an alternative to graded exercise

TABLE I.—*Best evidence provided by systematic reviews/evidence-based guidelines for the effectiveness of PRM interventions in fibromyalgia syndrome.*

PRM intervention	Evidence of effectiveness	Author, year [Reference.]
Exercise		
Aerobic	Favourable effects on function and well-being (gold level evidence), possible beneficial effects on pain and tender points	Busch *et al.*, 2007 [17]
	C level of recommendation based on IIb level of evidence	Carville *et al.*, 2008 [15]
	High efficacy with significant effects on pain and HRQoL at the final treatment and follow-up and on fatigue at only final treatment compared with controls (strong recommendation)	Winkelmann *et al.*, 2012 [21]
Strengthening	Favourable effects on symptoms and well-being	Busch *et al.*, 2007 [17]
Flexibility/stretching	C level of recommendation based on IIb level of evidence	Carville *et al.*, 2008 [15]
	Moderate posttreatment efficacy on pain, sleep, and fatigue (strong recommendation)	Winkelmann *et al.*, 2012 [21]
	Favourable effects on symptoms and well-being	Busch *et al.*, 2007 [17]
Functional training (callisthenics)	Slight reductions in pain and improvement in HRQoL (open recommendation)	Winkelmann *et al.*, 2012 [21]
	Indirect evidence from 'aerobic training' (strong recommendation)	Winkelmann *et al.*, 2012 [21]
Multicomponent treatment		
Exercise + education and/or CBT	Posttreatment reductions in pain, fatigue and symptoms of depression and improvements in HRQoL and physical fitness (strong evidence)	Häuser *et al.*, 2009 [22]
	Effective for pain, fatigue and HRQoL at postreatment and for fatigue and HRQoL at follow-up (strong recommendation)	Arnold *et al.*, 2012 [23]
Aerobic exercise and relaxation training	Efficacy on pain and HRQoL outcomes (strong recommendation)	Köllner *et al.*, 2012 [24]
Psychotherapeutic procedures alone		
Biofeedback	Significant SMD in pain, low efficacy (open recommendation)	Köllner *et al.*, 2012 [24]
Hypnosis and guided imagery	Average efficacy (open recommendation)	Köllner *et al.*, 2012 [24]
	Effective in treating pain when used together with other interventions	Terhorst *et al.*, 2011 [31]
CBT	A favourable trend for pain reduction (open recommendation)	Köllner *et al.*, 2012 [24]
	Potential important beneficial effects on pain and HRQoL	Nüesch et al., 2013 [25]
Education		
Patient education/information	Evidence is conflicting, however, can be considered as a basic measure (open recommendation)	Eich *et al.*, 2012 [27]
Self management education	Motivational interviewing encouraging exercise with favourable outcomes	Chilton *et al.*, 2012 [29]
Complementary and alternative medicine		
Balneotherapy	Favourable treatment effect for pain	Terhorst *et al.*, 2011 [31]
	Thermal baths with low efficacy, however, with high posttreatment SMD on pain (recommended)	Winkelmann *et al.*, 2012 [21]
Meditative movement therapies (quigong, tai-chi, yoga)	Moderate efficacy, superior to the treatments in the control group in improving pain, fatigue, and sleep at posttreatment (highly recommended)	Langhorst *et al.*, 2012 [36]
Acupuncture	Modest treatment effect	Terhorst *et al.*, 2011 [31]
	Limited efficacy with a small effect size for pain. Can be considered for a limited period (open recommendation)	Langhorst *et al.*, 2012 [36]
rTMS or tDCS	Significant pain reducing effects in evaluated studies	Marlow *et al.*, 2013 [40]
	Negative recommendation for tDCS	Winkelmann *et al.*, 2012 [21]

CBT: cognitive behavioural therapy; HRQoL: health-related quality of life; rTMS: repetitive transcranial magnetic stimulation; SMD: standardised mean difference; tDCS: transcranial direct current stimulation.
Note: the most recent systematic reviews as well as evidence-based guidelines were included in this Table. However, if a systematic review or guideline provided a different evidence or evidence on different outcomes, it was also included.

therapy and CBT added to specialist medical care.[67] However, this intervention has neither been found an effective added strategy [67] nor a cost-effective one.[68]

CAM therapies are also used in the management of CFS. An SR revealed beneficial effects of CAM therapies such as qigong, massage and tuina in patients with CFS.[69]

As for work outcomes, only exercise therapy, CBT, and rehabilitation were found associated with restoring the ability to work.[63] A guideline on occupational aspects of CFS/ME also underlined the efficacy of these non-pharmacological interventions for CFS which is a considerable public health burden with costs to the patient and the employer as well as to the economy.[60] This guideline also pointed to the lack of good quality research on how to best manage returning to work in patients with CFS.[60]

Although PRM specialists may well provide exercise interventions and rehabilitation for reducing symptoms and improving function for patients with CFS/ME for most of whom no evidence-based pharmacological interventions have been shown, it seems that this condition requires more attention of PRM specialists particularly in terms of improving work ability of individuals with CFS in interdisciplinary teams for the best care of these patients. UEMS PRM Section strongly recommends interdisciplinary team working [70] and PRM specialists are well-placed to develop and coordinate new management strategies in a wide range of health conditions including CFS/ME.

Hypermobility syndrome

Impaired quality of life, one of the main focuses of attention in PRM, has been observed in patients with HMS.[71] Self reported pain in the joints, joint dislocation, muscle cramps, muscle pain, tendinitis, fatigue and bad physical condition are frequently found in patients with HMS with respective percentages of 100%, 96.3%, 66.7%, 29.6%, 25.9%, 25.9% and 22.2% as found in a study in adults with Ehlers–Danlos syndrome hypermobility type.[71] Both pain and fatigue are considered as potentially important determinants of disability in HMS.[72] Gait abnormalities may also be observed in these patients.[73] HMS has also been shown to increase the risk of low bone mass.[74] Multifaceted features of HMS ranging from pain and other musculoskeletal symptoms to functional disturbances and resultant disability may make PRM physicians key players in the management of HMS.

PRM programmes for the management of HMS include relief of joint, limb, or generalised pain (for which paracetamol, NSAIDs, corticosteroids, opioids, amytriptyline, other tricyclic antidepressants, duloxetine and other selective serotonin or serotonin-norepinephrine reuptake inhibitors, pregabalin, and gabapentin may be drug treatment options [75]) and exercise for improving posture, proprioception, strength and motor control to achieve the aim of joint stabilising along with education and encouraging physical activity and fitness.[76] The use of mobilising techniques to joints or spinal segments may be required if there is a problem due to deconditioning and kinesiophobia.[77] Pain relief may be achieved by using CBT.[78] A very recent paper well describes possible physical therapies and lifestyle recommendations for pain and fatigue in hypermobility type Ehlers–Danlos Syndrome that include the above-mentioned exercises and some others such as diaphragmatic exercises, relaxation activities, some dietary recommendations and avoidance of some positions and postural changes.[75]

However, studies providing evidence for the efficacy of PRM programmes are rare. An RCT comparing generalised and targeted physiotherapy (focusing on strength and fitness exercises and focusing on functional stability, respectively) in the management of childhood HMS found statistically significant improvements in pain in both groups without any difference between children receiving generalised or targeted exercise.[79] A cross sectional study revealed that only 63.4% of patients receiving physical therapy reported a favourable outcome.[80]

HMS is indicated to be a neglected area [81] and the need for effective evidence-based treatments is clear.

Myofascial pain syndrome

Among the pain releiving medications used for chronic pain syndromes (most of them mentioned in the FMS section of this paper), those trialled for MPS in studies with some beneficial effects included ibuprofen combined with sedatives (alprazolam, diazepam), topical analgesics such as lidocaine or

methyl salicylate and menthol patches, clonazepam (with strong support for its use), amitriptyline, and tropisetron. However, the evidence was not sufficient to support the use of cyclobenzaprine, tizanidine, nortriptyline, and tiagabine, while no effect was observed for citalopram. No literature seemed to support the use of memantine, tramadol, dihydrocodeine, moclobemide, fluoxetine, duloxetine, venlafaxine, milnacipran, gabapentin, pregabalin, sumatriptan, L-tryptophan, and ketamine in the treatment of MPS as revealed in a review.[82]

Other than drugs, the recommended treatments for MPS, also among the most common generalised pain syndromes encountered in the general population, include myofascial trigger point (MFTP) release that might be achieved by muscle stretch and MFTP injection with anaesthetics or by therapeutic ultrasound as well as education on avoidance of incorrect habits or movements that may provoke mechanical stress.[83] Considering the skills, aptitudes and competencies of PRM specialists that include practical procedures such as injection therapies as well as providing education along with using a wide range of physical agents/modalities and manipulative techniques,[6, 7] PRM physicians may well meet the needs of patients with MPS.

Regarding efficacy of PRM interventions in MPS, an SR provided moderately strong evidence in favour of manipulation and ischemic pressure for relief of pain immediately at MFTP, but only limited evidence for relief of pain in the long-term. The effectiveness of laser therapy for myofascial pain syndrome and MFTPs was supported by strong evidence and transcutaneous electrical nerve stimulation, acupuncture, and magnet therapy were reported to be supported by moderate evidence, duration of pain relief varying among modalities. There was also evidence, though limited or weak, regarding the efficacy of electrical stimulation including high voltage galvanic stimulation, interferential current, and frequency modulated neural stimulation and therapeutic ultrasound.[84] The use of botulinum toxin injections for the treatment of MPS has also been addressed in a Cochrane review which was not able to reveal conclusive evidence regarding the recommendation of this treatment in clinical practice.[85] Recently, extracorporeal shock wave therapy has been suggested to have similar efficacy with trigger point injections and TENS for myofascial pain in the trapezius.[86]

Complex regional pain syndrome

CRPS, characterised by sensory, autonomic, motor, skin, and bone changes confined to the limb with the most important symptom as pain, is also associated with impaired functioning.[87] A wide range of health professionals including general practitioners, anaesthetists, rheumatologists, neurologists, psychiatrists, PRM specialists and some others may be involved in the management of patients with CRPS.[87] Among the medical specialists providing care for patients with CRPS, PRM specialists are well placed for the management of this condition. A Dutch study indicated 41% of the patients consulted a PRM specialist and 55% of the patients consulted an anaesthetist among those 80% who ever consulted another medical specialist after having been seen by a general practitioner, 89% receiving non-invasive treatments.[88]

There are two aims of the treatment of CRPS: relieving pain and restoration of function. For these aims, educational and self-management approaches, pain management strategies including pharmacological and non-pharmacological options, physical and vocational rehabilitation for sustaining and restoring limb function, and psychological interventions comprise the four cornerstones of the treatment of CRPS having equal importance.[87]

Regarding pharmacological options for reducing pain or improving other symptoms in CRPS, NSAIDs, glucocorticoids (prednisone, prednisolone), morphine, amitriptyline, carbamazepine, gabapentin, intravenous ketamine, oxygen radical absorbers (topical dimethyl sulfoxide, oral N-acetylcysteine, mannitol), calcitonin, biphosphonates (intravenous pamidronate, oral alendronate), vasodilators (phenoxybenzamine, terazosin, nifedipine) and spasmolytics (benzodiazepines, oral baclofen) and additionally immunoglobulins, tumor necrosis factor-α antagonists, and thalidomide have all been used in studies, however, only some of them with proven efficacy.[89, 90] An SR of 2013 evaluating studies after 2000 provided strong evidence for the efficacy of bisphosphonates (oral alendronate, intravenous alendronate, pamidronate, or clodronate [while evidence was strong for combined results, limited evidence was found when each treatment was evaluated separately]), moderate evidence for low-dose intravenous ketamine, and limited evidence for oral tadalafil, intravenous immunoglob-

ulin, and morphine combined with memantine. However, evidence of non-efficacy for intermediate dose gabapentin, intravenous mannitol, and topical isosorbide dinitrate, and conflicting evidence of efficacy for intranasal calcitonin were found in this SR.[91] It should be noted other guidelines evaluating studies conducted earlier than 2000 pointed to the possibility of favourable effects of corticosteroids and gabapentin in CRPS.[92]

Evidence-based guidelines for the management of CRPS type 1 include physiotherapy and occupational therapy along with a variety of interventional pain management techniques if drug and conventional treatments fail to improve pain and limb function.[92]

An SR well outlines physiotherapy management of adult CRPS type 1 that include interventions such as education, graded exposure to activities, sensorimotor treatment, exercise including stretching, active range of motion, water-based exercises, stress loading as well as mirror box therapy and graded motor imagery, among which graded motor imagery was found effective for pain relief in adults with CRPS type 1 based on good to very good quality evidence.[93] Recent literature suggests promising beneficial effects of mirror box therapy and its successor, immersive virtual reality, in the management of CRPS.[94]

A very recent SR yielded strong evidence for the effectiveness of rTMS and graded motor imagery for the treatment of CRPS.[91]

Pain exposure physical therapy, composed of an exercise programme of progressive-loading and control of pain avoidance behavior without the use of specific or nonspecific pain relieving medications, offers a new option for the treatment of CRPS type 1 with significant improvements in pain, muscle strength, upper extremity disability, gait speed, kinesiophobia, and health perception domain of a quality of life measure at the follow-up when compared to baseline as found in a multiple single-case design trial.[95] An RCT is also underway to test the efficacy of this form of treatment, known also as Macedonian therapy, in CRPS.[96]

Regarding interventional pain management approaches as a later stage resort for the management of CRPS, that PRM specialists may be able to perform, stellate ganglion blockade, lumbar sympathetic blockade, and spinal cord stimulation are recommended based on 2B+ evidence as well as brachialis plexus blockade, epidural infusion analgesia and peripheral nerve stimulation based on 2 C+ evidence as revealed in a very recent evidence-based interventional pain medicine article.[89] Among these procedures, spinal cord stimulation is indicated to be promising with reported success rates of more than 70% when added to physical therapy.[97] Regarding cost-effectiveness of this relatively expensive intervention, evidence suggested a lifetime cost saving of approximately €58,470 with spinal cord stimulation combined with physical therapy compared with physical therapy alone.[98] In a retrospective study reviewing medical records of patients with CRPS, the percentage of patients with CRPS reporting pain relief of 50% with spinal cord stimulation at a mean follow-up of 4.4 years was found to be more than 50%, 77.8% of patients, disproportionately, willing to undergo spinal cord stimulation again for a similar outcome indicating a high degree of satisfaction with this intervention.[99] A recent study also draws attention to the merits of spinal cord stimulation in improving pain, functional status and quality of life over the long term in patients with CRPS.[100] Additionally, there seems to be also a place for intramuscular botulinum toxin injections for the treatment of CRPS. A retrospective chart review showed beneficial effects of botulinum toxin injections in the upper limb girdle muscles for short term pain relief with low rates of complications.[101]

Taking into account evidence-based efficacious PRM interventions and interventional pain management strategies in the management of CRPS and considering the competencies and the areas of interest of PRM specialists such as injection therapies, other interventional pain medicine approaches, and other pain therapies including a wide range of physical agents/modalities and exercise for improving physical function as well as education, psychosocial interventions and occupational therapy/vocational rehabilitation [6, 7, 45, 52, 102] in addition to pharmacological treatment which a large number of health professions may use successfully, it appears justified to speculate that PRM specialists may well provide at least the three (if not the psychological interventions) of the four cornerstones of management strategies for CRPS in the very important multidisciplinary treatment for this condition.

To summarize, it appears that a number of evidence-based PRM interventions in regional and

TABLE II.—*Best evidence provided by systematic reviews/ evidence-based guidelines for the effectiveness of PRM interventions in generalised STP syndromes other than fibromyalgia syndrome.*

PRM intervention	Evidence of effectiveness	Author(s), year [Ref n.]
	Chronic fatigue syndrome/myalgic encephalomyelitis	
Graded exercise therapy and CBT	Apparently beneficial in reducing symptoms and improving function B grade of recommendation for GET and A grade of recommendation for CBT for occupational purposes (work outcomes)	Chambers *et al.*, 2006 [66] NHS guideline, 2006 [60]
Complementary and alternative medicine		
Qigong, massage and tuina	Possible beneficial effects on some symptoms	Alraek *et al.*, 2011 [69]
	Hypermobility syndrome	
	No systematic reviews providing best evidence	
	Myofascial pain syndrome	
Physical modalities	Strong evidence for laser, moderate evidence for TENS, acupuncture, and magnet therapy, limited evidence for EMS, HVGS, IC, and FMNS and weak evidence for US for reducing pain at MFTPs	Vernon and Schneider, 2009 [84]
Manipulation	Evidence is strong for short term relief of pain at MFTPs, but limited for long term	Vernon and Schneider, 2009 [84]
Botulinum toxin	No conclusive evidence for recommendation	Soares *et al.*, 2012 [85]
	Complex regional pain syndrome	
Interventional pain management techniques		
Stellate ganglion and lumbar sympathetic block	Positively recommended with a 2B+ score of evidence Conflicting evidence for sympathetic ganglion block with lidocaine	van Eijs *et al.*,2011 [89] Cossins *et al.*, 2013 [91]
Spinal cord stimulation	Positively recommended with a 2B+ score of evidence	van Eijs *et al.*, 2011 [89]
	Limited evidence for beneficial effects on pain and HRQoL, but not on function	Cossins *et al.*, 2013 [91]
Brachialis plexus block, epidural infusion analgesia and peripheral nerve stimulation	Can be considered based on 2C+ score of evidence	van Eijs et al.,2011 [89]
rTMS	Strong evidence of effectiveness for pain relief	Cossins *et al.*, 2013 [91]
Graded motor imagery	Effective for pain relief based on good to very good quality evidence	Daly & Bialocerkowski, 2009 [93]
	Strong evidence for significant pain reduction	Cossins *et al.*, 2013 [91]
Mirror therapy	Moderate evidence for decreasing pain	Cossins *et al.*, 2013 [91]
Traditional PT and OT (*e.g.* education, exercise, TENS)	Limited evidence for positive effects Recommended as a standard part of treatment based on expert opinion	Cossins *et al.*, 2013 [91] Perez *et al.*, 2010 [92]

CBT: Cognitive behavioural therapy; EMS: electrical muscle stimulation; FMNS: frequency modulated neural stimulation; GET: graded exercise therapy; HRQoL: health-related quality of life; HVGS: high-voltage galvanic stimulation; IC: interferential current; MFTP: myofascial trigger point; OT: occupational therapy; PT: physiotherapy; rTMS: repetitive transcranial magnetic stimulation; SMD: standardised mean difference; tDCS: transcranial direct current stimulation; TENS: transcutaneous electrical nerve stimulation; US: ultrasound.
Note: the most recent systematic reviews as well as evidence-based guidelines were included in this Table. However, if a systematic review or guideline provided a different evidence or evidence on different outcomes, it was also included.

generalised soft tissue syndromes other than the FMS (although not as many as those for FMS) (highlighted in Table II) can be helpful for providing best care for these patients, for a considerable number of whom pharmacological treatments may fail.

Conclusions

Generalised and regional STP syndromes including FMS, CFS/ME, HMS, MPS, and CRPS are challenging to treat and PRM specialists may play key roles in the management of these conditions. The most

important problems that these syndromes share in common are impairments in function and social participation including work ability that eventually lead to loss of productivity and impaired quality of life. The competencies, skills and aptitudes of PRM physicians in assessing, diagnosing, and treating their patients in interaction with the environment, an aspect that is unique to the medical specialty of PRM, and the already available evidence of effectiveness of PRM interventions for regional and generalised soft tissue pain syndromes well place them in the management of these conditions.

Action plan and recommendations

Although STP syndromes such as FMS, MPS, and CRPS are relatively frequently encountered and easily diagnosed in PRM practice, those including CFS/ME and HMS are easily missed and overlooked.[81, 103] The knowledge of PRM specialists should be enhanced regarding these conditions.

Another issue that could be recommended to PRM specialists would be 'best practices' in interventional pain relieving techniques that could be very helpful especially in the treatment of CRPS. The role of PRM specialists should be enhanced in the treatment of this very painful condition. It is well known that PRM specialists are interested in interventional procedures as well described in the White Book on Physical and Rehabilitation Medicine in Europe [6, 7] as well as in other papers on the field of competence of the PRM specialist.[8, 45] While the perceived preparedness of PRM trainees for botilinum toxin/phenol injections got a mean score of 4.00 out of 5.00, it seems that PRM trainees do not feel much prepared for epidural injections and nerve blocks with a mean score of 2.70 out of 5.00 as revealed in a survey conducted among the 4th year PRM trainees in the USA. However, it was encouraging to note that interventional procedures ranked the first with a percentage of 46% of trainees expressing to pursue their careers in this area.[51]

Given the enormous societal burden of generalised and regional STP syndromes and loss of productivity, the need for research on evidence-based "return-to-work" programs in the context of PRM is clear. The efforts of the UEMS PRM Section and Board for developing evidence-based medicine will be facilitating in this aspect.[104]

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Inflammatory Arthritis

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Inflammatory arthritis. The role of Physical and Rehabilitation Medicine Physicians. The European perspective based on the best evidence

A paper by the UEMS-PRM Section Professional Practice Committee

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One of the objectives of the Professional Practice Committee (PPC) of the Physical and Rehabilitation Medicine (PRM) Section of the Union of European Medical Specialists (UEMS) is the development of the field of competence of PRM physicians in Europe. To achieve this objective, UEMS PRM Section PPC has adopted a systematic action plan of preparing a series of papers describing the role of PRM physicians in a number of disabling health conditions, based on the evidence of effectiveness of the physical and rehabilitation medicine interventions. Inflammatory arthritis is a major cause of disability with an important economic burden in society. The goals in the management of inflammatory arthritis are to control pain and disease activity, prevent joint damage, protect and enhance function and improve quality of life. This paper aims to define the role of PRM physicians in people with inflammatory arthritis. PRM interventions imply non-pharmacological treatments which include patient education for joint protection, energy conservation and self-management techniques, exercise therapy, physical modalities, orthoses/assistive devices and balneotherapy. Therapeutic patient education and exercises are the cornerstones of therapy with strong evidence of their effectiveness to improve function. Physical modalities are primarily used to decrease pain and stiffness whereas orthoses/assistive devices are usually prescribed to enhance activities and participation. PRM physicians have distinct roles in the management of people with inflammatory arthritis such that they effectively organise and supervise the PRM program in the context of interdisciplinary team work. Their role starts with a comprehensive assessment of patient's functioning based on the International Classification of Functioning Disability and Health (ICF) as the framework. In the light of this assessment, appropriate PRM interventions individualised for the patient are administered. Future research and actions regarding the role of PRM in inflammatory arthritis should target access to care, updates on the use and effectiveness of physical modalities, orthoses/assistive devices, and standardization of therapeutic patient education programs.

KEY WORDS: Arthritis - Arthritis, rheumatoid - Spondylitis, ankylosing - Physical and rehabilitation medicine.

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Inflammatory arthritis is an important group of musculoskeletal diseases characterized by chronic or recurrent joint inflammation. Inflammatory arthropathies mainly include rheumatoid arthritis (RA) and spondyloarthritis. However, some diseases classified under connective tissue disorders, such as Systemic Lupus Erythematosus and Behcet's disease as well as crystal arthropathies such as gout and pseudogout might also have inflammatory arthritis.

Inflammatory arthritis remains a major cause of disability and loss of independence. The burden in the society is significant due to high prevalence and increased cost to the health care system.[1] The goals in the management of inflammatory arthritis are to control pain and disease activity, prevent joint damage, protect and enhance function and improve health status and quality of life (QoL).[2, 3] The main target is to control disease activity and progression by systemic pharmacological treatment. The introduction of biological therapies in the last two decades has constituted the greatest advance in the treatment of inflammatory arthritis, mainly RA, ankylosing spondylitis (AS) and psoriatic arthritis.[4, 5] Despite the fact that aggressive and early use of traditional disease-modifying agents and introduction of biological agents were associated with substantial gains in clinical, radiological and disability outcomes,[6-8] a considerable proportion of patients have high or moderate disease activity with significant effects on physical, emotional and social functioning.[6, 9, 10] Therefore non-pharmacological treatments are also prescribed and used in inflammatory arthritis as recommended in various guidelines.[3, 11-14] Non-pharmacological therapy (excluding surgery) implies physical and rehabilitative interventions which include patient education for joint protection, energy conservation and self-management techniques, exercise therapy, use of physical modalities, use of orthoses/assistive devices and balneotherapy.[12, 15-17] The primary goal of rehabilitation as a health strategy is functioning as defined by the WHO in the International Classification of Functioning Disability and Health (ICF).[18] Integrated action is a prerequisite for successful rehabilitation. Thus these interventions would be most beneficial if given by a co-ordinated multidisciplinary rehabilitation team. Physical and rehabilitation medicine (PRM) is the only specialty which systematically applies the rehabilitation strategy across populations, settings, and situations from acute settings to the community and across all age groups.[19] Non-pharmacological rehabilitation interventions mentioned above are among the competencies and practice field of PRM physicians who also have specific expertise in effective team working.[20, 21]

The aim of this paper was to define the role of PRM specialist in the assessment and management of inflammatory arthritis with reference to PRM interventions that have been shown to be effective. Two most common types of inflammatory arthritis, RA and AS from the spondyloarthritis group, have been taken as examples in the presentation of the topic.

Impact of inflammatory arthritis

Rheumatoid arthritis

Rheumatoid arthritis is a chronic inflammatory autoimmune disease that involves the synovial membrane and extraarticular sites. It usually presents with symmetrical, persistent, and destructive polyarthritis affecting particularly the small joints of the hand and feet, and is often associated with rheumatoid factor or positive results in tests for anti-cyclic citrullinated peptide (anti-CCP) antibodies.[13] RA affects approximately 0.5-1% of the population, with women 2-3 times as likely to be affected as men. Although the course of RA may vary over time and between individuals, the main clinical features of the disease include joint pain and stiffness, fatigue, joint inflammation and joint damage, leading to articular deformities. All these impairments are associated with increasing disability, which worsens by an average of 0.6% each year.[22] Approximately 10% of patients suffer from severe joint damage within 2 years of disease onset, leading to significant functional disability.[23] In one study, for example, two years after the diagnosis, 55% of patients reported difficulties with household chores, shopping, social activities and recreational activities.[9] Work disability, defined as inability to work due to a health condition,[24] is also reported to range between 15% and 90% in RA, with a tendency to increase by disease duration.[25] The main predictors of work disability in RA were found to be disease severity, physical disability, higher age and low educational level.[26] It is also well-documented that RA patients have poor QoL in all aspects of life.[27] Their QoL improves initially after treatment onset, but then over time gradually declines. The disease is associated with increased comorbidities which may further worsen function and QoL.[22] Socioeconomic consequences of RA are severe. In Canada, the economic costs of RA are comparable to those of cancer, and in the

USA they approximate those of coronary artery disease and cancer.[28] It is documented that the new treatment strategies including early and aggressive use of disease-modifying drugs and introduction of biological agents have improved the outcome of RA with reduced disease activity and slowing of joint damage as well as decreased functional disability and increased work participation.[8, 10, 22, 23, 29] Despite these advances in therapy, in the first 3 years of the disease, 15% of the patients had high or moderate disease activity.[30]

Spondyloarthritis

Spondyloarthritis (SpA) is a group of inflammatory rheumatic diseases with common clinical and aetiological features, including axial and peripheral inflammatory arthritis, enthesitis, extra-articular manifestations and a close link to the presence of the human leukocyte antigen (HLA)-B27 epitope.[31] The diseases included under this family are AS, psoriatic arthritis, reactive arthritis, inflammatory bowel disease-related or enteropathic arthritis, and undifferentiated spondyloarthritis which presents with various clinical features of SpA but lack the specific diagnostic criteria of the first four subtypes.[32] Overall prevalence of SpA has been reported as 1.9%, the most frequent subtype being AS.[33]

AS, perhaps the best known and characterised of the SpA, is a chronic, progressive, inflammatory disease affecting the sacroiliac joints, the spine, the entheses and occasionally the peripheral joints.[15] The hallmark of the disease is inflammatory back pain, restricted spinal mobility and the presence of sacroiliitis on imaging.[31] Overall, the prevalence of AS is between 0.1% and 1.4%, with the most data coming from Europe.[15] AS may cause significant deterioration in physical function and QoL.[34, 35] The percentage of patients with severe disability can reach up to 25%.[35] Various activities related to self-care and mobility, have been restricted in more than half of the patients.[36] In a study, describing the difficulties in everyday activities among 152 AS patients, the problems most frequently reported were "interrupted sleeping", "turning head when driving", "carrying groceries" and "having energy for social activities".[37] AS can also limit work ability resulting in a substantial economic burden on patients and the health care system.[25, 38] Work disability in AS has been reported to range from 3% to 50% across various studies.[25] Cessation of working occurred much later than RA, 15.6 years after disease onset. Various factors such as severity of the disease, limitation of spine mobility and pain were found to be related with work disability in AS.[39]

Role of PRM in inflammatory arthritis

One of the main practice fields of PRM is musculoskeletal conditions. As such, patients with inflammatory arthritis are likely to be seen by a PRM physician/specialist. Although rheumatologists are generally the primary specialists dealing with inflammatory arthritis, PRM physicians also have roles in the assessment and provision of management for these patients, especially with their expertise in team work and non-pharmacological treatment.[20, 21]

Assessment

The rehabilitation process includes four stages: assessment, goal-setting, intervention and re-assessment.[40] In the assessment stage, the presence and the severity of the patient's problems (impairments, activity limitations, participation restrictions, and environmental barriers), prognostic factors and the patient's wishes and expectations are identified. Considering all those identified, goals for the patient are established in the goal-setting stage. Then at the intervention stage, all therapeutic interventions are undertaken according to the goals set. At the re-assessment stage, which is done several times when monitoring patients with inflammatory arthritis, the effects of interventions on the goals set are evaluated (outcome assessment). The process is iterative and the cycle continues until the goals are achieved, and/or new goals are set. A comprehensive and appropriate assessment is a prerequisite for the successful management and rehabilitation of patients with inflammatory arthritis.[41] This assessment includes a detailed history-taking, clinical examination, laboratory tests, imaging methods and functional evaluation. At this stage, diagnosis of the condition is usually made and co-morbidities are identified. Classification and diagnostic criteria internationally established for various rheumatic diseases can be helpful.[42] New classification criteria for RA, and axial and peripheral SpA have recently been developed and published.[43-45]

Strategies for assessment and outcome measure-

ment in PRM have been described in an educational review recently.[46] The same strategies can be applied for assessment in inflammatory arthritis, taking the conceptual ICF model as the framework.[47] Therefore, the assessment of the patient should be made at the levels of ICF components: body functions, body structures, and activities and participation - as well as considering the environmental factors.[46] In addition, QoL or health-related QoL should also be evaluated as an important patient-reported outcome in rheumatology.[48] Body functions which require assessment in inflammatory arthritis are pain, mobility of joints, muscle power, muscle endurance, sensation of muscle stiffness, energy, sleep, emotional functions, exercise tolerance, gait pattern, and haematological system functions (for acute phase reactants). Joint deformities, muscle atrophy, structural impairments of various musculoskeletal regions determined by X-rays or other imaging methods are examples of body structures usually assessed in inflammatory arthritis. Activities are basic tasks or actions which represent the individual perspective of functioning, whereas participation is involvement in a life situation, representing the societal perspective of functioning. Assessment of "activities and participation" can be made either as one level or separately for "activities" and "participation". For instance, Health Assessment Questionnaire (HAQ) assesses "activities" whereas World Health Organization Disability Assessment Schedule (WHODAS-II) evaluates "activities and participation". Even the assessment may focus upon a special activity such as "dexterity" which, for example, might be assessed by Nine Hole Peg Test. A complete assessment often involves a professional interdisciplinary team.[21] Examples of assessment tools/methods for RA and AS are presented at Tables I, II. Assessment domains and subdomains that might be relevant for each diagnostic group and available assessment tools for the corresponding domain or sub-domain are listed.

In order to improve and standardise the assessment and outcome measurement, some international organisations, special interest or working groups have developed recommendations or guidelines. Outcome Measures in Rheumatology (OMERACT), an international network aimed at improving out-

TABLE I.—*Examples of assessment tools for rheumatoid arthritis.*

Domain	Assessment Tool/Method
Body functions	
Sensation of pain	VAS, Verbal Rating Scale, Multidimensional Pain Inventory, AIMS2-Pain, NHP-Pain, SF36-Pain, Rheumatoid Arthritis Pain Scale
Sensation of muscle stiffness	Duration of morning stiffness
Sensitivity to pressure	Tender joint count
Mobility of joint functions	Joint range of motion
Muscle power functions	Grip strength
Haematological system functions	Erythrocyte sedimentation rate, C-reactive protein
Energy and drive functions	Multidimensional Assessment of Fatigue Scale, VAS
Exercise tolerance functions	Exercise tolerance test, VO_2max, heart rate, MET
Sleep functions	Medical Outcomes Study (MOS) Sleep measure
Emotional functions	Hospital Anxiety Depression Scale, Beck Depression Inventory
Body structures	
Structures related to movement	Swollen joint count
	Joint damage by X-ray: Larsen Index, Sharp Index
Body functions/structures	
Composite	DAS28, SDAI, RADAI
Activities and participation	
Activities	HAQ, AIMS2-Mobility, AIMS2-walking&bending, AIMS2-hand&finger function, AIMS2-arm function, AIMS2-self care, AIMS2-household tasks
Participation	AIMS2-social activity, AIMS2-support, AIMS2-work, RA Work Instability Scale
Activities and participation	London Handicap Scale, WHODAS II
QoL/ Health-related QoL	
	SF-36, NHP, EuroQoL, RAQoL, patient global assessment

VAS: Visual Analogue Scale; AIMS: Arthritis Impact Measurement Scales, NHP: Nottingham Health Profile, SF-36: Short Form 36, DAS: Disease Activity Score, SDAI: Simple Disease Activity Index; RADAI: Rheumatoid Arthritis Disease Activity Index; HAQ: Health Assessment Questionnaire; WHODAS: World Health Organization Disability Assessment Schedule; RAQoL: Rheumatoid Arthritis Quality of Life.

TABLE II.—*Examples of assessment tools for ankylosing spondylitis.*

Domain	Assessment tool/method
Body functions	
Sensation of pain	VAS, NRS, NHP-pain
Sensation of muscle stiffness	Duration of morning stiffness, level of morning stiffness by VAS/NRS
Sensitivity to pressure	Tender joint count, MASES
Mobility of joint functions	Spinal mobility: chest expansion, modified Schober, occiput-to-wall distance, cervical rotation, lateral spinal flexion, BASMI
Hematological system functions	Erythrocyte Sedimentation Rate, C-reactive protein
Energy and drive functions	VAS, NRS, Multidimensional Assessment of Fatigue Scale
Exercise tolerance functions	Exercise tolerance test, VO_2max, heart rate, MET
Sleep functions	Medical Outcomes Study (MOS) Sleep measure
Emotional functions	Hospital Anxiety Depression Scale, Beck Depression Inventory
Body structures	
Structures related to movement	Swollen joint count
	Joint damage by X-ray: lateral lumbar and cervical spine, BASRI, Larsen hip score, SASSS
Body functions/structures	
Composite	BASDAI, ASDAS
Activities and participation	
Activities	BASFI, Dougados Functional Index, Revised Leeds Disability Questionnaire
Participation	Ankylosing Spondylitis Work Instability Scale
Activities and participation	HAQ-S, London Handicap Scale, WHODAS II
QoL/Health-related QoL	
	SF-36, NHP, EuroQoL, ASQoL

VAS: Visual analogue scale; NRS: Numeric Rating Scale; NHP: Nottingham Health Profile; MASES: Maastricht Ankylosing Spondylitis Enthesitis Score; BASMI: Bath Ankylosing Spondylitis Metrology Index; BASRI: Bath Ankylosing Radiology Index; SASSS: Stoke Ankylosing Spondylitis Spine Score; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; ASDAS: Ankylosing Spondylitis Disease Activity Score; BASFI: Bath Ankylosing Spondylitis Functional Index; HAQ: Health Assessment Questionnaire; WHODAS: World Health Organization Disability Assessment Schedule; SF-36: Short Form 36; ASQoL: Ankylosing Spondylitis Quality of Life.

come measurement in rheumatology, has recommended core sets of measures for most rheumatologic conditions.[42] For example, OMERACT, with the endorsement of World Health Organization and International League Against Rheumatism, suggested a preliminary core set for use in RA clinical trials. This core set of outcome measures includes pain, patient global assessment, physical disability, swollen joints, tender joints, acute phase reactants, physician global assessment and radiographs of joints (in studies of one or more years' duration).[49] The Assessment of SpondyloArthritis International Society (ASAS) is another international working group initiated with the aim of bringing evidence-based unity in the multitude of assessments in the field of AS and later in all SpA. It has extended its work to measuring treatment response in clinical trials, the re-evaluation of existing classification criteria and the development of diagnostic criteria for SpA.[50] To date, the ASAS Working Group has defined core sets for endpoints to be used in 4 settings. Core set of outcome measures recommended by ASAS for clinical record keeping in AS include pain, physical function, spine mobility, patient global assessment of disease activity, assessment of peripheral joints and entheses, morning stiffness of the spine, acute phase reactants and fatigue.[50] Disease activity, which is an important outcome measure in inflammatory arthritis, is usually assessed by composite measures such as Disease Activity Score 28 (DAS28) in RA and Bath AS Disease Activity Index (BASDAI) or AS Disease Activity Score (ASDAS) in AS.[48] To document the assessment of change in clinical trials, American College of Rheumatology (ACR) and European League Against Rheumatism (EULAR) have recommended their own response criteria in RA. Similarly ASAS have developed response criteria for AS.[48]

Another attempt to improve assessment in healthcare has been the development of ICF core sets.[51] ICF Core Sets are selections of ICF categories relevant for specific diseases or conditions, which can be used in clinical studies or health statistics (brief ICF core sets) or to guide multidisciplinary assessments (comprehensive ICF core sets). For clinical practice and research, they list the ICF categories which should be measured but they provide no in-

TABLE III.—*ICF brief core sets for rheumatoid arthritis and ankylosing spondylitis.*

ICF component	Rheumatoid arthritis		Ankylosing spondylitis	
	ICF code	ICF category	ICF code	ICF category
Body functions	b280	Sensation of pain	b280	Sensation of pain
	b710	Mobility of joint functions	b710	Mobility of joint functions
	b730	Muscle power functions	b780	Sensations related to muscles and movement functions
	b455	Exercise tolerance functions	b130	Energy and drive functions
	b780	Sensations related to muscles and movement functions	b134	Sleep functions
	b770	Gait pattern functions	b152	Emotional functions
	b134	Sleep functions	b455	Exercise tolerance functions
	b740	Muscle endurance functions		
Body structures	s730	Structure of lower extremity		
	s750	Structure of upper extremity	s750	Structure of lower extremity
	s710	Structures of head and neck	s760	Structure of trunk
	s720	Structures of shoulder region	s740	Structures of pelvic region
	s810	Structure area of skin	s770	Additional musculoskeletal structures related to movement
	s760	Structure of trunk		
	s299	Eye, ear and related structures, unspecified		
Activities and participation	d450	Walking	d230	Carrying out daily routine
	d850	Renumerative employment	d410	Changing basic body position
	d440	Fine hand use	d450	Walking
	d410	Changing basic body position	d845	Acquiring, keeping and terminating a job
	d445	Hand and arm use	d850	Renumerative employment
	d230	Carrying out daily routines	d760	Family relationships
	d430	Lifting and carrying objects	d920	Recreation and leisure
	d470	Using transportation	d475	Driving
	d540	Dressing		
	d510	Washing oneself		
	d920	Recreation and leisure		
	d770	Intimate relationships		
	d859	Work and employment, other		
	d550	Eating		
Environmental factors	e310	Immediate family	e110	Products or substances for personal consumption
	e580	Health services, systems, policies	e3	Support and relationships
	e355	Health professionals		
	e115	Products and technology for personal use in daily living		
	e570	Social security services, systems, policies		
	e155	Design, construction and building products and technology of buildings for private use		
	e540	Transportation services, systems and policies		
	e120	Products and technology for personal indoor and outdoor mobility and transportation		
	e110	Products or substances for personal consumption		
	e150	Design, construction and building products and technology of buildings for public use		

formation about how to measure them. ICF Core Sets have been developed for various conditions, including RA and AS.[52,53] Brief ICF core sets for RA and AS are presented at Table III. It has been suggested that the assignment of existing standardised instruments to ICF categories and the operationalisation of the ICF qualifiers can contribute to further improvements of ICF-based rehabilitation management in the future.[54]

Management

Management of patients with inflammatory arthritis includes pharmacological, non-pharmacological

and surgical interventions. The first step is to control disease activity as early as possible with appropriate pharmacological therapy. At the same time all considerations to reduce the impact of disease and its comorbidities on the person and his family/carers should be a priority for the PRM physician. Pharmacological agents used in inflammatory arthritis include non-steroidal anti-inflammatory drugs, disease-modifying antirheumatic drugs, glucocorticoids, biological agents and analgesics. Pharmacological treatment should be planned individually depending on the diagnosis and characteristics of the patient considering comorbidities, concomitant medications, psychosocial and economic aspects.[3] Recommendations of international rheumatology organisations will help the physician to plan the appropriate treatment algorithm for his/her patient.[3, 13, 14] Although rheumatologists are the main physicians prescribing pharmacological treatment for inflammatory arthritis, some PRM physicians, depending on their training as well as the setting they work, have responsibility for pharmacological interventions. Pharmacological and surgical interventions for inflammatory arthritis are beyond the scope of this manuscript. Perioperative rehabilitation for patients requiring surgery is also an important practice area for PRM physicians and will be reviewed in another paper as part of this series of papers scheduled to be produced by the Professional Practice Committee of the Union of European Medical Specialists (UEMS) PRM Section.[55]

Non-pharmacological therapy

Non-pharmacological therapy implies physical and rehabilitative interventions which aim to reduce the impact of inflammatory arthritis and its related comorbidities such as osteoporosis, cardiovasculary disease and obesity. These interventions include patient education, exercise therapy, use of physical modalities, use of orthoses /assistive devices, balneotherapy, acupuncture and others.

Patient education

Patient education for joint protection, energy conservation and self-management techniques are widely regarded as being fundamental to the comprehensive management of inflammatory arthritis.[3, 56, 57] Therapeutic patient education helps patients to know and understand the disease and its treatment, acquire the movements that protect joints, establish changes in life style (diet, physical activity program, smoking, etc.), learn to cope with their disease and the problems it causes, and involve relatives in disease management, treatment and repercussions.[12] Studies evaluating the effectiveness of patient education programs in inflammatory arthritis were done mainly in RA. A recent study by Albano et al. pointed out the characteristics and developments of therapeutic patient education in RA through an analysis of the international articles published from 2003 to 2008.[58] The study reported that although patient education was delivered in several structures, group education represented the most widespread educational strategy mainly provided by a multiprofessional team. There were two types of programs: 1) educational; aiming to make the patient competent in the daily management of his disease, including basic knowledge, self-management, physical activity, pain control/management, joint protection, diet, footwear, assistive devices, sexual issues, leisure, daily activities and work; 2) psycho-educational; aiming to improve coping and to decrease stress, anxiety and depression, focusing on stress management, relaxation, anxiety and depression, social functioning/social activities, and doctor-patient communication. Twenty-eight studies showed the effectiveness of patient education on the basis of bio-clinical, educational, psychosocial, and economical criteria, but the majority of those positive results were only observed in the short term.[58] In another recent systematic review exploring the effectiveness of self-management programs in arthritis, significant improvements in pain, fatigue, mood, function and self-efficacy were recorded in most studies,[59] supporting the effectiveness of patient education in inflammatory arthritis.

Joint protection is defined as a self-management strategy aimed to preserve function via modification in work methods, enhanced awareness of posture and joint position, activity pacing, and the use of orthotic and assistive devices.[57, 60] In a randomized controlled study (RCT) evaluating the long-term (4 years) effects of joint protection in early RA, significant improvements in terms of function, morning stiffness and deformity development were documented suggesting the effectiveness of joint-protection programs.[61] In a Cochrane review on occupational therapy (OT) in RA, there was strong evidence for the efficacy of "instruction on joint pro-

tection" regarding the improvement in functional ability.[62]

The ASAS has emphasized that regular exercises and patient education are the cornerstone of non-pharmacological therapy in AS.[3] However, there are not many studies evaluating the effects of education separately from other rehabilitation interventions in AS. In a recent study comparing three groups; exercise plus education, education and control group (all patients were taking TNF blockers), the education group was found to be superior to the control group in terms of improvements in function at 6 months.[63] In another study, evaluating the effects of OT including a comprehensive patient education program, combination of OT and TNF blockers were superior to TNF blockers alone in terms of pain, physical function and mental health.[64]

Exercise therapy

Physical activity and exercises are important components of non-pharmacological therapy in inflammatory arthritis. Physical activity is defined as any bodily movement produced by skeletal muscles, that results in energy expenditure, whereas exercises are a subset of physical activity that is planned, structured, and repetitive, with the objective of improvement or maintenance of physical fitness.[57] Exercises can be given with the aims of improving or maintaining joint range of motion, flexibility, and balance, and increasing muscle strength and aerobic capacity.

The benefits of exercise and physical activity programs regarding RA-related outcomes have been consistently demonstrated.[65] There is high quality evidence for the positive effects of dynamic exercise programs on aerobic capacity, muscle strength, functional ability and QoL as presented in various systematic reviews and RCTs.[57, 65-68] Dynamic exercises are safe and beneficial both in early and established RA with no harmful effects on the disease activity and radiological damage.[57] It is recommended that RA patients should be taught and supported in an effective exercise program of moderate (60-85% of maximum heart rate) aerobic exercise three times a week for between 30-60 minutes cumulatively, combined with moderate strengthening (50-80% of maximal voluntary contraction) two or three times a week.[17, 69] When the disease is very active or there is severe involvement of the joints of the lower limbs, aerobic activities with low impact on the joints or with load alleviation should be preferred.[12] Severely inflamed joints should only be subjected to gentle mobilisation and stretching within available range of movement.[56] Due to the increased risk of comorbidities such as cardiovascular diseases and osteoporosis, it is important that RA patients should be encouraged for regular physical activity and exercise programs.[12, 57]

As hand function is commonly impaired in RA, hand exercises are also recommended.[57] A systematic review, in 2004, has concluded that there is some but limited evidence that long-term hand exercise may increase grip strength in RA.[70] Recent studies have further confirmed that intensive hand exercise programs are well tolerated and more effective in improving hand function in terms of pain and grip strength.[57, 65]

Physical activity and exercises are recommended also in AS.[3] In an RCT, including 40 AS patients, an exercise regimen based on the Global Posture Reeducation method and focusing on specific strengthening and flexibility exercises of the shortened muscle chains offers promising short- and long-term (1 year) results in terms of mobility measures and functional ability.[71] In another RCT, a multimodal exercise program including aerobic, stretching, and pulmonary exercises provided in conjunction with routine medical management yielded greater improvements in spinal mobility, work capacity, and chest expansion.[72] A Cochrane review, in 2008, investigated the effectiveness of physiotherapy interventions.[73] Four trials included in this review compared individualised home exercise programs or a supervised exercise program with no intervention and reported low quality evidence for effects in spinal mobility and physical function. Three trials compared supervised group physiotherapy with an individualised home-exercise program and reported moderate quality evidence for small differences in spinal mobility and patient global assessment in favour of supervised group exercises. The authors suggested that an individual home-based or supervised exercise program was better than no intervention; that supervised group physiotherapy was better than home exercises; and that combined inpatient spa-exercise therapy followed by group physiotherapy was better than group physiotherapy alone. A recent study in AS investigated the effects of exercise plus

education and education alone with a control group (all patients were taking TNF blockers). The results revealed that exercise group was superior to control group in terms of improvements in spine mobility, disease activity and function, at 2 and 6 months.[63] All studies mentioned above support that exercises should remain a mainstay of AS treatment. Currently, home exercises improving and maintaining proper posture and respiratory capacity, increasing spinal mobility as well as strengthening paraspinal and abdominal muscles are recommended for all patients with AS. Physical therapy with supervised exercises, land or water based, individually or in a group, should be preferred as these are more effective than home exercises.[3]

Physical modalities

Heat, cold and other physical modalities are frequently used in the non-pharmacological treatment of inflammatory arthritis, being accepted by tradition, and have only recently been subjected to controlled trials.[56] Physical modalities are used for their therapeutical physiological effects with the aims of relieving pain and stiffness, increasing flexibity and restoring function.[57, 60]

Thermotherapy includes local application of cold (cold packs, ice massage, cold air, etc.), superficial heat (hot packs, paraffin baths, infrared) and deep heat (ultrasound, electromagnetic wave forms).[57, 60] In a systematic review including seven studies of different thermotherapy applications in patients with RA, no significant effect of cold or heat applications on pain, joint swelling, range of motion and grip strength was found. However there were positive effects of paraffin baths for arthritic hand in terms of pain, stiffness, range of motion, pinch and grip strength after 4 weeks of therapy.[74] Overall, no detrimental effects of thermotherapy were detected. Another systematic review, comprising only 2 studies, did not demonstrate the effectiveness of ultrasound used in combination with other modalities in RA.[75] The reviewers concluded that ultrasound alone could however, be used on the hand to increase grip strength, increase wrist dorsal flexion, decrease morning stiffness, reduce the number of swollen and painful joints. It is important to note that these conclusions were limited by the methodological considerations such as poor quality and/or low number of trials, and the small sample size of the included studies. In another study, promising efficacy of pulsed electromagnetic fields on pain reduction in RA, with possible anti-inflammatory effects as demonstrated in animal arthritic models, were documented.[76]

Electrotherapy is the therapeutic use of different forms of electric current with the aims of pain control and muscle stimulation. In a systematic review, including 3 studies on 78 RA patients, there were conflicting effects of TENS on rheumatoid hand: Acupuncture-TENS was beneficial for reducing pain intensity and improving muscle power over placebo while, conversely, conventional TENS resulted in no clinical benefit on pain intensity compared with placebo. However conventional TENS resulted in a clinical benefit on patient assessment of change in disease over acupuncture TENS.[77] Authors concluded that well-designed studies were needed to document the effect of conventional- and acupuncture-TENS in the treatment of rheumatoid hand. A systematic review on the use of electrical stimulation in RA (included only one RCT) concluded that electrical stimulation had beneficial effects on grip strength and fatigue resistance for RA patients with muscle atrophy of the hand.[78]

Low level laser therapy (LLLT) is a light source that generates light of a single wavelength. Its effect is not thermal, but rather related to photochemical reactions in the cell.[16] A systematic review investigating the effectiveness of LLLT (including 5 RCTs) suggested that LLLT was effective in reducing pain and morning stiffness and increasing tip-to-palm flexibility.[79] The authors also pointed out that their meta-analysis lacked data on how LLLT effectiveness was affected by wavelength, treatment duration, dosage and site of application emphasizing the need to investigate the effects of these factors.

Regarding the use of different physical modalities in AS, it has been noticed that such modalities were embedded in the rehabilitation programs,[73, 80] making it impossible to comment on their specific effects. However, in an RCT including 58 AS patients, Stanger bath therapy (a combination of electrotherapy and hydrotherapy modality) showed immediate beneficial effects in spinal mobility, functional capacity, disease activity, and QoL.[81]

In summary, physical modalities are commonly used and recommended as part of the PRM program. However, more well-conducted and adequately

powered clinical trials are needed to document their specific effects in inflammatory arthritis.

Orthoses

Wrist-hand orthoses.—Using wrist-hand orthoses in rheumatoid hand aims to decrease inflammation and/or pain, prevent contractures and deformities and increase joint stability.[57] A Cochrane review on OT in RA concludes that wrist splints are effective in reducing pain and increasing grip strength but may have a negative effect on dexterity.[62] These findings were supported by an RCT in which pain scores decreased by 32% in the working splint group whereas increased by 17% in the control group after four weeks.[82] In another RCT including 50 RA patients, the use of a night-time hand positioning splint reduced pain, improved grip and pinch strength, upper limb function and functional status.[83] Finger orthoses, especially ring splints for finger deformities were shown to correct deformities and improve finger stability and dexterity.[16, 57]

Foot orthoses

More than 85% of patients with established RA have foot involvement which can result in pain, joint instability and deformities, postural and biomechanical impairments in the entire lower limb and walking difficulties.[57] Foot-care is essential in the non-pharmacological management of RA. Every patient should be given advice regarding foot hygiene and foot joint protection. Metatarsal pain and/or foot alignment abnormalities should be searched regularly.[11] Suggestions about appropriate footwear should be made and appropriate foot orthoses should be prescribed if needed.[12, 17] Extra-depth orthopaedic shoes or off-the-shelf orthopaedic footwear combined with moulded insoles as well as soft insoles made of viscoelastic materials decrease pain during various activities.[17, 57] A systematic review, including 6 RCTs, concluded that there was strong evidence regarding the effectiveness of foot orthoses in terms of reducing pain and improving function as well as slowing down the progression of hallux valgus deformities in RA.[84] Similarly, another systematic review indicated that extra-depth shoes had beneficial effects on pain and function.[85] A recent systematic review also provided evidence for possible beneficial effects of custom-made foot orthoses for feet and ankle pain reduction in RA.[86]

Assistive devices

Assistive devices and adaptations of the physical environment are frequently prescribed to decrease pain, overcome joint limitations, compensate for muscle weakness and enhance safety with the aim of preventing or reducing dependence.[16] Most commonly used assistive devices in inflammatory arthritis for mobility and daily activities include utensils facilitating kitchen activities (such as jar openers), broad handles for covers and doors, raised toilet seats, bathroom appliances and mobility aids such as walking aids and scooters.[16,56] Appropriate assistive devices should be prescribed depending on the patient's needs, considering his/her physical and social environment. Unfortunately the literature about the effectiveness and use of assistive devices in inflammatory arthritis is scanty. In a survey regarding the use and effectiveness of assistive devices (including a cohort of 284 early RA patients), use of assistive devices was found to be related to more severe disease and more pronounced disability, and to reduce difficulties significantly.[87] A Cochrane review, including only one RCT, revealed that there was limited evidence for the effect of assistive technology in RA and concluded that there was an urgent need for high-quality research in this field.[88]

Balneotherapy

Balneotherapy, a common therapy in inflammatory arthritis, uses physical properties of mineral and thermal springs. It may be offered as an adjunct to rehabilitation interventions, including exercises and physical modalities.[12] It is well-tolerated, at least outside the episodes of inflammatory flare-up. A systematic review, including six RCTs, investigated the effects of balneotherapy in RA included six RCTs. The interventions were mineral baths plus mud packs, radon-carbon dioxine baths, carbon dioxine baths, Dead Sea baths and tap water of 36°C. Although most of these trials reported positive results with respect to pain, morning stiffness and functional ability, with the effects lasting for 3-9 months, the authors concluded that a definite judgement about efficacy was impossible, because of the methodological flaws in the studies included.[89] The effects of balneotherapy in AS were evaluated in 2 RCTs. The first one including 120 patients showed that 3-week spa therapy combined with exercises was superior

to control group (only exercise therapy) regarding pain and patient global assessment, with its effects lasting for 4 months.[90] In the other RCT comprising 60 patients, balneotherapy (spa water at 39 °C) was found to be superior to control group in terms of pain, disease activity, function and health-related QoL immediately after the therapy. However, the effects were not maintained at 6 months.[91] A recent review, including 19 RCTs, updated the rheumatological indications for balneotherapy (spa therapy). The conclusion was that spa therapy was indicated for stabilised RA and AS.[92]

Complementary and alternative medicine treatments and dietary interventions

Complementary and alternative medicine (CAM) treatments have become popular worldwide, especially among patients with arthritis. Among CAM therapies, acupuncture has been shown to yield favourable results in patients with RA in terms of reductions in erythrocyte sedimentation rate and C-reactive protein levels in a systematic review.[93] At the same time, another systematic review including 8 RCTs, failed to show specific effects of penetrating or non-penetrating acupuncture for pain control in patients with RA.[94] A more recent review pointed to the possible usefulness of acupuncture as an adjunct modality for pain reduction in some patients with RA.[95] In a very recent meta-analysis, another CAM treatment, yoga has also been suggested as helpful in reducing pain and disability in painful conditions including RA.[96] Dietary supplements, included among CAM modalities, are also popular amongst patients with inflammatory arthritis. Nutritional supplements of fish-oil (omega 3 polyunsaturated fatty acids) and antioxidants (vitamins C, E and beta-caroten) may be of benefit for some patients especially for decreasing pain and stiffness.[60, 95] Fish oil supplements have been shown to reduce the daily non-steroidal anti-inflammatory drug requirement.[97] In summary, although acupuncture may be offered as an adjuvant treatment for chronic pain, other CAM modalities such as topical or oral herbal products or dietary supplements are not recommended in RA on account of their inconsistent or insufficient efficacy.[11, 12, 98]

In a systematic review investigating the effectiveness of different diet interventions on RA, the effects of dietary manipulation, including vegetarian, Mediterranean, elemental and elimination diets have been found to be uncertain due to the included studies being small, single trials with moderate to high risk of bias.[99] Nevertheless, patients with inflammatory arthritis should be encouraged to follow a Mediterranean-type of eating pattern which meets the requirements of a healthy diet.[57, 60] In addition, appropriate dietary measures are necessary to correct nutritional deficiencies (*e.g.* Vitamin D, calcium, folic acid) and prevent or treat related comorbidities such as cardiovascular disease or osteoporosis.[12]

Other interventions

Psychological interventions such as cognitive-behavioural therapy, relaxation strategies, biofeedback or psycho-educational interventions may be effective adjuncts to conventional treatment with their established short-term positive effects on pain, functional ability and psychological status.[60] As the prevalence of work disability is high among people with inflammatory arthritis, attention should be directed to rapid identification of persons at risk of being work disabled and their access to multidisciplinary vocational rehabilitation programs should be enabled.[17, 57] In addition, referral for appropriate financial advice and support as well as third sector support such as arthritis-related charities should be considered.

Conclusions

Inflammatory arthritis is a major cause of disability with an important economic burden in society. Although rheumatologists are generally the primary specialists dealing with inflammatory arthritis in various parts of the world, PRM physicians do also have distinct roles in the rehabilitation of these patients in order to effectively organise and supervise the PRM program. Their role starts with a comprehensive assessment of the patient regarding his/her impairments, activity limitations and participation restrictions as well as consideration of the environmental and personal factors. A complete assessment often involves the interdisciplinary rehabilitation team. The assessment results in a negotiation between the patient and the team members to agree on common goals and essential elements of the individualized PRM program. It should be noted that therapeutic

patient education and exercises are the cornerstone of the non-pharmacological therapy in inflammatory arthritis. During active flares of the disease, the rehabilitative emphasis is on providing pain relief with physical modalities and maintaining range of motion of the joints and preventing contractures, while appropriate pharmacological agents are being administered to control systemic inflammation. Once the disease activity decreases, emphasis shifts to active exercises, strengthening, retraining of functions and ambulation.[56] Orthoses and assistive devices are prescribed to enhance activities and participation. Modification of the environment can also help facilitate functioning. Future research and actions regarding the role of PRM in people with inflammatory arthritis should target access to care, updates on the use and effectiveness of physical modalities, orthoses and assistive devices, and standardisation of therapeutic education programs for those patients.

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Osteoporosis

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Oral A, Küçükdeveci A A, Varela E, Ilieva E M, Valero R, Berteanu M, Christodoulou N.

Osteoporosis. The role of Physical and Rehabilitation Medicine Physicians. The European perspective based on the best evidence

A paper by the UEMS-PRM Section Professional Practice Committee

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One of the objectives of the Professional Practice Committee (PPC) of the Physical and Rehabilitation Medicine (PRM) Section of the Union of European Medical Specialists (UEMS) is the development of the field of competence of PRM physicians in Europe. To achieve this objective, UEMS PRM Section PPC has adopted a systematic action plan of preparing a series of papers describing the role of PRM physicians in a number of disabling health conditions, based on the evidence of effectiveness of PRM interventions. A wide range of health conditions treated by PRM specialists carries the risk of osteoporosis (OP). The consequences of OP may be associated with significant disability. The aim of this paper is: to define the role of PRM physicians in the prevention and management of OP, to describe the needs of people with OP in relation to rehabilitation strategy, and to highlight why and how PRM physicians should be involved in the diagnosis and management of OP. PRM physicians may intervene in the prevention of and risk factor assessment for OP, falls and fractures along with other assessments of functioning and of quality of life. In addition, they are involved in diagnosis and in both pharmacological and nonpharmacological treatment of OP. From a specific PRM perspective based on the International Classification of Functioning, Disability and Health (ICF), there is an important role in optimizing functioning and promoting "activities and participation", including interventions associated with environmental factors for people with OP or osteoporotic fractures. Evidence suggests that a large number of interventions within the scope of PRM that range from preventive strategies (including education and self management and most importantly exercise) to pain management strategies and spinal orthoses or hip protectors may be effective in the prevention and/or management of OP and its sequelae. Competencies and aptitudes of PRM specialists, focusing especially on functioning while providing care over the whole course of a health condition from the hospital to the community, may well place them in the management of OP. Evidence-based ef-

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fective PRM interventions further warrant the role of PRM physicians in the management of OP.

Key words: Osteoporosis - Evidence based medicine - Physical and rehabilitation medicine.

Osteoporosis (OP) is defined as "a systemic skeletal disease characterised by low bone mass, deterioration of bone tissue and disruption of bone architecture, all compromising bone strength that leads to enhanced bone fragility and a consequent increase in the risk of fractures".[1] Osteoporotic fractures commonly occur at the spine, hip, distal forearm, and proximal humerus as well as at many other sites including the ribs, pelvis, distal femur and tibia.[2] Fractures, especially those of the hip, are the most important clinical consequence of OP and are a major cause of morbidity and mortality worldwide. The worldwide incidence of osteoporotic fractures in 2000 was estimated to be 9 million with 1.6 million for the hip, 1.7 million for the forearm and 1.4 million for clinical fractures of the vertebrae. Their annual cost was estimated at 20 billion US$ in the USA and 30 billion Euros in Europe.[3] The health and economic burden resulting from OP and its consequences is not only based on mortality and the financial costs of fractures, but also on significant ensuing disability with extensive limitations in functioning.[4] Therefore, OP poses a significant challenge for society and, thus for physical and rehabilitation medicine (PRM) specialists, the specialty of PRM being defined as "the medical specialty that, based on the assessment of functioning and including the diagnosis and treatment of health conditions, performs, applies and coordinates a wide range of interventions with the goal of optimizing functioning of people experiencing or likely to experience disability" (Stucki & Melvin, 2007, p. 288).[5]

Although some reviewers commented that it is an unusual way of citation, this is a quote from another paper which we do not want to change any word. So it is more ethical to cite quotations like this in Harvard style.It may be important for 'copyright' issues and as a courtesy to the authors. Please ask the Editor-in-Chief that it would be appropriate like this. PRM also aims to contribute to a person's quality of life by improving functioning.[6] Moreover, since functioning and quality of life are either key outcomes or related outcomes in other three of the health strategies including preventive strategy, curative strategy, and supportive strategy,[6] it means that PRM specialists may well contribute to the prevention, treatment, and support for disabling chronic diseases such as OP. It should also be noted that rehabilitation strategy is relevant for care and service provision over the whole course of a health condition from the hospital to the community and only the specialty of PRM explicitly considers assessment and intervention in all aspects of life from disease to social role fulfilment and quality of life and recognizes the importance of contextual factors.[6] Therefore, PRM specialists may have a significant role in the management of OP that extends from prevention to participation in the community.

The aim of this paper is to: define the role of PRM specialist in the prevention and management of OP with reference to PRM interventions that have been shown to be effective in these aspects; describe the needs of people with OP in relation to rehabilitation strategy; and outline and emphasise why PRM specialists should be more involved in the diagnosis and management of OP in an attempt to promote the role of PRM specialists in the management of OP.

Why should PRM physicians be more involved in the diagnosis and management of OP? A perspective on the needs of rehabilitation patients for OP diagnosis and treatment

As described well in the White Book on Physical and Rehabilitation Medicine in Europe,[7, 8] PRM specialists focus on the treatment of many conditions that may be associated with an increased risk of OP or the clinical features and sequelae of this disabling condition. PRM specialists should be well aware of the needs of the patients with the following conditions for OP diagnosis and treatment.

Age is the most important risk factor for OP and contributes to the risk of OP independently of bone mineral density (BMD).[2] Since we treat many elderly patients for a variety of reasons, PRM specialists should be alert that a substantial number of the elderly may be in need of screening and treatment for OP. It is alarming that in a very large study of OP in the oldest-old in Sweden, only 16.1% of the women and 3.4% of the men were reported to use OP drugs.[9]

Regarding common musculoskeletal diseases (MSDs) PRM specialists treat, our patients with back pain, the most common clinical symptom of OP [10] as well as that of OP related vertebral fractures,[11] may also require consideration of OP. Idiopathic scoliosis

is another MSD which may cause or contribute to OP.[12] Diabetes mellitus, commonly presenting with musculoskeletal symptoms, is a major cause of OP and fractures. In a systematic review (SR) and meta-analysis (MA) including 836941 participants and 139531 cases with fracture in the USA and Europe, both type 1 and 2 diabetes were shown to be associated with an increased hip fracture risk in both men and women.[13] Moreover, the most commonly used drugs for MSDs, non-steroidal antiinflammatory drugs (NSAIDs) have also been shown to increase the risk of hip fractures.[14] In patients with rheumatoid arthritis (RA), the frequency of glucocorticoid induced OP and osteopenia were reported to range from 4 to 24% and 28% to 61.9%, respectively, with the incidence of fractures reaching up to 25%. However, the number of patients with RA receiving evaluation and preventive treatment for OP was noted to be low.[15] The risk of developing OP is also common in patients with ankylosing spondylitis with a high prevalence of decreased BMD ranging from 51% to 54% and with a prevalence of OP ranging from 13% to 16 % within ten years following the diagnosis.[16]

Many people with disabling neurological conditions are known to be at risk of OP mainly due to immobilisation and decreased mobility.[17] Stroke survivors have more than seven fold increase in fracture risk in the first year after stroke,[18] mainly of the hip, about three fourths occurring on the hemiparetic side leading to further disability.[19] It is clear that preventing bone loss at an early stage and targeting OP treatment can provide significant benefits and may have the potential to reduce further disability and mortality from hip fractures in post-stroke hemiplegic patients. The prevalence of low bone mass in patients with multiple sclerosis (MS) is also high. The North American Research Committee on Multiple Sclerosis Registry reported a prevalence of low bone mass in patients with MS as 27.2%, leading to a fracture in more than 15% patients over the age of 13, 46.2% of those being multiple fractures, 35.2% being wrist fractures, 11.1% being vertebral fractures, and 7.4% being hip fractures. Despite this, many patients were found not to be receiving adequate OP treatment.[20] The higher extent of disability was shown to predispose MS patients to a 2.6-fold increased risk of fractures.[21] Many reasons for low BMD and fracture risk such as disability, immobility, proneness to falls, and corticosteroid use in patients with MS make it clear that close attention should be paid to OP in these patients.[22] As for spinal cord injured patients, they are also prone to future fractures due to acute and extensive demineralisation of bone below the level of injury.[23] However, the investigation for OP in this population is low. In a study assessing the practices of PRM specialists for OP in spinal cord injury in France, a routine screening for OP was reported to be done by only 19.2% of the physicians and only in 80.2% of the cases after fractures.[24] Patients with Parkinson's disease were also shown to have lower hip and spine BMD levels when compared to healthy controls with an odds ratio of 1.18 for developing OP.[25] The risk of fractures in patients with epilepsy has been reported to be two to six times greater than that in the general population, for which seizure related injuries, antiepileptic drugs and reduction in physical activity have the potential to be the contributing factors.[26] Traumatic brain injury and amyotrophic lateral sclerosis can be added to the list of neurological conditions which are associated with OP and fractures.[17]

As for orthopaedic rehabilitation patients, it is unquestionable that patients with hip fractures require rehabilitation conducted by a multidisciplinary rehabilitation team that should be led by a PRM specialist.[27] Although consideration of treatment for individuals with vertebrae or hip fractures is strongly recommended,[28] undertreatment of patients with fractures has long been problematic. In a very large study examining OP treatment in 51346 patients aged over 65 years hospitalized for hip fractures at 318 hospitals in the US between the years 2003 and 2005, only 7.3% of the patients were found to have been provided with antiresorptive or bone-forming drugs.[29] The situation of undertreatment of OP in postfracture patients was noted not to have improved, the proportion of patients with postfracture treatment being less than 20% in 2008.[30] A very recent SR examining studies on investigation and treatment of OP in patients with fragility fractures in orthopaedic environments pointed to the investigation of OP in up to 71% of patients, but revealed medication provision to be less than 35%.[31] Another recent study drew attention to an important issue that treatment varied in the clinical setting where these patients were hospitalized, medicine services having the highest rate of (58%) provision of OP treatment followed by rehabilitation services (44%) and then orthopaedic surgery (12%).[32] This very important finding, that is, the lower rates of OP treat-

ment in rehabilitation wards points to the urgent need for PRM specialists to be more involved in the pharmacological treatment for OP in those patients with fractures. Since there is confirmatory evidence revealed by MAs that a previous fracture is a risk factor for future fracture[33] as well as an evidence of 11% reduction in mortality with OP treatment in the elderly patients with OP at a high fracture risk,[34] being actively involved in the treatment of OP in patients with osteoporotic fractures should be a mandate for all physicians including PRM specialists. Finally yet importantly, OP is also common in lower limb amputees with decreased BMD of the hip showing correlation with the time since amputation.[35]

Another group at risk undergoing PRM programmes are cancer patients. In an inpatient rehabilitation facility where 1041 cancer patients were undergoing an oncological rehabilitation programme, BMD screening was justified by revealing that 15.8% of these patients had OP, which is higher than in the general population.[36] An SR of breast cancer patients identified cancer treatment induced bone loss, which resulted in fractures of the hip occurring at a younger age and at higher BMD values compared to those without breast cancer.[37] A case-control study of 124655 fracture cases and 373962 controls revealed that primary bone cancer, bone metastases, multiple myeloma, metastatic lung cancer, gall bladder, liver, pancreas, and prostate cancer constituted the high risk group for fractures to occur particularly within the first year following the diagnosis.[38]

A further group at risk are cardiopulmonary rehabilitation patients, including those with cystic fibrosis (CF), chronic obstructive pulmonary disease (COPD), congestive heart failure (HF), and heart transplantation. Given the high prevalence of OP, osteopenia, and vertebral and non-vertebral fractures in adults with CF reported as 23.5%, 38%, and 14%, respectively,[39] it is very important to screen for OP in this population. A disappointing finding relates to patients with COPD undergoing rehabilitation, where 21% of the patients were found to have OP, with independent predictors being cachexia and age over 55 years. However, only 18% of patients with COPD diagnosed as having OP were reported to be receiving OP treatment, while 82% were not, in this pulmonary rehabilitation setting.[40] Again, PRM specialists should be involved in the assessment and treatment of OP in pulmonary rehabilitation patients, particularly those over 55 years. Undertreatment of OP in patients with HF, significantly associated with an increased risk of major fractures independently of BMD,[41] is also common. In a tertiary care setting in Canada, the prevalence of vertebral compression fractures was reported as 12% in patients with HF and more than half of these patients (55%) were reported to have multiple fractures, only 15% of whom having been treated for OP.[42] These findings should also alert PRM specialists involved in the rehabilitation of HF patients not to miss the opportunity of diagnosing OP and providing bone treatment appropriately. It should also be noted that falls or gait instability were prevalent in patients enrolled in early outpatient cardiac rehabilitation and were reported in 11% of participants.[43] This further warrants the use of OP/fracture prevention strategies in patients undertaking cardiac rehabilitation. Medications used for cardiac patients should also lead to BMD screening, such as for those on anticoagulation treatment including long-term heparin that may reduce BMD in about one third of the patients and be associated with symptomatic fractures in about 2% to 3%. Low molecular weight heparin may also carry risk of OP, however, lower than that of heparin. The use of warfarin for more than one year has been shown to be associated with a 25% increased risk of fractures. Acenocumarol has also been shown to provoke a progressive decrease in BMD on prolonged use.[44] Additionally, a recent article revealed an association between beta-blocker use and fragility fractures.[45]

Regarding organ transplantation, a challenging situation for PRM specialists, in a study examining the prevalence of OP in patients awaiting organ transplantation, the highest prevalence of OP were found in patients with lung (67%) failure, followed by patients with liver (31%), kidney (24%), and heart (23%) failure.[46] The consideration of a threshold of a T-score of -1.5 or less to identify risk of fractures after heart transplantation was proposed based on the findings of the considerable prevalence of vertebral fractures at even T-scores of >-2.5 in these patients.[47]

Regarding our paediatric rehabilitation patients, in an article addressing BMD in cerebral palsy (CP), CP has been reported as the most prevalent childhood condition associated with significantly decreased BMD resulting in painful fractures that impair functioning and quality of life. It has been suggested that the individual risk factors of children with CP for OP should be assessed frequently and BMD screening should be performed when necessary in order to improve their BMD to minimize their future frac-

ture risks.[48] Also, children with rheumatic diseases using corticosteroids have a great potential to have incident vertebral fractures as early as within a year after the onset of corticosteroid use with an incidence rate of 6%.[49] Similarly, children with spina bifida were also found to have low BMD with an increased risk for fractures.[50] A MA confirmed the association between low BMD and severe haemophilia, haemophiliac patients (both children and adults) having significantly lower spinal BMD than that in controls.[51] Patients with inherited connective tissue disorders such as Ehlers-Danlos syndrome, Marfan syndrome, and osteogenesis imperfecta and other genetic diseases such as Riley-Day syndrome, who may require rehabilitative interventions, are also known to be at risk for OP.[12]

Bearing in mind that OP can progress with the great potential to end up with fractures if not prevented or if left untreated, the needs of a broad range of patients with conditions associated with OP within the scope of PRM impose a responsibility and obligation on PRM specialists for the management of OP in patients at risk of OP and related fractures.

The role of PRM physicians in the management of patients with OP

PRM specialists have six tasks in the management of OP: 1) Prevention; 2) risk factor assessment and modification; 3) other assessments (general, of functioning, and of quality of life); 4) diagnosis and treatment (pharmacological and non-pharmacological); 5) optimizing functioning, promoting "activities and participation" (at the societal level, including interventions associated with environmental factors); 6) advocacy.

Prevention

Primary prevention includes health promotion through education and self-management to promote bone health for reducing the risk of OP as a major strategy.[52] Gutenbrunner clearly describes that self-management education should be an integrated part of a PRM programme integrated into all aspects of rehabilitation and all processes of prevention.[53] Therefore, PRM physicians may have a significant role in the primary prevention of OP using education and self-management interventions. Education programmes were shown to encourage young adults to modify their health behaviour regarding OP prevention.[54] Evidence suggests that OP prevention and self-management training is an effective intervention for preventing OP in females aged 40 and over living in the community.[55]

Exercise, the powerful intervention the PRM specialists utilize, which has long been used for the prevention of OP,[56] is another important strategy for the primary prevention of OP. Exercise appears to help reduce the risk of OP by maximizing bone mass in the young adult, maintaining bone mass in the mature adult, and lessening bone loss in postmenopausal women. An SR and MA evaluating the efficacy of exercise for optimising bone strength throughout life found a small and significant positive effect of regular weight-bearing exercise in pre- and early pubertal boys with 1% to 8% improvements in bone strength at the loaded skeletal sites, but not in pubertal girls, adolescent boys or girls, pre- or postmenopausal women. Although less definitive, 0.5% to 2.5% improvements in bone strength have also been reported in premenopausal women with high exercise compliance.[57] Bone gain through exercise programmes including high-impact activity with high magnitude resistance training or brief bouts of high impact exercises alone were shown in SRs and MAs in premenopausal women with BMD increases both at the hip and spine for the former exercise programme [58] and solely at the hip for the latter.[59] In a Cochrane review (CR), bone loss reduction effects of exercises were also shown in postmenopausal women with a small but statistically significant effect on BMD of the lumbar spine and the hip, strengthening exercises for the lower limbs appearing the most effective exercise for the femoral neck and combined exercise programmes for the spine.[60] This was later confirmed by an SR and MA which indicated that loaded sites of the skeleton particularly at early stages after menopause may benefit from exercise as evaluated using peripheral quantitative computed tomography bone variables.[61]

Whole-body vibration (WBV) training emerges as a new exercise option for increasing BMD as a preventive strategy for OP associated with significant favourable changes in volumetric BMD of spine and tibia in children or adolescents and in hip areal BMD in postmenopausal women as shown in an SR and MA.[62]

Risk assessment and modification

According to OP guidelines, the first step in the management of OP is the assessment of the patient's absolute risk of OP related fractures.[12, 63] This may be well managed by BMD screening and also using the WHO Fracture Risk Assessment Tool, namely FRAX® (www.shef.ac.uk/FRAX), that has been developed by WHO Collaborating Centre for Metabolic Bone Diseases to estimate the absolute fracture risk of patients.[64]

Falling was found to have the strongest association with risk of fractures. Falling more than once a year has at least twice of significance over other risk factors.[65] Therefore, a major issue for those at higher risk for fractures is the task of identifying the risks for falling and fallers along with appropriate interventions. Some of the medical and environmental risk factors for falls [12] and corresponding PRM interventions for modifying these risk factors are shown in Table I.

The following studies highlight the significant role of PRM interventions outlined in Table I and provide evidence for modifying risk factors for falls.

The high prevalence of urinary incontinence in osteoporotic women, 67% as reported in a study,[66] necessitates PRM interventions for management of this condition for which strategies including biofeedback, functional electrical stimulation, pelvic floor muscle exercises, and vaginal cones can be delivered in urogynecological rehabilitation programmes. The best results are achieved when a combination of two or more techniques is used.[67] Whether a better quality of care for urinary incontinence resulted in better patient outcomes was addressed in a recent article, which found that each 10% increment in receipt of care for urinary incontinence resulted in an improvement of 1.4 points in "Incontinence Quality of Life Score".[68]

A recent review of cognitive rehabilitation for fall prevention pointed to the potential utility of multiple, diverse forms of cognitive therapy for reducing fall risk.[69]

Exercise is not only important for OP prevention, but also for fall prevention. Two CRs of exercise interventions in hospital settings [70] as well as in community-dwelling elderly performing multiple-component group or individually prescribed home-based exercises, and tai chi [71] pointed to a fall risk reduction. However, two SRs and MAs of 2011 were not able to find conclusive evidence for the effectiveness of tai chi in this regard. They implied tai chi could be used as an alternative intervention for reducing falls and fear of falling.[72, 73] It is also known there is an impairment of postural control in patients with OP.[74] Exercise programmes in two SRs included balance and muscle strengthening exercises [75] as well as gait, coordination, and 3D exercises with moderately positive effects for balance improvement.[76] However, the evidence was weak. A very recent randomised controlled trial suggested the use of insoles as effective for improving balance and preventing falls with additional favourable effects on pain and disability in elderly persons with OP.[77] Additionally, "spinal proprioceptive extension exercise dynamic programme" was found useful in reducing risk of falls in osteoporotic-kyphotic women.[78] The evidence was not conclusive on the effects of WBV on rates of falls in the elderly; possible beneficial effects of this type of exercise modality on balance and mobility were suggested [79] with additional favourable effects on the strength of leg muscles.[80] An important note would be that in addition to effects of exercise on fall prevention, a very recent MA provided evidence for fracture reducing effects of exercise.[81]

Sleep disturbance is also a risk factor for falls [82] and there is evidence of possible beneficial effects

TABLE I.—*Risk factors for falling* and corresponding PRM interventions.*

Medical risk factors	PRM Intervention
Urgent urinary incontinence	Urogynecological rehab
Orthostatic hypotension	Elastic binders; exercise
Impaired transfer and mobility	ADL and mobility training
Diminished cognitive skills	Cognitive rehab
Neuromuscular risk factors	Exercises; appropriate rehab
Poor balance	Balance training
Weak muscles	Strengthening exercises
Kyphosis	Posture training
Reduced proprioception	Proprioception exercises
Impaired vision	Education
Use of sedative agents	Education
Environmental risk factors	**PRM intervention**
Low level lighting Obstacles in the walking path Loose throw rugs Lack of assist devices in bathrooms Slippery outdoor conditions	Evaluating home environment and intervening as appropriate

*Risk factors for falls were chosen among those available in "National Osteoporosis Foundation Clinical's Guide to Prevention and Treatment of Osteoporosis".[12]

from exercise programmes for sleep dysfunction, although not conclusive.[83]

Although hip protectors do not reduce the risk of falls, they can protect against fractures. Evidence suggested a small significant reduction in hip fracture risk in the elderly in nursing or residential care settings, while no evidence was found for community-dwelling elderly.[84]

Based on the evidence of the efficacy of PRM interventions provided here, it is clear that risk factors for falls and PRM strategies for their modification make a person who falls frequently an ideal person to be referred to a PRM specialist.

Other assessments

Assessment of functioning

The International Classification of Functioning, Disability and Health (ICF) [85] allows us to assess functioning properties in a very detalied and comprehensive way. Proposed comprehensive ICF Core Sets for OP provide an excellent guide for multidisciplinary detailed assessments in patients with OP.[4] Table II provides the ICF category titles in the brief ICF core sets.[4] Physicians are supposed to assess not only body functions and body structures such as muscle power, joint mobility which PRM physicians always do, but also activities and participation such as walking, doing housework and even recreation and leisure. The PRM team will also assess environmental factors and the need for assistive technology.[86] Assessment of functioning is a key element in PRM.[5] Functional tests are essential to evaluate risks of falling in an attempt to plan an effective rehabilitation programme for fall prevention. These include the assessment of ambulation, postural control, and physical performance including gait analysis, gait speed tests, backward tandem walk test, standing balance tests using force or balance platforms, repeated chair stands, timed up and go test, and Berg balance scale.[74]

Assessment of quality of life

The enormous impact of OP related fractures on physical function dimension of health-related quality of life (HRQoL) has been well established, particularly that of vertebral [87] and hip fractures.[88] Recent literature suggested deterioration in HRQoL even in those patients with OP without vertebral fractures as well as in those with any osteoporotic fracture other than hip and vertebrae.[89] Therefore, PRM specialist could use HRQoL goals for discussing goal-setting with patients during PRM programmes. HRQoL may be assessed using generic measures such as the SF-36 Health Survey and EuroQol (EQ-5D) [89] or disease specific tools such as Quality of Life Questionnaire of the International OP Foundation (QUALEFFO-41), Questionnaire Quality of Life in OP (QUALIOST™), OP-Targeted Quality of Life Questionnaire, the 16-item Assessment of HRQoL in OP, OP Assessment Questionnaire, the Women's Health Questionnaire, OP Quality of Life Questionnaire, and OP Functional Disability Questionnaire.[90]

Diagnosis and treatment of OP

BMD testing using dual-energy X-ray absorptiometry (DXA) at the spine and hip is the most widely used method for the diagnosis of OP. A DXA spine or hip (neck of the femur), or one third distal radius (measurement acceptable in certain conditions) T-score ≤-2.5 is the WHO criterion for the definition of OP, while a T-score between -1.0 and -2.5 indicates low bone mass or osteopenia and a T-score ≥-1.0 is defined as normal. Other techniques for bone assessment to predict fracture risk include peripheral DXA, central and peripheral quantitative computed tomography, and quantitative ultrasound. Along with bone assessment, a detailed history taking and physical examination are important for the diagnosis. Treatment decisions can be made based on a previous vertebral or hip fracture, the results of BMD testing, and a 10-year hip or major OP-related fracture probability using the WHO Fracture Risk Assessment tool (FRAX®).[64] Other risk factors for fractures and secondary causes of OP should also be taken into consideration for treatment decisions.[2, 12, 64]

Adequate intake of Vitamin D and calcium is essential for both the prevention and treatment of OP and education on nutrition is important. Vitamin D and calcium supplementation may be required. OP medications used most frequently include bisphosphonates (alendronate, ibandronate, risedronate, and zoledronic acid), denosumab, parathyroid hormone derivatives and strontium ranelate. Other medications such as other classes of bisphosphonates (clodronate, etidronate, pamidronate, and tiludronate) calcitonin, hormone replacement ther-

TABLE II.—*ICF categories for OP, related problems, and PRM solutions along with evidence of effectiveness.*

ICF categories	Influence/problems	PRM interventions	Evidence
Body functions			
b152 Emotional functions	Fear of falling, body image, independence	Tai chi 'Spinal proprioceptive extension exercise dynamic programme	Significant improvement for fear of falling [73] Reduces fear of falling [78]
b280 Sensation of pain	Back pain, pain related to fractures, negative influences on functioning and HRQoL	PEMF	Quickly and efficiently relieves pain [91]
		Patient education on postural correction and self-management	Pain reduction effects [92]
		TENS	Recommended for pain relief [92]
		Exercise (isometric contractions and strengthening of spinal extensors)	Reduces back pain in patients with vertebral fractures [11, 78]
		'Spinal proprioceptive extension exercise dynamic programme	Reduces back pain [78]
		Spinal orthoses	Beneficial effects for reducing pain in patients with vertebral fractures [92]
b710 Mobility of joint functions	Impaired mobility/ functioning	Exercises (quadriceps, gait, resistance training)	Potential effects for improving mobility after surgery in patients with hip fracture [93]
b730 Muscle power functions	Weak muscles	Muscle strengthening exercises	Reduces bone loss [60] Improves balance [75, 76]
		Whole body vibration	Favourable effects on the strength of leg muscles in the elderly [80]
b765 Involuntary movement functions	Impaired postural, balance, supporting and defensive reactions	Balance, muscle strengthening, gait, coordination, and 3D exercises	Improves balance for reducing fall risk [75, 76]
		Whole body vibration	Possible beneficial effects on balance and mobility [79]
		Foot orthoses (insoles)	Effective for improving balance [77]
Activities and participation			
d430 Lifting and carrying objects	Limitations in ADL	Exercise programmes in general	Significant improvements in pain, physical function, physical role and vitality domains of HRQoL [94]
d450 Walking	Limitations in walking ability	Progressive resistance training	Beneficial for improving gait speed, strength, balance [95] and ADL [96]
d470 Using transportation	Limitations/restrictions in activities and participation		
d640 Doing housework	Limitations in ADL	'Spinal proprioceptive extension exercise dynamic program'	Significant favorable changes in gait [78]
d920 Recreation and leisure	Limitations in ADL	Yoga	Favourable effect on pain, physical and social functions of HRQoL [97]
		Spinal orthoses	Improve balance, gait, physical functioning [98, 99] and decreases ADL limitations [100]
		Specific ADL training (occupational therapy, cognitive behavioural therapy in inpatient settings, home rehabilitation or group learning program)	Significant effects on improving independence with ADL could not be demonstrated after hip fracture [101]
		Educational interventions	Some positive effects for improving self-efficacy expectations in ADL [101]

TABLE II.—*Continues from previous page.*

ICF categories		Influence/problems	PRM interventions	Evidence
Environmental factors				
e110	Products or substances for personal consumption	May be facilitators for preventing fractures	Medications	Some with proven efficacy [2]
e115	Products and technology for personal use in daily living	May be facilitators for functioning	Hip protectors	A small significant reduction in hip fracture risk in the elderly in residential care settings [84]
			Spinal orthoses	Improve balance, stability of the gait, physical functioning [98, 99] and HRQoL by reducing pain and ADL limitations [100]
e155	Design, construction and building products and technology of buildings for private use	Barriers or facilitators for functioning	Appropriate modifications	Requires research for providing evidence
e225	Climate	Risk factor for falls	Education and self management	No evidence
e310	Immediate family	May be facilitators for functioning	Education	No evidence
e355	Health professionals	Care	A multidisciplinary team approach for comprehensive care	Marginal favorable effects of home-based multidisciplinary rehabilitation on function; significantly lower burden on caregivers of patients with hip fractures [93]
				Effective for earlier discharge and in reducing falls, morbidity and mortality [102]
e580	Health services, systems and policies	An important environmental factor	Advocacy	Requires research for providing evidence

ADL: activities of daily living; HRQoL: health-related quality of life; PEMF: pulsed electromagnetic field; TENS: transcoutaneous electrical nerve stimulation.
Note: PRM interventions next to the 'activities and participation' categories do not necessarily correspond to a specific category. Evidence for the effectiveness of interventions relates to reducing ADL limitations in general..
ICF category titles were chosen from 'Cieza *et al.*, 2004'.[4]

apy, sodium fluoride, tibolone and Vitamin D derivatives such as calcitriol and alfacalcidol may be or have been used for the treatment of this health condition.[2, 12] The availability and approval/indication/recommended use of duration status of OP medications and reimbursement policies should be checked since these may vary between countries. One may refer to the "European guideline for the management of OP" [2] for the details about the antifracture efficacy of the major OP medications.

Optimizing functioning and promoting "activities and participation"

ICF core sets for OP [4] not only allows us for a detailed assessment of body functions, structures, activities and participation as well as environmental factors, they also direct us for using appropriate PRM strategies for optimizing functioning.[5] Training for posture, transfers, ambulation, and activities of daily living (ADL) in patients with OP or those at high risk for OP and the use of assistive devices for lifting, reaching, balance, and ambulation, promoting 'activities and participation' in interaction with the environment [12, 28] as well as measures for improving symptoms such as pain and others that may interfere with safe and independent movement and ADL are key PRM strategies for optimizing functioning and promoting participation. Table II shows the ICF category titles,[4] relevant influences/problems when there is impairment/limitations/restriction in related categories as well as PRM interventions with evidence of effectiveness for problems wherever there is available evidence.

Advocacy

As PRM doctors are involved in the prevention and management of osteoporotic patients, they also have a role in defining policy and planning of services to improve bone health.[86]

Conclusions

PRM physicians are actively involved in the prevention and management of OP and this condition falls within the specialty's field of competence. PRM specialists are thus suitably placed to intervene in the management of OP from prevention to advocacy. Since many health problems in OP can be prevented, reduced, or improved by evidence-based PRM interventions, PRM specialist makes substantial contributions to the best practice care of the patients with OP. It is well-known that many other disciplines may be involved in the successful treatment, particularly of pharmacological treatment of OP. The clear-cut role of PRM specialists in the management of patients with OP can be summarised as intervening in the whole continuum of this health condition at one hand/specialty with effective interventions including the restoration of bone and reduction of bone loss as well as providing strategies for reducing falls and fractures and their risk factors. They are also suitably qualified to manage pain due to OP and/or fractures as well as promote functioning and quality of life of their patients, particularly of those with fractures, so that they can continue to fully participate in the society.

Recommendations

PRM specialists should be well aware of the needs of their patients for the prevention, assessment, diagnosis and treatment for OP. PRM specialists should not miss the opportunity to diagnose and treat OP in terms of both pharmacological and nonpharmacological treatment to help their patients for this disabling condition. Given the low rates of treatment provision for the individuals with OP, PRM specialists should be more involved in dealing with OP and its consequences and detection and treatment of OP should be a mandate of all physicians including PRM specialists. It should be noted that the fight against OP can only be achieved when medical specialists from a broad range of fields join forces and work together. There are more reasons why PRM specialists should be more involved in OP: PRM specialists make substantial contributions to the best practice care of patients with OP, with the unique feature of PRM that encompasses all aspects of health, from disease to community.

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Osteoarthritis

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Osteoarthritis. The role of Physical and Rehabilitation Medicine Physicians. The European perspective based on the best evidence

A paper by the UEMS-PRM Section Professional Practice Committee

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One of the objectives of the Professional Practice Committee (PPC) of the Physical and Rehabilitation Medicine (PRM) Section of the Union of European Medical Specialists (UEMS) is the development of the field of competence of PRM physicians in Europe. To achieve this objective, UEMS PRM Section PPC has adopted a systematic action plan of preparing a series of papers describing the role of PRM physicians in a number of disabling health conditions, based on the evidence of effectiveness of the PRM interventions. Osteoarthritis (OA) is the most common joint disorder and the major cause of musculoskeletal pain and limited mobility in the elderly in the world. Therefore, proper management of persons with OA is of substantial importance. The goal of OA management is to reduce the impact of OA on the individual by reducing pain and improving function, activities and participation. The aim of this paper is to descibe the explicit role of PRM physicians in providing management for persons with OA. The optimal management of OA requires the combination of both non-pharmacological and pharmacological approaches, an issue most of the main guidelines on the evidence-based management of OA share in common. There is good level of evidence about the effectiveness of PRM interventions in the management of OA: high level of evidence about the effect of education, weight reduction and exercise and growing evidence about the effectiveness of physical agent modalities. PRM specialists are involved not only in diagnosis and medical and physical treatments of OA, but, as a rehabilitation strategy, they also deal with the problems of the person focusing on the improvement of all components of human functioning as defined in the ICF including personal and environmental factors with a holistic approach. ICF core sets for OA serve as excellent models for directing proper assessments as well as targeting interventions. PRM specialists well meet the needs of people with OA from the early stages of the disease to the stage of disability that could cause activity limitations and participation restrictions. In conclusion, PRM specialists can make substantial contributions to providing management of OA in order to improve the functioning of individuals with OA from both personal and societal perspective.

KEY WORDS: Osteoarthritis - Physical and rehabilitation medicine - Joint diseases - Aged.

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Osteoarthritis (OA) is known to be the most common type of joint disorder and the major cause of chronic musculoskeletal pain and mobility disability in elderly populations.[1] OA is reported to affect 9.6% of men and 18% of women aged over 60 years worldwide with the prediction that it is going to be the fourth leading cause of disability by the year 2020 due to the increase in life expectancy.[2] It affects also the younger populations in the workforce.[3] OA is indicated to be one of the leading causes of non-fatal burden in the world accounting for 3% of total years lost to disability.[4] The novel World Report on Disability launched on June 9, 2011 reported the prevalence of moderate and severe disability associated with OA as 1.9 million between the ages of 0 and 59 and 8.1 million at the age of 60 and over in high-income countries and 14.1 at 0 to 59 ages and 19.4 at the age of 60 and over in low-income countries with the world wide prevalence of OA-associated disability reaching to 43.4 million at all ages worldwide.[5]

Osteoarthritis is characterised by areas of destruction of the articular cartilage that forms the load-bearing surfaces of joints, associated with hypertrophy of bone and thickening of the capsule. When symptomatic, this joint damage leads to pain on movement, restrictions of joint motion, and stiffness of joints. Pain, reduced function, and participation restrictions are important consequences of OA. Weight-bearing lower limb joints, including knees and hips, are especially vulnerable to the disease, but it frequently affects the hands, spine, feet, and other joints as well.[6]

There are numerous recommendations for the treatment of OA based on research evidence and expert opinion as revealed in major international (such as those of the Osteoarthritis Research Society International [OARSI] [7, 8] and European League Against Rheumatism [EULAR] [9-11]) and national (such as those of the United Kingdom National Institute for Health and Clinical Excellence NICE],[12] the American Association of Orthopedic Surgeons (AAOS),[13] the American College of Rheumatology [ACR] [14]) guidelines. All of them indicate non-pharmacological interventions/physical and rehabilitation medicine (PRM) approaches.

The aim of this paper is to discuss the explicit role of the PRM specialist in providing management for persons with OA.

Management of OA by PRM physicians

The competencies of the PRM specialist in managing OA include prevention, diagnosis, assessment, prescription and/or application of a wide range of interventions and the PRM programme management.[15]

Prevention

The pathogenesis of OA is incompletely understood. Considering its management, an evaluation of the risk factors for the incidence and progression of OA is of relevance. Strong evidence is found about the association of age, gender, physical activity, high body mass index, bone density, previous injury, and hormonal therapy with the incidence of osteoarthritis of the knee, and - about age with the incidence of OA of the hip and hand. The modifiable risk factors are obesity, mechanical aspects, abnormal loading, occupational factors, sports participation, muscle weakness and nutritional and hormonal factors.[16] By targeting lifestyle interventions to avoid or reverse these risks, it is possible to have a positive effect on preventing joint damage, reducing pain and other impairments and improving function and activities and participation.

Diagnosis and assessment

The role of the PRM specialist is to set up a comprehensive strategy – a PRM problem-oriented programme of care.[15] The complex role of the PRM specialist starts with a medical diagnosis, a functional and a social assessment. The diagnosis of OA in PRM is a clinical diagnosis, including patient history, examination, clinical investigation and imaging techniques**.**

Strategies for assessment and outcome measurement in PRM have been described in an educational review recently.[17] These same strategies can be applied for the assessment of patients with OA, based on the biopsychosocial model as described in the International Classification of Functioning, Disability, and Health (ICF).[18] The ICF is a comprehensive and adequate framework for assessing the impact of arthritis on the individual patient and on the populations.[19] ICF core sets for OA [20] serve as excellent models for directing proper assessments as well as targeting interventions. In this aspect, the PRM specialist should assess not only the impairment of body functions and structures (pain, range of motion, muscle weakness, coordination deficit), but also the limi-

tations in activities (mobility, handling and grasping of objects, activities of daily living) and the restrictions in participation (vocational performance, family relations, recreation and leisure, social life), modified by the contextual factors (environment and personal factors – health behaviour, coping strategies, co-morbidity, age and gender) as well as quality of life.[17, 21, 22] The Brief ICF Core Set for OA [20] shown in Table I outlines the primary assessment and treatment targets in patients with OA as well as appropriate PRM interventions. As Stucki and Ewert underline, the use of an ICF model sheet based on the ICF framework is a most useful way to understand the relationship between selected target problems and impaired body structures and functions and personal and environmental factors which worsen or help to minimize them. The problems become initial treatment goals, which define the selected measures.[19] Measurement potential of ICF core sets for OA [20] have already been evaluated in patients with knee and/or hip OA in a number of studies in different populations.[23-25] While the validity of the comprehensive ICF core sets were supported in the populations studied,[23, 25] 14 additional categories, 7 of which for "activities and participation"/changing basic body function, lifting and carrying objects, moving around, using transportation, toileting, doing housework, and recreation and leisure, already present in the comprehensive ICF core set [20] were suggested to be covered in the brief Core Set to capture commonly important problems in functioning and to reflect different dimensions of disability in these people.[24] These attempts of validation of the ICF core sets in populations further points to the importance of the impact of OA on function-

TABLE I.—*The brief ICF core set for osteoarthritis*, related problems, and PRM solutions.*

ICF categories		Influence/problems	PRM interventions**
Code	Category title		
Body functions			
b280	Sensation of pain	Pain in affected joints	Pain management interventions within the scope of PRM
b710	Mobility of joint functions	Impaired mobility and functioning	Exercise and other measures
b730	Muscle power functions	Weak muscles	Strengthening exercise
Body structures			
s730	Structure of upper extremity	Degenerative changes related to OA	Pharmacological and nonpharmacological approaches
s750	Structure of lower extremity	Degenerative changes related to OA	Pharmacological and nonpharmacological approaches
s770	Additional musculoskeletal structures related to movement	Problems with bones, joints, tendons, muscles, and extra-articular ligaments	Musculoskeletal rehabilitation
Activities and participation			
D445	Hand and arm use	Also associated with self-care and domestic life-activities which may be adversely affected by OA	Appropriate PRM interventions
d450	Walking	Limitations in the ability of walking	Mobility training
D540	Dressing	Activity restrictions in ADL	ADL training
Environmental factors			
e115	Products and technology for personal use in daily living	May be facilitators for functioning	Assistive devices
e150	Design, construction and building products and technology of buildings for public use	May be barriers or facilitators for functioning	Appropriate modifications
e310	Immediate family	May be facilitators for functioning	Education
e580	Health services, systems and policies		Improvement of OA-related health services

*Adapted from Dreinhöfer K, Stucki G, Ewert T *et al*.[20] **The philosophy, rationale and justifications for the interventions of PRM specialists are provided in the White Book on Physical and Rehabilitation Medicine in Europe [21, 22] and in other documents published by the Professional Practice Committee of the UEMS PRM Section.[15]

ing for which the best possible solutions can be provided by PRM specialists since PRM is defined as the "medicine of functioning".[26]

Outcome Measures in Rheumatology (OMERACT), an international network aimed at improving outcome measurement in rheumatology, has recommended a core set of measures to be used in clinical trials of the knee, hip, and hand OA.[27] This core set includes 4 domains: pain, physical function, patient global assessment, and, for studies of one year or longer, joint imaging. Currently, various patient-reported questionnaires either disease-specific or generic are available to be used for the assessment of patients with OA both in clinical practice and research.[28, 29] There has also been some studies linking the commonly used questionnaires in OA to the ICF.[30]

Work related OA is also an important area of assessment in patients with OA in terms of prevention as well as support for those affected by OA. Consistent evidence reveals deleterious effects of long-term exposure to heavy lifting for developing chronic hip or knee pain and occupational exposure to regular kneeling or crawling is associated with an increased risk of chronic knee pain.[31] A very recent systematic review adds to evidence by revealing a possible association between long-term standing at work and increased risk of hip OA in addition to heavy lifting.[32] Therefore, identification of personal and environmental (*i.e.*, work, workplace) risk factors as well as implementing a risk management strategy could be a challenge for PRM specialists, preventive strategy being of relevance to rehabilitation.[33] Regarding the impact of OA on work participation and productivity, a very recent Dutch study revealed a significant relation with more pain during activity and loss of productivity in a working population with knee OA.[34] Another study revealed that OA pain in workers resulted in significantly greater work impairment (34.4%) than among workers without OA pain (17.8%).[3] A survey drew attention to the difficulties in computer use in patients with arthritis including those with OA of the hand, that could limit work participation of those individuals.[35] A study in a Dutch cohort with early hip or knee osteoarthritis revealed that societal factors rather than the early stage of OA might have more effect in work participation.[36] In summary, the substantial impact of OA on work outcomes necessitates attention of physicians for the careful assessment and identification of work-related problems in people with OA.

Treatment

The goal of the treatment is to reduce the impact of OA on the individual by reducing pain and improving function and participation. Treatment of the OA is directed towards decreasing joint pain and stiffness, stabilizing and increasing joint mobility, reducing physical limitations and disability, improving health-related quality of life, limiting the progression of joint damage.[8]

All the guidelines and recommendations agree on the fact that the optimal management of OA combines both non-pharmacologic and pharmacologic treatment modalities.[7-14] For each OA anatomical site, the non-pharmacologic approach must be adapted to the individual patient, while the pharmacological treatment is usually the same.[37] Table II shows recommended non-pharmacological approaches in the management of OA in major international and national guidelines for the management of OA including a specific one relevant to those with obesity and OA.[8-14, 38] The PRM specialist is in an excellent position to direct the non-pharmacologic and pharmacologic management of OA, because it incorporates the aspects of his training.

Recommended and/or available interventions within the scope of PRM need some elaboration particularly on evidence of effectiveness in order to better understand the role of PRM specialists in providing management of this disabling condition. The most important role of the PRM specialists in the management of OA is to comprise the complex PRM programme of care and prescribe medical and physical interventions. PRM programme of care includes patient education, weight reduction interventions, exercise therapy, physical agent modalities, assistive devices and orthoses as well as work-place interventions and pharmacological treatment.[15]

Education

One of the important roles of the PRM specialist is to "provide information and education programs for patients and their families together with the other members of the rehabilitation team".[15, 39] Personal beliefs about pain and self-ability to control pain, as well as psychological reactions to pain are associated with its severity. Education should, therefore constitute the initial step in the management of arthritis pain, with focusing on information

TABLE II.—*PRM interventions recommended in guidelines.*

Guidelines (year)	Subject	Recommended PRM interventions (Level of evidence)*	Author (Reference)
OARSI, 2010 (based on best availiable evidence of effectiveness)	Hip and knee	Education (Ia), self management (Ia), strengthening exercise (Ia), aerobic exercise (knee) (Ia), water-based exercise (Ia), Spa/ sauna (Ib) acupuncture (knee)(1a), Insoles (1a), Joint protection (braces) (1a), IA CS injections (knee) (1a)	Zhang *et al.*, 2010 [8]
EULAR, 2003	Knee OA	Education (1A), exercise (1B), aids and devices [sticks, insoles (1B), braces (1B)] and weight loss (1B), IA CS injections (1B)	Jordan *et al.* 2003 [9]
EULAR, 2005	Hip OA	Education (1b), exercise (1a-extrapolation), aids and devices (sticks, insoles) and weight loss (III), IA CS injections (1b-inconclusive)	Zhang *et al.*, 2005 [10]
EULAR, 2007	Hand OA	Education+exercise (IV), local heat (paraffin wax, hot pack) (IV), ultrasound (IV), splint (IV), IA corticosteroid (Ib-inconclusive)	Zhang *et al.*, 2007 [11]
NICE, 2008 (NCC-CC, 2008)	OA	Education and self-management, thermotherapy (local heat or cold), exercise (local muscle strengthening, general aerobic fitness), manipulation and stretching (especially for hip OA), weight loss, electrotherapy (TENS), aids and devices [Footwear (lower limb OA), bracing/ joint supports/insole and walking sticks and tap turners], IA CS injections	Conaghan *et al.*, 2008 [12]
AAOS, 2010	Knee OA	Self-management (II), weght loss (I), aerobic exercise (I), strengthening exercise (II), patellar taping (II), inconclusive about valgus brace (II), inconclusive about acupuncture (I), against glucosamin and chondroitin (I)	Richmond *et al.*, 2010 [13]
ACR, 2012	Knee, hip, & hand OA	Knee: weight loss, aerobic, resistance land-based exercise and aquatic exercise (Strong recommendations). Self-management, manual therapy combined with exercise, psychosocial interventions, medially directed patellar taping, medially wedged insoles for lateral compartment OA, laterally wedged subtalar strapped insoles for medial compartment OA, thermal modalities, walking aids, tai chi, TCA, and TENS (conditional recommendations). *No recommendations for balance exercises, manual therapy alone, laterally wedged insoles and laterally directed taping, and knee braces.* Hip: Strong and conditional recommendations are the same as those for knee OA except for taping, insoles, tai chi, TCA and TENS. *No recommendations for balance, tai chi exercises and manual therapy alone.* Hand: education on joint protection techniques, assistive devices for ADL, thermal modalities, splints for trapeziometacarpal joint (conditional recommendations)	Hochberg *et al.*, 2012 [14]
Ottawa Panel, 2011	OA/in obese	Physical activity and diet programmes	Brosseau *et al.* 2011 [38]

*Included if clearly stated in the guidelines (please refer to the original articles for the definitions of the levels of evidence; AAOS: American Academy of Orthopaedic Surgeons; ACR: American College of Rheumatology; ADL: activities of daily living; CS: corticotreroids; EULAR: European League against Rheumatism; IA: ıntra-articular; NCC-CC: National Collaborating Centre for Chronic Conditions; NICE: National Institute for Health and Clinical Excellence; OARSI: Osteoarthritis Research Society International; PEMF: pulsed electromagnetic field; TCA: traditional Chinese acupuncture; TENS: transcutaneous electrical nerve stimulation.

about the disease and its treatment, alleviating fear of damage, advice regarding other self-management strategies, the importance of exercise, joint protection and energy conservation techniques, and the appropriate use of analgesics.[40] Accordingly**,** most of the guidelines point out that the initial treatment should focus on patient empowerment and self-driven therapies and all patients should receive education on life-style changes including modification in work methods, exercise, pacing of activities, adherence to various treatment modalities, weight loss and use of suitable orthotic and assistive devices.[7-14] Research has found 1a level of evidence for the effect of patient education on pain in knee and hip OA.[8] Education techniques have benefits also in improving function, increasing coping skills, improv-

ing psychological outcomes, fewer visits to primary care and improved quality of life.[41-44] A more recent systematic review evaluating self-management interventions for rheumatic conditions found pain-relieving effect for knee OA in the short and in the long term.[45] Concerning educational interventions in hip OA, in a subsequent RCT evaluating the efficacy of a patient education programme combined with exercise and patient education alone, no significant difference could be demonstrated with any additive effects of exercise regarding pain.[46]

Weight reduction

Weight loss is strongly recommended by OARSI with high (1a) level of evidence regarding pain relief and disability in knee OA.[8] Disability was found to be significantly improved with a weight reduction greater than 5.1%, based on meta-regression analysis.[47]

As for hip OA, the recommendation for weight reduction is still based on expert opinion.[8] Recently a systematic review found the role of increased BMI in susceptibility to hip OA.[48]

There is no clear evidence that weight loss can slow disease progression. Some research suggests that symptomatic improvement in knee OA is related more to reduction in the percentage of body fat than to reduction in overall body weight.[49] In favor of this are the findings of a systematic review that revealed a positive association between BMI and weight and hand OA based on moderate level of evidence.[50] While the latest Ottawa Panel evidence-based clinical practice guidelines suggested beneficial effects of combined physical activity and diet programs in obese patients with OA for improving pain and function, it was not able to provide convincing evidence for the effects of a weight loss of 5% on slowing the proggression of knee or hip OA.[38] The most effective nonpharmacologic weight loss interventions combine fat and caloric restriction, increased physical activity, behavioral reinforcement, and an extended weight maintenance programme, with support from the physician and weight-loss support groups.[51]

Exercise

Evidence shows that subjects with lower limb OA have reduced muscle strength, impaired proprioception, restriction in the ROM, and poor balance.[52] Exercise can target factors that lead to disability. Some studies of patients with knee OA have found that quadriceps weakness is the most important predictor of functional limitations and disability, stronger than pain, radiographic findings, and other factors.[53] More recent studies find that quadriceps weakness seems to precede the development of knee OA and could be a predictor of knee OA, while there is conflicting evidence regarding the role of muscle weakness in disease progression.[54] A very recent systematic review provides strong evidence for muscle weakness and muscle atrophy within the affected leg when compared with the unaffected leg in persons with unilateral hip OA with the implication for the need to avoid this weakness as early as possible.[55]

Exercise for patients with OA is not only required for preventing muscle weakness and improving muscle function, but it is also beneficial for improved physical fitness, stimulation of reparative processes in cartilage, activation of the natural descending inhibitory pain pathway and for a reduction in cardiovascular risk.[40] Therefore, exercise should be core initial treatment of OA, regardless of age, comorbidity, pain intensity and disability.[12]

The exercise programme in OA usually includes: 1) ROM exercises and stretching; 2) strengthening exercises; 3) balance and proprioceptive training; 4) aerobic exercise; and 5) water-based exercise.[56]

There is a considerable amount of evidence supporting the efficacy of exercise for patients with lower limb OA, particularly knee OA. In a Cochrane review based on a meta-analysis of 32 RCTs, Fransen and McConnell found platinum level of evidence that land-based therapeutic exercise including range of motion exercises, stretching exercises, muscle strengthening programs for knee flexors and/or extensors (dynamic, isometric, or isokinetic), aerobic exercises such as fitness walking and Tai Chi exercises has at least short term benefit in reduction of knee pain and improvement of physical function for people with knee OA. The magnitude of the treatment effect is comparable to estimates reported for non-steroid anti-inflammatory drugs.[57]

In a systematic review specifically on strengthening exercises in knee OA, improvements in muscle strength, pain and physical function were reported to appear in 50-75% of patients with the use of strengthening exercises.[58] Resistance exercises have been the subject of a most recent systematic review that confirmed the positive effects of strength training in knee OA with implications that a high-intensity of training greater than 70% of 1RM is more effective than low-

intensity resistance training.[59] A recent systematic review added to the evidence showing that the effect size, although moderate, was greater when manual mobilization was added to combined exercise therapy consisting of active range of motion exercises, strength training and aerobic activity compared to the effect sizes for strength training or exercise therapy alone.[60] Recent trials showed beneficial effects of hip muscle strengthening programmes (hip abductor and/or adductor strengthening) for pain reduction and improved function in patients with knee OA.[61, 62]

Regarding aerobic exercises, the Ottawa panel recently confirmed the effectiveness of aerobic walking programmes combined with other therapies on improving strength, stiffness, mobility, and endurance in the short term in patients with OA of the knee, greatest improvements being in pain, function and quality of life.[63] A Cochrane review indicated that there were no significant differences between high intensity and low intensity aerobic exercise in patients with knee OA for functional status, gait, pain, and aerobic capacity.[64]

It should be noted that aerobic and strengthening exercises are supported by Ia level of evidence in knee OA with pooled effect sizes for pain relief being 0.52 (95% CI: 0.34, 0.70) for aerobic and 0.32 (95% CI: 0.23, 0.42) for muscle strengthening exercise and for the improvement of function being 0.46 (95% CI: 0.25, 0.67) for aerobic and 0.32 (95% CI: 0.23, 0.41) for strengthening exercise, respectively, as calculated by the latest OARSI review.[8]

Aerobic exercise and strength training, aquatic exercises, whole body vibration exercises, balance exercises, and Tai Chi were reported to improve balance in women with knee OA in a very recent systematic review.[65]

In another systematic review, proprioceptive exercises have been found beneficial in knee OA with some evidence of superiority over general strengthening exercises in terms of functional outcomes being evident at joint position sense-related measurements, while being similar to those of strengthening exercises concerning other outcomes.[66]

Tai Chi exercises have also been suggested to be potentially effective in patients with knee OA for pain control and improving function (based on limited evidence) with standard mean differences of -0.79 and -0.86 for pain and function, respectively, in a systematic review and meta-analysis.[67]

Aquatic exercises are also frequently used in PRM practice. A very recent best evidence synthesis revealed beneficial effects of aquatic exercises for improving pain and disability in many musculoskeletal conditions including OA with effect sizes varying from 0.19 to 0.32.[68] A Cochrane review showed that water-based exercises have small to moderate effect on function and quality of life and minor effect on pain in both knee and hip OA in the short term, with no documented effect on stiffness or walking ability.[69] While aquatic exercises were shown to have statistically significant short-term effect in locomotor diseases including OA in a summary of systematic reviews,[70] a systematic review of nonrandomized controlled trials was not able to demonstrate sufficient evidence on the curative effects of aquatic exercise in OA.[71] The effectiveness of land-based versus aquatic exercise in knee or hip OA has been compared recently in a systematic review and meta-analysis where these two rehabilitation strategies showed no differences in outcomes such as function, mobility or patient satisfaction.[72]

There has been moderate evidence for the effect of exercise in hip OA, but one recent systematic review found that exercise, particularly strengthening exercise, was also associated with reduction in pain in hip OA with an effect size of 0.38.[73] It was confirmed by a systematic review performed by Fransen *et al*.[74] The effects of aquatic exercises in hip OA were similar to those observed in knee OA [69] with effect sizes for both knee and hip OA being 0.19 (95% CI: 0.04, 0.35) for pain and 0.26 (95% CI: 0.11, 0.42) for function supported by Ia level of evidence.[8]

Since the positive posttreatment effects of exercise therapy on pain and physical function in patients with OA of the hip and knee are not sustained in the long term 6 months after treatment with exception of the global assessment of effectiveness, additional booster sessions are needed to maintain the effect.[75] This is proved by the MOVE consensus, that underlines the necessity for strategies to improve adherence to exercise therapy and lifestyle change with increased physical activity (1b).[76]

There is moderate evidence about the effect of exercise in hand OA.[77]

The exercise programme, prescribed by the PRM specialist, should be patient-centred and individualized, taking into account factors such as age, comorbidity and individual mobility.[75] The diversity of exercise programmes used in trials of knee and hip osteoarthritis offers numerous options that may bet-

ter meet the individual patient's needs and preferences.[78] Additionally, it is important to note that exercise programs for hip and knee OA, very commonly utilized by PRM specialists, appear to be the most cost-effective interventions offering the best value for money based on quality-adjusted life-years as revealed in a very recent cost-effectiveness analysis.[79]

Manual therapy

While manipulative therapy did not appear as a recommendation for knee or hip OA in earlier guidelines,[9-11] it is recommended especially for hip OA [12] and knee and hip OA not as a single treatment but in combination with exercise.[14] A recent systematic review provided silver level evidence that manual therapy defined as manipulation with high velocity, low amplitude thrusts, low velocity small or large amplitude mobilization, or massage in a broader context is more effective than exercise for those with hip OA for improved pain and function both in the short and long-term for pain reduction and increased physical function based on one high quality study. As for knee OA, manipulative therapy in the form of massage was found efficacious compared to no intervention based on one trial.[80] A very recent updated systematic review, however, pointed to better results for manual therapy combined with multimodal or exercise therapy for knee OA with fair and limited evidence of effectiveness for the short and long term, respectively. The evidence for the efficacy of manual therapy for hip OA was similar to those of knee OA.[81]

Physical modalities

Many physical modalities have been used for the alleviation of symptoms in OA. There are some controversies and their application is not always based on research evidence. The role of the PRM specialist is to prescribe the appropriate modality according to the symptoms and individual needs of the person.

Electrostimulation.—Transcutaneous electrical nerve stimulation (TENS) is recommended by some of the guidelines for the treatment of knee OA for pain relief.[12, 14] Although two previous articles – a systematic review and an overview of systematic reviews – found that TENS, interferential currents and pulsed electrical stimulation offer clinically relevant short term pain relieving effect in knee OA, based on evidence of moderate quality [82, 83] the effectiveness of electrostimulation for pain relief could not be confirmed in a relatively new Cochrane review, although large effects on pain have been found.[84] A very recent systematic review and meta-analysis revealed inconsistent evidence regarding the impact of neuromuscular electrical stimulation on pain, function, and quadriceps strength in knee OA with a mean difference of -1.32 and -5.31 points for WOMAC pain and function scores, respectively, in favor of the intervention.[85]

Ultrasound.—Ultrasound therapy is usually applied in persons mainly with OA of the knee. Despite previous insufficient evidence as commented in an overview of systematic reviews,[83] more recent systematic reviews provide some encouraging evidence for beneficial effects of therapeutic ultrasound for the treatment of knee OA in terms of pain relief and improved physical function.[86, 87] A RCT showed that the addition of ultrasound to traditional physiotherapy in hip OA has a longitudinal positive effect on pain.[88]

Low level laser therapy (LLLT).—A systematic review and meta-analysis showed clinically relevant effects of LLLT in improving pain with a reduction of 17.7 mm on a 100 mm VAS compared with placebo controls.[82] The latest meta-analysis on the effects of laser irradiation on joints in general including eight articles on OA, LLLT groups were found to have a decrease in pain by 13.7 mm compared with controls.[89]

Electromagnetic fields.—Among the other physical treatment options, pulsed electromagnetic fields (PEMF) have been applied successfully in different musculoskeletal conditions. A number of studies shed light on their positive effect on bioactivity of chondrocytes and glycosaminoglycan metabolism.[90] Ganesan *et al.* confirmed that PEMF reduces pain in arthritic conditions and also has chondroprotective and anti-inflammatory effect.[91] A meta-analysis of 8 RCTs suggests that PEMF is a successful adjuvant option in the management of OA. Its effect on WOMAC scores is fairly similar to those of intra-articular corticosteroids, so it improves clinical scores and function, mainly activities of daily living but there is still equipoise of evidence for an effect on pain in the current literature.[92] Accumulating evidence, especially those obtained from high-quality studies, suggests significant effectiveness of PEMF over placebo

at 1 and 2 months for pain and at 2 months for function as shown in a very recent systematic review.[93]

Short wave diathermy.—A latest systematic review and meta-analysis points to significant (although small) effects of SWD (only a local thermal sensation evoking modality) on pain and muscle performance in patients with knee OA with no reported adverse effects.[94]

Heat/cold.—Thermotherapy is recommended by most of the guidelines, especially in OA of the knee. The use of local heat or cold should be considered as an adjunct to core treatment, but supporting evidence is very limited. The latest Cochrane review of 2003 could not show any significant effects of either heat or cold in terms of pain reduction in OA. It found silver level of evidence that ice massage could be used to improve strength, range of motion and function in people with knee OA.[95] For OA of the hand, there is moderate evidence about the effect of continuous heat wrap or steam treatments and weak evidence about paraffin.[77]

Complementary and alternative medicine (CAM) treatments

The use of CAM therapies by PRM specialists is very common with acupuncture being the most widely used.[96] On the side of the patients with knee OA, the prevalence of CAM use may reach up to 47%.[97]

Acupuncture.—Acupuncture is considered to have short to medium term positive effect on pain and function, especially in knee OA.[7, 8] An overview of systematic reviews recommends it in knee OA based on sufficiently sound evidence.[98] A subsequent systematic review demonstrated significantly better pain relief and a larger improvement in function for acupuncture in knee OA compared with sham acupuncture, standard care, or waiting list controls.[99] Furthermore, cost effectiveness analyses consider acupuncture as a cost-effective treatment in patients with chronic OA pain and also for some other chronic pain conditions.[100, 101] However, evidence could not be documented concerning the positive effects of acupuncture in hip OA.[102]

EMG biofeedback.—Although no additional effects of EMG biofeedback on VAS and WOMAC pain scores compared with strengthening exercises has been shown in a moderate quality RCT,[103] in a systematic review investigating the effects of EMG biofeedback on quadriceps strength, the strongest effect was found in the subjects with knee OA regarding strengthening, however, with inconclusive evidence.[104]

Assistive devices and orthoses

Assistive devices and orthotics are being used widely by PRM specialist in the management of upper and lower limb disorders with a wide variety of options based on a realistic goal setting by the PRM specialist.[105] The use of a stick is recommended for OA of the hip and knee, because it helps in off-loading of the arthritic joint.[106] The use of knee braces and foot orthoses were also found effective in decreasing pain, joint stiffness and drug dosage in patients with knee OA.[107] Medially-directed tape was found to decrease in pain by 20.1 mm on a 100 mm VAS in patients with chronic knee pain compared with no tape.[108] A review pointed to beneficial effects of lateral wedge insoles in patients with knee OA.[109]

Splints are commonly used for hand problems, especially OA of the thumb base. Two recent systematic reviews found consistent evidence that splints reduce hand pain.[110, 111]

Work/work place interventions

Occupational therapy for evaluating and adapting work places will be helpful to minimize any upper-limb cumulative trauma disorders that may be exacerbating upper-limb OA. This area of intervention is very important for PRM specialists who pay attention to environmental factors for improving activities and participation. It is well known with good evidence that work activities such as kneeling, squatting, lifting and climbing can cause or aggravate knee OA.[112] However, evidence of the effectiveness for work place interventions is lacking. Workplace interventions may include scheduling changes such as more breaks or changes in work arrival or departure time, assistive devices, appropriate furniture and equipment as well as help from other in patients with arthritis in general.[113] However, dealing with work disability requires cooperation of professionals involved in vocational rehabilitation. Vocational rehabilitation is performed in many rehabilitation hospitals in Europe that may provide solutions to work disabilities in patients with OA.[114]

Balneotherapy

Thermal mineral waters are effective for treating patients with knee OA. A systematic review performed by Harzy *et al.* found an improvement in pain and functional capacity, which were sustained until week 24, in patients with OA of the knee.[115] A latest systematic review suggests the beneficial effects of Dead Sea balneotherapy in locomotor diseases, including knee OA.[116]

Pharmacological interventions

The PRM specialist is responsible also for the prescription of drug therapy in OA, including paracetamol, NSAIDs, topical NSAIDs and capsaicin, opioids, intraarticular corticosteroids, intra-articular injections of hyaluronate and symptomatic slow acting drugs such as glucosamine, chondroitin sulphate, avocado soybean unsaponifiables, and diacerhein.[8-11] Glucosamine and chondroitin sulphate may relieve symptoms of OA, but treatment should be discontinued if there is no relief after 6 months of therapy.[7, 8]

Injection therapies deserve special attention in PRM practice, this practical procedure being widely used by PRM specialists. The most common intraarticular injections for OA include corticosteroids and hyaluronic acid. Botulinum toxin is also used lately.[117] As concluded in a very recent systematic review, there is strong evidence supporting intra-articular knee injections as a viable intervention in the management of arthritis with a 1A+ level of evidence for corticosteroids resulting in significant pain relief and functional improvement up to 1 year after the injection. There is 2B+ level of evidence for triamcinolone hexacetonide being advantageous over triamcinolone acetonide. Intra-articular hyaluronans are reported to provide longer relief of pain than corticosteroid injections in OA.[118] However, there is controversy regarding the evidence of efficacy of viscosupplementation for knee OA. Some very recent systematic reviews report that despite improvement in pain by about 40-50% compared with baseline levels, the difference in efficacy is not that large when compared with saline [119] and some others point to a small but clinically irrelevant benefit and risk for serious adverse events.[120] It is suggested to be recommended for those with significant surgical risk factors and also for those with mild radiographic disease if conservative treatment fails.[118] Botulinum toxin type A injection has also been shown to be effective for relieving knee OA pain based on 2B+ level of evidence.[118]

Surgical treatment

The PRM specialist should refer the patient to an orthopaedic surgeon for a surgical intervention in cases unresponsive to the above mentioned interventions. There are guidelines for referral and surgical prioritisation, based mainly on the level of pain and disability, but also taking in account psychosocial and other reasons.[6]

Others

Depression is significant among patients with osteoarthritis. A focused collaborative depression care intervention was found to decrease depression and to improve arthritis associated outcomes, such as pain severity and limitations in daily activity.[121] So, psychological interventions and a combined approach to address both depression and pain problems have benefits in the general management of people with OA.

Although this paper is mainly focused on knee, hip and hand OA, emerging evidence on the effectiveness of PRM approaches in the treatment of other localizations of OA is well worth mentioning.

Big toe OA

Evidence, although weak, suggests stretching exercises, ultrasound, electrical stimulation + mobilization and gait training may improve pain in patients with big toe OA as revealed in a Cochrane review.[122]

Ankle OA

A review points to potential beneficial effects of unloading assistive devices such as a single cane and some ankle–foot orthoses for providing pain relief in ankle OA.[123]

Temporomandibular joint (TMJ) OA

A previous Cochrane review reported that active exercises, manual mobilizations, postural training, relaxation techniques and/or mid-laser therapy and biofeedback may have positive effects on pain in TMJ OA.[124] A very recent Cochrane review revealed weak evidence of equal effectiveness for intra-artic-

TABLE III.—*PRM interventions with demonstrated efficacy in osteoarthritis as revealed in recent systematic reviews.*

Type of OA	PRM intervention		Evidence of effectiveness	Author, year (Reference)
Knee OA	Education/self management		Significant modest effects on Improvement in pain	Iversen *et al.*,2010 [45]
	Weight reduction		Reduces pain and improve self-reported disability	Christensen *et al.*, 2007 [47]
	Exercise	Land-based Strengthening	Supported with platinum level evidence	Fransen and McConnell, 2009 [57]
			Improvement in pain in over 50–75% of subjects	Lange *et al.*, 2008 [58]
			Positive effects in the rehabilitation context	Kristensen and Miller, 2012 [59]
		+ manual mobilisation	A moderate effect on pain	Jansen *et al.*, 2011 [60]
		Aerobic	Improves strength, stiffness, mobility, and endurance in short term	Loew *et al.*, 2012 [63]
		Proprioceptive	Beneficial with some evidence of superiority over strengthening	Smith *et al.*, 2012 [66]
		Thai Chi	Encouraging evidence on improvement of pain and function	Kang *et al.*, 2011 [67]
		Aquatic	Short term effects on pain (small) and function (small to moderate)	Bartels *et al.*, 2009,[69] Kamioka *et al.*, 2010 [70]
	Manual therapy + exercise		Fair evidence of effectiveness in short term	Branthinham *et al.*, 2012 [81]
	Physical modalities	TENS	A large effect on pain reduction (efficacy not confirmed)	Rutjes *et al.*,2009 [84]
		NMES	Inconsistent evidence on pain, function and quadriceps strength	Giggins *et al.*, 2012 [85]
		Ultrasound	An effect in favour of therapeutic ultrasound	Rutjes *et al.*, 2010,[86] Loyola-Sanches *et al.*[87]
		LLLT	Clinically relevant pain relief	Bjordal *et al.*, 2007,[82] Jang *et al.*, 2012 [89]
		PEMF	Improvement in clinical scores; effect on pain questionable	Vavken *et al.*, 2009 [92]
			Effective in improving pain and function based on HQT	Ryang We *et al.*, 2012 [93]
		SWD	Significant effects on pain and muscle performance (thermal one)	Laufer and Dar, 2012 [94]
		Heat/cold	Limited evidence for heat; moderate evidence for ice massage	Brosseau *et al.*, 2003 [95]
	CAM therapies	Acupuncture	Effective based on relatively clear consensus	Ernst and Lee, 2010 [98]
			Significantly better pain relief and a larger improvement in function	Cao *et al.*, 2012 [99]
	Orthotics	Braces & orthoses	Effective in reducing pain	Raja & Devan, 2011 [107]
		Patellar taping	Decrease in pain with medially-directed tape	Warden *et al.*, 2008 [108]
	Balneotherapy		Significant improvement in pain	Harzy *et al.*, 2009 [115]
	IA injections		1A+ level of evidence for CSs, longer pain relief for hyaluronans, 2B+level of evidence for botulinum toxin	Cheng *et al*, 2012 [120]
Hip OA	Land-based exercise		Silver level of evidence for pain reduction	Fransen *et al.*, 2010 [74]
	Manual therapy		More effective than exercise	French *et al.*,2011 [80]
Hand OA	Exercise, education, orthotics, heat		Favorable functional outcomes	Valdes and Marik, 2010 [77]
	Splints		Consistent evidence on pain reduction	Ye *et al.*,2011,[110] Kjeken *et al.*, 2011 [111]
Big toe OA	Physical therapy program		May improve pain	Zammit *et al.*, 2010 [122]
TMJ OA	Physical therapy, hyaluronans, CS,appliances		Possible favorable effects on pain	Medlicott, 2006,[124] de Souza *et al.*, 2012 [125]

CS: corticosteroid; CAM: complementary and alternative medicine; CM: conventional medications; HQT: high quality trials; IA: intra-articular; LLLT: low level laser therapy; MA: meta-analysis; NMES: neuromuscular electrical stimulation OA: osteoarthritis; PEMF: pulsed electromagnetic fields; SWD: short wave diathermy; TENS: transcutaneous electrical nerve stimulation; TMJ: temporomandibular joint.

ular hyaluronic acid injections and betamethasone for relief of pain and discomfort as well as equal effectiveness for occlusal appliances and diclofenac sodium for reducing pain.[125]

Table III summarizes the evidence-based efficacy of PRM interventions in the management of OA as revealed in latest systematic reviews. Rapidly growing evidence on the effectiveness of PRM approaches in a wide variety of options is very important in the era of evidence-based medicine.

Conclusions

The PRM physician is responsible for the diagnosis and functional and social assessment of persons with OA and for setting up a comprehensive strategy – a PRM problem-oriented programme of care. It should include education of the patients, exercise, physical modalities, occupational therapy, aids and orthoses, pharmacological interventions and proper advice to refer to surgical interventions when the conservative approach is ineffective. The demonstrated effectiveness of a large number of PRM interventions and evidence-based recommendations for PRM interventions further enhance the role of PRM specialists in providing management of OA.

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Spinal pain management

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MUSCULOSKELETAL DISORDERS MANAGEMENT
AND THE ROLE OF PHYSICAL
AND REHABILITATION MEDICINE PHYSICIANS.
THE EUROPEAN PERSPECTIVE BASED ON THE BEST EVIDENCE

Guest Editor: N. Christodoulou

Spinal pain management. The role of physical and rehabilitation medicine physicians. The European perspective based on the best evidence.

A paper by the UEMS-PRM Section Professional Practice Committe

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One of the objectives of the Professional Practice Committee (PPC) of the Physical and Rehabilitation Medicine (PRM) Section of the Union of European Medical Specialists (UEMS) is the development of the field of competence of PRM physicians in Europe. To achieve this objective, UEMS PRM Section PPC has adopted a systematic action plan of preparing a series of papers describing the role of PRM physicians in a number of disabling health conditions, based on the evidence of effectiveness of the PRM interventions. The aim of this paper is to describe the role of PRM physicians in the management of spinal pain focusing particularly on low back pain and neck pain. These disorders are associated with significant disability that results in activity limitations and participation restrictions. A wide variety of PRM interventions including patient education, behavioural therapies, exercise, a number of physical modalities, manual techniques, and multidisciplinary rehabilitation may help patients with low back pain and cervical pain in improving their functioning. PRM physicians may address many of the problems encountered by these patients in many life areas taking the International Classification of Functioning, Disability and Health as a reference guide and may have an important role in improving the quality of their lives.

KEY WORDS: Pain, low back- Cervical pain- Physical and rehabilitation medicine.

Spinal disorders such as acute, subacute, and chronic low back pain as well as neck pain are disabling conditions commonly encountered by

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Physical and Rehabilitation Medicine (PRM) physicians/specialists. These disorders usually cause important disability with activity limitations and participation restrictions.

Low back pain (LBP) designates pain or muscular tension between the margins of costae and the inferior gluteal folds that may be present with or without pain radiating to the leg. It is classified as specific low back pain if it is caused by non mechanical spinal disorders/organic diseases such as malignancies, infectious diseases or fractures known as 'red flags', these specific causes being identifiable in less than 1% of back X-rays and can usually be captured with a detailed history taking and clinical examination.[1]If there is no identifiable serious cause for LBP, then it is classified as nonspecific LBP which accounts for the majority (about 95%) of the cases.[2]

LBP can also be classified based on symptom duration as acute LBP if the duration of symptoms is less than four weeks, as subacute LBP if the duration of pain is between four and twelve weeks and as chronic LBP if the symptoms persist for more than three months, each of which requiring different treatment strategies.[2,3] Psychosocial and work-related factors, termed as 'yellow flags', may increase the risk of progression from acute to chronic LBP, necessitating urgent assessment of personal factors including beliefs, attitudes, and behaviours regarding pain as well as the consideration of immediate environment such as the family and work.[2] There is good level of evidence that impairments in functioning, psychological problems/disorders such as depression, augmented fear avoidance beliefs, and somatisation, and problems related to work such as work dissatisfaction and work-related disputes have a causal connection with more unfavourable LBP outcomes.[3]

There are also many other classification systems, especially for chronic LBP, that may be used for diagnostic, prognostic, or treatment purposes. While treatment oriented classification systems might be more useful in targeting treatment in subgroups of patients with LBP in order to achieve desired outcomes, it seems that there is a need for the development of new classification systems for better identifying the needs of the individual patient.[4]

As for neck pain, the Task Force on Neck Pain proposed a new model and classification system as Grade I, II, III, and IV based on the signs and symptoms, interference with activities, treatment requirements, and response to interventions such that Grade I, II, and III covering neck pain without serious structural pathology but with no or little interference (I), with significant interference with daily activities (II), or with neurological signs (III) and Grade IV covering neck pain caused by serious pathologies such as fractures or malignancies.[5]

A diagnostic classification of neck pain has also been made based on the International Classification of Functioning, Disability and Health (ICF)[6] taking into consideration the mobility of joints, sensation of pain, and movement functions category titles in the body functions component of the ICF that assigned a person with neck pain into the categories of neck pain with mobility deficits, with headaches, with movement coordination impairments, and with radiating pain,[7]thus, allowing us making a diagnosis based on functioning.[7]

The causes of neck pain can include trauma including whiplash injuries, myofascial pain syndrome, torticollis, disc pathologies, osteoarthritis, infection and malignancies.[7] Work related factors such as sedentary position at work, repetitive movements, work requiring precision, intensity of work demands and lack of sufficient social support are among those that may increase neck pain risk.[5] While 40% of the patients with acute nonspecific neck pain may show full recovery and mild symptoms and moderate or severe symptoms may persist in about 30% and 30%, respectively, a full recovery may occur in the majority of those with acute neck pain associated with whiplash injury in three months to within one to two years with 15-40% having persistent symptoms and with 5% having severe problems.[2] The level of pain intensity at onset was reported to be the most important prognostic factor, high levels of which unfavourably affecting the outcome.[8]

Low back pain and neck pain are among the most common musculoskeletal disorders. According to the Global Burden of Disease Study 2010, low back pain and neck pain (affecting 9.17% and and 4.82% of the world population, respectively) account for almost 117 million years lived with disability (YLD) in combination with 83.1 million YLDs for low back pain and 33.6 million YLDs for neck pain when assessed separately.[9]

The problems with functioning in patients with LBP and the association of disability with LBP are well reflected in the ICF core sets for LBP that identifies the whole spectrum of problems encountered

by patients with LBP in many life areas.[10] A similar situation exists for patients with neck pain, patients having impairment in body functions, limitation in activities and participation restrictions.[7] Therefore, the impressive association of these spinal pain disorders with disability and problems in functioning properties necessitate a comprehensive approach based on the ICF. The treatment of spinal pain may be well addressed by Physical and Rehabilitation Medicine (PRM) physicians who base their assessment and a wide variety of treatment approaches on the ICF.[11,12]

The aim of this paper is to describe the role of PRM physicians in the management of spinal pain focusing on low back pain and neck pain. The best available evidence on the efficacy of PRM interventions will be provided to emphasize the important role of PRM specialists in the management of these health conditions.

How do PRM physicians intervene in the management of patients with spinal pain?

The intervention of PRM physicians in the management of musculoskeletal conditions is best exemplified in the White Book on Physical and Rehabilitation in Europe.[11] Figure 1, adopted from the White Book,[11] illustrates how a health condition (a musculoskeletal disorder) is viewed based on the ICF with a holistic approach considering not only body functions but also activities and participation in addition to contextual factors (environmental and personal) and their interaction.[6] This approach is very important in the management of spinal pain disorders including LBP and neck pain which are known to be associated with impairments, limitations, restrictions or barriers in the various components of the ICF.[7, 10] Since PRM physicians base their assessments and treatment targets on the ICF,[11,12,13] they may intervene in all aspects of these conditions as described in the ICF and may provide solutions to the wide variety of problems in body functions which include ICF category titles such as sensation of pain, emotional functions, muscle power functions, exercise tolerance functions, and sleep functions in the body functions component of the ICF, such as changing and maintaining body position, self care, mobility, domestic life activities, and work and employment in the activities and participation component of the ICF, and issues related to health care and attitudinal aspects in the environmental functions component of the ICF as identified in the brief 'ICF core sets for low back pain'.[10] Table I shows the comprehensive 'ICF core sets for low back pain'.[10]

The competencies of PRM physicians focusing on functioning and their interventions including assessment of functioning, education, and a wide range of treatments (medications, physical modalities, and others)[14] with the aim of advancing functioning, activities and participation and modifying contextual factors (personal and environmental) for promoting quality of life [15] may well address the needs of patients with spinal pain.

Interdisciplinary team working is also an asset in PRM which is strongly recommended by the UEMS-PRM Section.[16] As an example, the management of LBP including pharmacological treatment, patient education, advice to go on with usual daily activities, and physical treatments can be best achieved by coordinating the interventions and evaluating and modifying treatment plans to meet the changing needs and functional properties of the individual patient in interdisciplinary teams where PRM physicians play the fundamental role.[16] Interdisciplinary rehabilitation team adds together skills and knowledge of various health care professionals both at the clinical level and in the long term management in interaction with the environment, an inherent feature of the medical specialty of PRM, to improve the quality of life of persons with disabling health conditions. [13]

Outcome measures

Outcome measurement is an important element in PRM. There is a wide range of measurement instruments/questionnaires used in LBP including Oswestry Disability Index (the most commonly used), Roland-Morris Disability Questionnaire, Clinical Back Pain Questionnaire, Million Disability Questionnaire, Fear-Avoidence Beliefs Questionnaire, Quebec Back Pain Disability Scale, LBP Impairment Scale, Back Pain Function Scale, Functional Improvement Measure for Low Back Pain and the North American Spine Society Instrument, among which Million Disability Questionnaire and Clinical Back Pain Questionnaire were found to reflect all

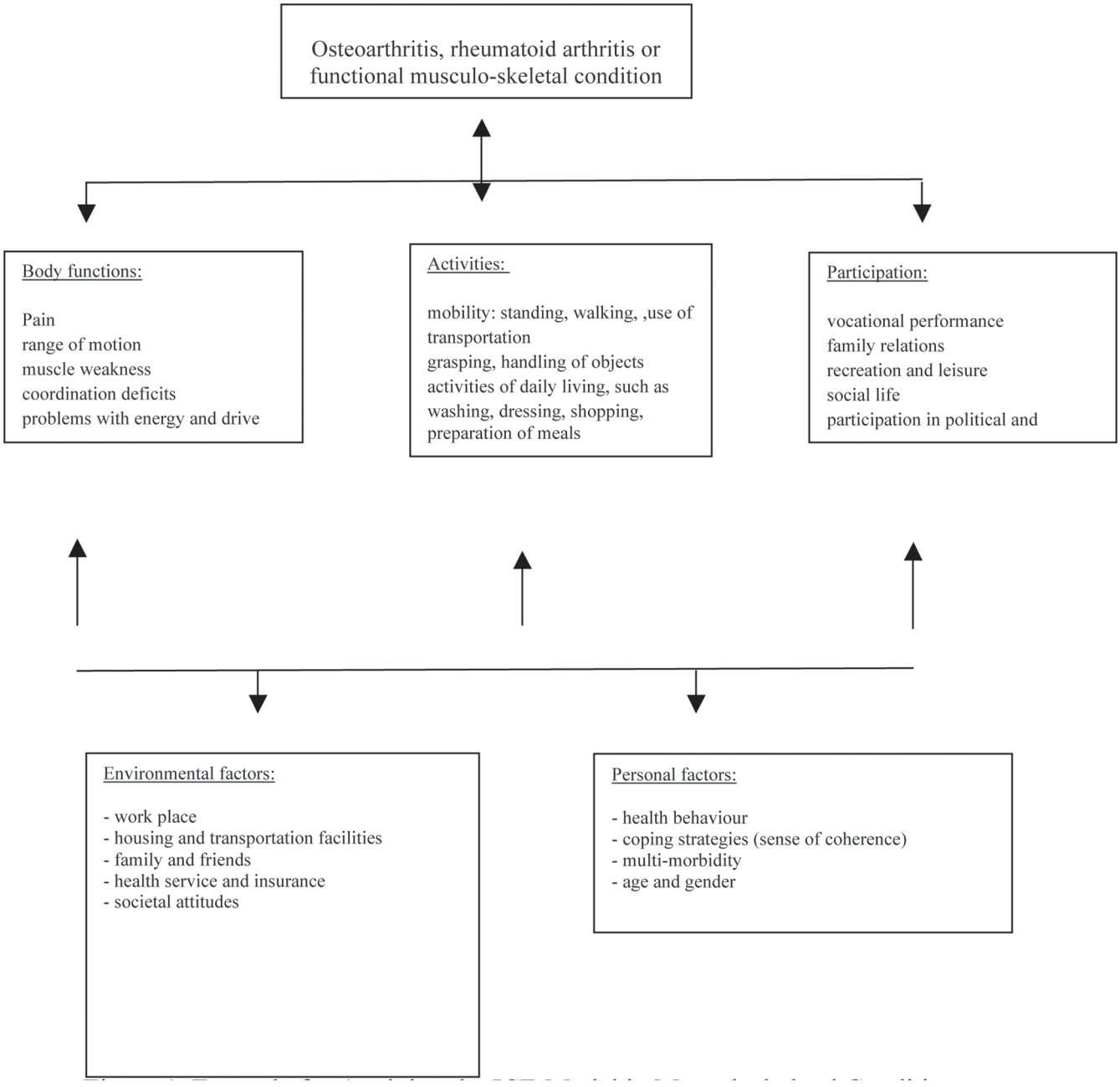

Figure 1. Example for Applying the ICF-Model in Musculoskeletal Conditions. Adapted with permission from the White Book on Physical and Rehabilitation Medicine in Europe.[11]

the components of the ICF in a more balanced way as evaluated in a systematic review linking the ICF concepts to LBP questionnaires. [17]

Regarding outcome measures for neck pain, a systematic review[18] identified five scales for assessing neck pain or dysfunction: Neck Disability Index (the most commonly used and validated), the Northwick Park Scale, the Copenhagen Neck Functional Disability Scale, the Patient-Specific Functional Scale and the Neck Pain and Disability Scale. The authors

TABLE I—*Comprehensive ICF core sets for LBP.*

ICF components		
Body functions (ICF code-ICF category title)	Activities and participation (ICF code-ICF category title)	Environmental factors (ICF code-ICF category title)
b280 - Sensation of pain	d415- Maintaining a body position	e580- Health services, systems and policies
b152- Emotional functions	d430- Lifting and carrying objects	e570- Social security services, systems and policies
b730- Muscle power functions	d410- Changing basic body position	e355- Health professionals
b710- Mobility of joint functions	d450- Walking	e450- Individual attitudes of health professionals
b455- Exercise tolerance functions	d850- Remunerative employment	e410- Individual attitudes of immediate family members
b134- Sleep functions	d859- Work and employment, other specified and unspecified	e135- Products and technology for employment
b740- Muscle endurance functions	d640- Doing housework	e110- Products or substances for personal consumption
b735- Muscle tone functions	d540- Dressing	e310- Immediate family
b715- Stability of joint functions	d240- Handling stress and other psychological demands	e155- Design, construction and building products and technology of buildings for private use
b130- Energy and drive functions	d760- Family relationships	e550- Legal services, systems and policies
b126- Temperament and personality functions	d530- Toileting	e120- Products and technology for personal indoor and outdoor mobility and transportation
b180- Experience of self and time functions	d845- Acquiring, keeping and terminating a job	e150- Design, construction and building products and technology of buildings for public use
b260- Proprioceptive functions	d420- Transferring oneself	e225- Climate
b620- Urination functions	d445- Hand and arm use	e255- Vibration
b640- Sexual functions	d455- Moving around	e325- Acquaintances, peers, colleagues, neighbours and community members
b720- Mobility of bone functions	d460- Moving around in different locations	e330- People in positions of authority
b750- Motor reflex functions	d465- Moving around using equipment	e360- Other professionals
b770- Gait pattern functions	d470- Using transportation	e425- Individual attitudes of acquaintances, peers, colleagues, neighbours and community members
b780- Sensations related to muscles and movement functions	d475- Driving	e455- Individual attitudes of other professionals
	d510- Washing oneself	e460- Societal attitudes
	d570- Looking after one's health	e465- Social norms, practices and ideologies
	d620- Acquisition of goods and services	e540- Transportation services, systems and policies
	d630- Preparing meals	e575- General social support services, systems and policies
	d650- Caring for household objects	e585- Education and training services, systems and policies
	d660- Assisting others	e590- Labour and employment services, systems and policies
	d710- Basic interpersonal interactions	
	d770- Intimate relationships	
	d910- Community life	
	d920- Recreation and leisure	

ICF codes-ICF category titles were selected from 'Cieza *et al.*, 2004',[10] Those which are not in numerical order are those ranked in the 'Brief ICF core sets'; the rest is included from the 'Comprehensive ICF core sets' except for the 'body structures' component.

pointed to the high level of sensitivity of capturing change for the Patient-Specific Functional Scale.[18]

Evidence of the effectiveness of PRM interventions: Low back pain

Drug therapies

Pharmacological treatment is common in medical specialties involved in the treatment of spinal pain.

Pain relieving medications including paracetamol (usually for mild and moderate pain) and nonsteroidal anti-inflammatory drugs (NSAIDs) for more severe pain are widely used for pain treatment. While conventional NSAIDs and muscle relaxants were found effective in acute LBP for pain reduction in the short term, Cox-2 inhibitors and antidepressants were found to have beneficial effects again for short term pain reduction with Cox-2 inhibitors showing effectiveness on improving function in the short term.[19] The evidence for the effectiveness is fair for

paracetamol and good for NSAIDs and muscle relaxants in acute LBP and also good evidence exists for the effectiveness of NSAIDs in subacute and chronic LBP.[20] An important point is that caution should be taken for potential gastrointestinal, renal, and cardiac adverse effects of NSAIDs.

Opioids and tramadol can be used in the treatment of acute, subacute and chronic LBP with a B grade of recommendation based on fair and extrapolated evidence (for chronic LBP) with moderate effectiveness. There is C grade of recommendation for gabapentin with little effects in patients with subacute or chronic LBP with radiculopathy based on fair evidence, while tricyclic antidepressants may have little to moderate effects based on good evidence in these patients.[20]

Duloxetine has also been approved by the US Food and Drug Administration (FDA) (in November 2010) for the treatment of chronic LBP.[21]

Patient education

It is suggested that patient education using various forms (back care information, advice, brochures, booklets, videos) and particularly biopsychosocial model based education may be effective in changing beliefs regarding LBP, reducing fear-avoidance behavior and providing better compliance with treatment in patients with LBP. [22]

Back schools

Moderate evidence has been found for the efficacy of back schools in reducing pain and improving function and return to work in the short and intermediate term, being more beneficial in occupational environments in patients with chronic LBP.[23]

Exercise

Advice on continuing daily activities (staying active) was strongly recommended in the Philadelphia Panel LBP guideline of 2001 with sick leave reducing effects in patients with acute LBP. [24] A recent Cochrane review also pointed to the beneficial effects (however, small) of staying active in improvement of pain and function when compared to bedrest. [25]

All types of exercises were shown to have significant (although small) pain and disability reducing effects when compared to minimal interventions in patients with chronic LBP. [26] This finding was also confirmed in a later systematic review adding to evidence that exercise therapy had long term improvement effects on function. [27] Exercise therapy is a consistent recommendation in guidelines for chronic LBP. [28]

While the evidence on the best type of exercise for patients with LBP is not that clear, [29] recent systematic reviews pointed to the beneficial effects of various types of exercises.

Based on the role of transversus abdominis and multifidus muscles on the dynamic stability of the spine,[30,31] exercises termed as transversus abdominis or multifidus training, lumbar or core stabilization exercises or motor control exercises are successfully used in the treatment of low back pain. A systematic review revealed beneficial effects of these exercises for pain relief and reducing disability.[32] McKenzie exercises[33] and similar ones termed as directional preference exercise[34] were also found to have pain and disability reducing effects in acute,[33,34] subacute, and chronic[34] LBP, the latter being also associated with favourable return to work outcomes.[34]

The Royal Dutch Society for Physical Therapy (KNGF) guidelines pointed to gradual increase in exercise in terms of intensity, duration and frequency based on the baseline activity level of the patient and previously set goals with communication with the patient.[36]

Physical modalities

Philadelphia Panel guidelines published in 2001 reported no demonstrated benefit of transcutaneous electrical nerve stimulation (TENS) and therapeutic ultrasound (US) in acute and chronic LBP and no data for these physical modalities in subacute LBP, while reporting no data on thermotherapy and electrical stimulation in acute and subacute LBP and insufficient data for these in chronic LBP. Insufficient data also existed for EMG biofeedback for acute and chronic LBP and no data for subacute LBP in this guideline. [24] KNGF guideline also pointed to unclear effectiveness of TENS and US in these patients.[36]

ACP and APS guideline was not able to provide sufficient evidence to recommend superficial cold, TENS, interferential therapy, low level laser therapy (LLLT), or short wave diathermy in patients with acute, subacute, or chronic LBP without being able to estimate beneficial effects; whereas superficial

heat was recommended at B level based on good evidence in acute LBP.[20] Heat wrap application was indicated as a self-care option with short term benefits on pain in acute LBP.[37] Regarding LLLT, a later Cochrane review reported some studies showing significant (however, not important clinically) pain reducing effects when compared to sham; but these findings were rated as insufficient data by the authors,[38] as in the previous guidelines.[20]

Manual therapies

Massage

Massage was found to have favourable effects on pain and function in both the short and the long term with comparable efficacy with exercise and with better effects than some other interventions.[39]

Spinal manipulation

Spinal manipulation combined with other PRM interventions such as education, exercise, electrical stimulation and massage was shown in a Cochrane review to have pain and disability reducing effects in the short and intermediate term, but not in the long term in acute and subacute LBP,[40] with also similar effects in the short term in chronic LBP when added to another intervention.[41]

Traction

A Cochrane review was not able to provide conclusive evidence on the effectiveness of traction as a single approach with implications of the ineffectiveness in acute, subacute and chronic LBP.[42]

Lumbar Supports

No clear evidence was found on the better effectiveness of lumbar supports when compared to no intervention or other interventions in the treatment of LBP.[43]

Cognitive-behavioral therapy

Cognitive interventions combined with an exercise program were shown to have similar efficacy with lumbar fusion surgery in reducing disability in patients with chronic LBP with degenerative disc disease.[44] A Cochrane review reported positive outcomes for pain reduction associated with cognitive behavioural therapy when compared to standard care in patients with chronic LBP. [45]

Complementary and Alternative Medicine

Complementary and alternative medicine (CAM) treatments are increasingly used for LBP. [46] Among them, acupuncture was demonstrated to have better effectiveness for relieving pain in the short term than no treatment based on moderate evidence, however, without a significant difference when compared to sham acupuncture based on strong evidence with suggestions as an adjunct therapy in patients with nonspecific LBP. [47] It was also found cost-effective in comparison to no treatment or usual care. [46]

Multidisciplinary treatments

Multidisciplinary treatments are based on the biopsycosocial model comprising physical components such as exercise as well as psychological components such as cognitive behavioural therapy and social or vocational components regarding the immediate environment of the patient including the work environment.[48]

These programs are mostly used for work outcomes. Therefore, multidisciplinary treatments well fit the aims of PRM, guided by the biopsychosocial model of the ICF, which also considers environmental factors including return to work.[49]

The terms of functional restoration programs[50] and physical conditioning programs[51] are also used for this type of treatment approach.

Regarding evidence of effectiveness of multidisciplinary treatments, a Cochrane review revealed improvement of pain with multidisciplinary biopsychosocial rehabilitation that was intensive; however, work outcomes were conflicting with some studies showing favourable effects on work readiness, while some others showing no effect on sick leaves.[48] Another recent Cochrane review also pointed to the uncertainty of the effectiveness of physical conditioning programs on sick leave in patients with acute LBP; on the contrary, possible beneficial effects on sick leave were noted in workers with subacute and chronic LBP, with implications for better outcomes with workplace interventions. [51]

Evidence of the effectiveness of PRM interventions: Neck pain

The evidence on the effectiveness of PRM interventions for neck pain is not as much as it is for LBP and not as clear either, failing to reveal the most desirable possible therapies showing effectiveness.[52]

The Task Force on Neck Pain listed helpful management options for Grade I or II whiplash associated neck pain as reassurance/education on the absence of serious pathology and unlikelihood of serious disability, encouragement on returning to usual activities, and exercise therapy with or without mobilisation. For those with nontraumatic Grade I or II neck pain, NSAIDs, muscle relaxants, laser, and mobilisation were suggested as more effective therapies than placebo and exercise therapy and acupuncture as more effective therapies than usual care. For those with Grade III or IV neck pain, more specific therapies or surgery were recommended. [53]

Strong evidence based recommendations of the ICF based neck pain guideline[7] for improvement in pain and disability included education/reassurance for whiplash-related neck pain (the same as in the above recommendation[53]), strengthening, endurance, and coordination exercises as well as cervical mobilization and manipulation for neck pain with headache. Moderate evidence based recommendations were listed as upper quarter and nerve mobilization techniques, cervical traction (intermittent) in combination with strengthening exercises and manual techniques in patients with neck and radiating arm pain. Those interventions recommended based on weak evidence were thrust manipulation of the thorax for those with neck and arm pain and flexibility exercises of neck and thorax muscles and centralization techniques in general.[7]

Evidence for the effectiveness of PRM interventions in neck pain provided by more recent systematic reviews are given below.

Patient education

The Cochrane review of 2012 on education for neck pain was not able to demonstrate the efficacy of educational interventions such as advice on being active and on pain, coping with stress and workplace, and self management. [54]

Exercise

Another Cochrane review of 2012 reported the beneficial effects of strengthening and stretching exercises for the cervical and scapulothoracic regions for chronic neck pain in the short and intermediate terms and for neck pain with headache in the long term based on low to moderate quality evidence. Functional improvement with exercise in the long term was also noted in patients with chronic neck pain based on low quality evidence. Endurance exercises for the craniocervical and cervical-scapular regions and self-mobilisation were also found to have favourable effects on pain and function in patients with neck pain and headache. [55]

Physical modalities

Although it was not possible to estimate the effects because of the very low quality of trials, some evidence (however, very low quality) existed for the better effectiveness of TENS, repetitive magnetic stimulation, and pulsed electromagnetic field than placebo,[56] not allowing conclusive comments.

A systematic review demonstrated immediate post-treatment pain reducing effects of LLLT in patients with acute neck pain and its long term (more than five months) effects in chronic neck pain patients.[57]

Manual therapies

Massage

The results of a Cochrane review implied functional improvement and lessening of tenderness with some types of massage when compared with no or placebo treatment based on very low quality evidence. [58]

Cervical mobilisation / manipulation

A Cochrane review pointed to the comparable efficacy of cervical mobilization and manipulation in terms of patient satisfaction, function and pain in patients with subacute or chronic neck pain based on moderate quality evidence. Beneficial effects of manipulation as a single treatment on short term pain relief were also noted in patients with neck pain and headache, however based on low quality

evidence. Thoracic manipulation was indicated as a useful adjunct therapy for immediate pain relief in patients with acute or chronic neck pain based on low quality evidence.[59]

Traction

As for continuous or intermittent traction for improvement of pain and function, the available literature evaluated in a Cochrane review was not able to provide sufficient evidence for the recommendation or refutation of this type of intervention. [60]

Acupuncture

A Cochrane review provided moderate evidence for the better effectiveness of acupuncture than sham acupuncture or other inactive treatments right after treatment or in the short term.[61]

Multidisciplinary treatments

Although multidisciplinary treatments have the potential to be very useful for patients with neck pain with associated disability, little evidence was found on multidisciplinary biopsychosocial rehabilitation to show its effectiveness due to the lack of high quality trials.[62]

Conclusion

Considering the high burden of spinal pain disorders both on the patient in terms of impairments of body functions and resultant disability and on the society in terms of health care costs and its impact on working ability,[63] it is very important to provide a treatment for patients with LBP or neck pain that would not only relieve pain but also would improve function, reduce activity limitations and participation restrictions and remove environmental barriers such as work related factors. This can be managed with reference to the biopsychosocial model of the ICF. Therefore, PRM specialists, guided by the ICF,[49] are in a position to be helpful to these patients largely. Although there are a number of effective PRM interventions based on good evidence for the treatment of patients with spinal pain, especially for LBP, there seems to be a need for more high quality trials in this field especially on activities and participation and environmental factors (i.e. work) components of the ICF to enable PRM physicians to base their treatment decisions on evidence-based treatments to ensure the best care of their patients.

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Local soft tissue musculoskeletal disorders and injuries

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Local soft tissue musculoskeletal disorders and injuries. The role of physical and rehabilitation medicine physicians. The European perspective based on the best evidence

A paper by the UEMS-PRM Section Professional Practice Committee

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One of the objectives of the Professional Practice Committee (PPC) of the Physical and Rehabilitation Medicine (PRM) Section of the Union of European Medical Specialists (UEMS) is the development of the field of competence of PRM physicians in Europe. To achieve this objective, UEMS PRM Section PPC has adopted a systematic action plan of preparing a series of papers describing the role of PRM physicians in a number of disabling health conditions, based on the evidence of effectiveness of PRM interventions. Soft tissue musculoskeletal disorders (MSDs) and injuries are associated with significant pain and loss of function that may lead to significant disability. The aim of this paper is to define the role of PRM physician in the management of local soft tissue MSDs and injuries with their specific focus on assessing and improving function as well as participation in the community. The training of PRM specialists make them well equipped to successfully treat MSDs including soft tissue MSDs and injuries. PRM specialists may well meet the needs of patients with soft tissue MSDs and injuries using PRM approaches including 1) assessment based on the comprehensive model of functioning, the International Classification of Functioning, Disability and Health (ICF), that enable them to identify the areas of impaired functioning in order to apply necessary measures; 2) accurate diagnosis using instrumental diagnostic procedures in addition to clinical examination; 3) outcome measurements available to them; 4) evidence-based pharmacological and nonpharmacological treatments; and finally 5) maintenance of social involvement including "return to work" based on restoration of function, all of which will eventually result in improved quality of life for patients with soft tissue MSDs and injuries.

KEY WORDS: Musculoskeletal diseases - Musculoskeletal system - Cumulative trauma disorders - Soft tissue injuries - Pain - Physical and rehabilitation medicine.

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Soft tissue musculoskeletal disorders (MSDs) and injuries comprise musculoskeletal complaints or conditions of muscles, nerves, ligaments, tendons,

tendon sheaths, and bursae apart from bones, joints, or cartilage.[1, 2] There are various ways of defining upper and lower extremity soft tissue MSDs, generally defined as 'soft tissue rheumatism,[1] or "MSD".[3] As for upper extremity soft tissue MSDs, several umbrella terms are used that vary from country to country based on different conceptualizations as well as on their multifactorial aetiology. These include "upper extremity MSDs",[2] "complaints of the arm, neck and/or shoulder (CANS)",[4] "repetitive strain injury", "occupational overuse syndrome", "occupational cervico-brachial disorder", and more frequently "work-related upper extremity disorders", "work related upper limb disorders", or "work-related MSDs" [3] based on a causal link between a certain type of work and upper extremity soft tissue problems.[5] Upper extremity soft tissue MSDs as gathered from various classifications under these umbrella terms encompass a large number of conditions that include shoulder capsulitis, rotator cuff syndrome, thoracic outlet syndrome, biceps tendinitis, bursitis of the elbow (olecranon bursitis), lateral epicondylitis (tennis elbow), medial epicondylitis (golfer's elbow), cubital tunnel syndrome, radial tunnel syndrome, carpal tunnel syndrome, Guyon canal syndrome (ulnar tunnel syndrome), de Quervain's disease, intersection syndrome (oarsman's wrist), other tendinosis, tenosynovitis, or tendinitis of the wrist/hand, extensor retinaculum impingement, ganglia, Dupuytren's disease, trigger finger, hand-arm vibration syndrome, and regional and generalized soft tissue pain syndromes including myofascial pain syndrome and fibromyalgia.[3, 4, 6, 7] For the lower extremity, hip soft tissue MSDs and injuries include trochanteric bursitis, iliopsoas bursitis, femoroacetabular impingement, snapping hip syndromes, osteitis pubis, athletic pubalgia/sports hernia, adductor strains, and hamstring injuries.[8-10] Prepatellar bursitis, anserine syndrome, knee ligament injuries including the injuries of collateral and cruciate ligaments, patellar tendinopathy, "shin splints", chronic exertional compartment syndrome, calf strains/injuries, soft tissue impingements around the ankle region, ankle ligament injuries, chronic ankle instability, Achilles tendinopathy, Achilles tendon rupture, Achilles bursitis (retrocalcaneal bursitis), and plantar fasciitis are those of the knee, ankle, and foot regions.[1, 11, 12] Soft tissue MSDs constitute a major part of painful conditions. When the terminology "soft tissue rheumatism" was used, in an Italian cohort of 3537 patients referred to rheumatology centres, 18.5% was diagnosed as having soft tissue rheumatisms, among them fibromyalgia being the most frequent diagnosis (29.4%) followed by shoulder capsulitis (10.7%) and carpal tunnel syndrome (6.1%).[13] When the term "upper extremity MSDs" was considered, a systematic literature evaluation revealed the point prevalence of upper-extremity MSDs as ranging from 1.6% to 53%, while the one year prevalence ranged from 2.3% to 41%, considerable differences in prevalence resulting from the lack of universally accepted definitions for these conditions.[2] In a working age population of 6038 subjects surveyed for the prevalence of upper extremity MSDs, 44.8% of the subjects with pain were found to have at least one soft tissue MSD with the highest prevalence rates for those around the shoulder ranging from 4.5% to 10.1% in men and women, respectively, followed by lateral epicondylitis (1.3% in men and 1.1% in women), other tenosynovitis of the hand or wrist (1.1% in men and 2.2% in women), de Quervain's disease (0.5% in men and 1.3% in women), and carpal tunnel syndrome (1.2% in men and 0.9% in women), the most important consequences of which being deterioration of physical function that affects activities of daily living which in turn leads to a substantial burden of disability in adults in working age.[14] As for the prevalence and burden of lower extremity soft tissue MSDs, most of them being injuries, a general prevalence rate is difficult to give due to the large variations of prevalence in specific groups affected. The consequences these disorders share in common are pain and loss of function which necessitate pain management strategies and restoration of function. Since Physical and Rehabilitation Medicine (PRM) is defined as a medical specialty "that, based on the assessment of functioning and including the diagnosis and treatment of health conditions, performs, applies and coordinates a wide range of interventions with the goal of optimizing functioning of people experiencing or likely to experience disability" [15] (Stucki and Melvin, 2007, p. 288) with competencies of analyzing all problems through the assessment of body structures, functions, activities and participation as well as contextual factors (personal characteristics and environment) [16-18] may well serve to the needs of patients with soft tissue MSDs and injuries from diagnosis to social involvement.

The aims of this paper are to describe the needs of patients with local soft tissue MSDs and injures

in the context of PRM, to define the role of PRM physicians in the management of local soft tissue MSDs and injuries reflecting the European perspective, and to elaborate to what extent PRM specialists may contribute to a patient with a soft tissue MSD from the acute phase to full participation in society based on the evidence of effectiveness of interventions within the scope of PRM.

It should be noted that local soft tissue MSDs around the shoulder and other regional and generalised soft tissue pain syndromes will be excluded in this paper because they are subject to be covered in other papers produced by the Professional Practice Committee of the Union of European Medical Specialists (UEMS) PRM Section as part of a series of papers.[19]

The needs of patients with local soft tissue MSDs: a patient with carpal tunnel syndrome (CTS) as an example

Patient scenario

A 42 year-old diabetic woman working as a secretary involved in intensive computer use for many years presents with pain as well as burning and tingling sensations radiating to her three fingers including the thumb and sometimes to the half lateral side/thumb side of the ring finger of her right hand and numbness in her thumb exacerbated at night awakening her. She noticed that shaking her affected hand has relieved these sensations to some extent. She also describes difficulty in gripping the small computer mouse she has been using and also describes severe pain when there is a need to take out heavy box files from bottom shelves with her wrists in a downward bent position. Due to her complaints, she needed to take frequent sick leaves and she is afraid to lose her job.

The needs of this patient can be listed as the following: A careful assessment, an accurate diagnosis, an effective treatment including pharmacological and nonpharmacological approaches with specific aims of relieving pain and restoring function and workplace interventions for "return to work".

As described well in the White Book on Physical and Rehabilitation Medicine in Europe, PRM physicians assess, diagnose, treat, and promote participation in a very wide range of health conditions including MSDs.[16, 17] Supporting this notion, a survey conducted among the 4th year PRM trainees in the US on their perceptions of their current clinical education revealed that they felt most confident and prepared in musculoskeletal medicine with 4.41 points on a 5-point scale for confidence and with 4.23 points for preparedness,[20] that may reflect the skills, aptitudes, and competencies of PRM physicians in the management of MSDs.

The following section of this paper will define the role of the PRM physician in the management of soft tissue MSDs and injuries through a systematic approach performed by a PRM physician taking the patient scenario given above (a patient with work-related CTS) into consideration first as an example. Then a detailed list of PRM interventions in other upper and lower extremity soft tissue MSDs and injuries will be given to describe the contributions of the PRM specialists to these disorders as well as available evidence on the effectiveness of PRM approaches/interventions.

The role of PRM physicians in the management of soft tissue MSDs: the approach of a PRM physician to the management of a patient with CTS as an example

Assessment

It is unquestionable that an in-depth analysis of the impact of health conditions on all aspects of health domains is crucial for the best care of our patients. The International Classification of Functioning, Disability and Health (ICF) [21] provides a means for an excellent history taking and assessment for the PRM specialist whose management of disabilities is based on the comprehensive model of functioning as represented in the ICF, allowing the analysis of problems in all aspects of body functions and structures, activities and participation as well as contextual factors including environmental and personal factors.[22] Table I clearly points to the areas requiring assessment as well as those requiring intervention as revealed in a systematic review (SR) that mapped the outcomes assessed in randomised controlled trials (RCTs) of surgical interventions for CTS to the relevant categories of the ICF [23] and as shown in an article describing the use of ICF to guide ergonomic interventions.[24]

TABLE I.—*ICF categories relevant to carpal tunnel syndrome.*

ICF component	Category title	Appropriate PRM approaches
Body functions/Structures	Sensory functions	Clinical examination with sensibility tests and instrumental studies
	Muscle power functions	Manual muscle testing, dynamometers and instrumental studies, goniometric measurements; strengthening
	Sensation of pain in median nerve distribution	Pain scales or questionnaires, symptom severity scales; pain management strategies
	Sleep functions	Interventions for relief of symptoms
	Structure of median nerve	Instrumental studies such as musculoskeletal ultrasound or electrodiagnostic tests
Activities and participation	Self care	Functional status scales; restoration of function
	Domestic life	Functional status scales; restoration of function
	Hand and arm use	Dexterity testing; hand rehabilitation
	Fine hand use	Dexterity testing; hand rehabilitation
	Participation in work and environment	QoL scales, return-to-work assessment; work place interventions
Environmental factors	Products and technology	Pain relieving products; splints
	Natural environment and human made environmental changes	Work place interventions
	Supports and relationships	Getting involved as a health professional; Education for the employers
	Attitudes	Facilitating support
	Services, systems and policies	Contacting the employer or supervisor

The items in the two columns on the left for body functions/structures and activities and participation were chosen from Jerosch-Herold *et al.*, 2006.[23] The items in the environmental factors section were chosen from Leyshon and Shaw 2008.[24]

Outcome measures

PRM specialists use appropriate outcome measures in order to assess the areas pointed to in the relevant ICF categories that include "Disabilities of the Arm, Shoulder and Hand", severity of symptoms and functional status scales of "Boston CTS Questionnaire", "Medical Outcomes Study 36-Item Short-Form Health Survey" and hand performance tests such as Jebsen-Taylor hand function test as revealed in research papers in CTS evaluated very recently.[25] General strategies for outcome measurement in PRM are also clearly defined in a very recent paper covering suggestions for the selection of appropriate assessment tools.[26]

Diagnosis

Because basic clinical examination for CTS is common for all clinicians, the details are not included in this paper. However, the practice of instrumental diagnosis in CTS may differ among specialties.

INSTRUMENTAL DIAGNOSTIC PROCEDURES

Musculoskeletal ultrasound.—MSUS is recommended by MSUS experts in Europe as the first choice level instrumental diagnostic procedure or with indication equivalent to other imaging techniques in almost all of the soft tissue disorders of the shoulder (with the exclusion of adhesive capsulitis), elbow, wrist, hip (with the exclusion of intraarticular snapping hip), knee (with the exclusion of anterior and posterior cruciate ligament tears), and ankle/foot.[27]

Before discussing the value of MSUS in the diagnosis of CTS, a general description of MSUS in PRM practice will be very helpful in understanding the capabilities of PRM physicians in the instrumental diagnosis and follow-up of MSDs.

MSUS has been suggested as an ideal imaging modality after plain X-ray for the specialist in PRM with its features of being dynamic in nature and therefore allowing the PRM specialist not only to make a diagnosis on which to base an effective and accurate rehabilitation treatment plan but also to judge response to rehabilitation approaches in terms of functional gains,[28] enabling them to provide a better quality of care from the diagnosis to return to normal life for patients with soft tissue MSDs or injuries.

MSUS is being increasingly used by PRM physicians, which is part of the curriculum proposed by UEMS PRM Section and Board (www.euro-prm.org). Some residency programmes have already implemented

MSUS courses in their PRM trainee education.[29] In a world-wide survey conducted during the 5th World Congress of the International Society of Physical and Rehabilitation Medicine (ISPRM 2009) aiming to explore the current status of MSUS in PRM, data obtained from 306 PRM doctors (66.3% from Europe and the rest from other parts of the world) revealed that 90.4% of the PRM physicians thought that they should perform MSUS themselves with the information that 18.2% were actually able to perform MSUS.[30] It is interesting to note that in a study conducted solely in Europe aiming to explore MSUS implementation among rheumatologists in EULAR member countries, from less than 10% to more than 50% of rheumatologists were found to perform MSUS routinely in their clinical practice [31] and in another study on MSUS use in the US revealed that 20% of rheumatologists were utilizing MSUS for diagnosis and as an injection guide.[32] It should be noted that all these studies were published at the same time period. The increase in the remarkable interest in the use of MSUS in PRM has also been reflected in the publications of PRM specialists that showed a significant increase in recent years with a trend of augmentation after 2004 and reaching to 149 papers published solely by PRM physicians.[33] Additionally, in order to promote the growth and development of MSUS competencies among PRM specialists European-wide and to make the ultrasound probe the "*stethoscope*" (Ozçakar *et al*., 2012, p. 310) [34] of PRM specialists, a study group called EURO-MUSCULUS has been established in 2010.[35]

An important aspect of the use of MSUS by PRM physicians in MSDs is that it provides a substantial gain in terms of time and cost that may shorten periods of waiting time and also decrease cost for other radiological assessments as well as radiation exposure.[36] The most important of all, the use of MSUS by PRM specialists for the diagnosis of soft tissue conditions provides a "one-stop approach" enabling diagnosis in a single hospital visit and avoiding referral to other clinics [37] that may further provide time and cost benefits.

The part on MSUS cannot be considered complete without mentioning its importance in interventional PRM approaches. It is well known that MSUS provides guiding for more accurate performance of a large number of infiltration procedures using corticosteroids, local anaesthetics, sclerosing substances, platelet rich plasma, and botulinum toxin for the treatment of a wide variety of soft tissue pathologies.[38]

Back to the diagnosis of CTS using MSUS, studies have shown that diagnostic value of MSUS is higher than physical manoeuvres [39] and MSUS may be helpful in the diagnosis of idiopathic CTS, although not superior than electrophysiological assessments in terms of predicting symptom severity and functional status.[40] The diagnostic sensitivity and specificity of MSUS have been reported to be ranging from 84% to 87.3% and from 79% to 83.3%, respectively, in very recent meta-analyses (MAs) as calculated from studies using the largest cross-sectional area of the median nerve.[41, 42] Although MSUS cannot fill the place of electromyography, these data suggest the usefulness of MSUS as a valuable complementary technique.

Electrodiagnosis

Electromyography (EMG) is a procedure that is also within the scope of the medical specialty of PRM. In a study aiming to identify patterns of electrodiagnostic services in the US, PRM physicians followed neurologists very closely as physician providers for electrodiagnostic services with the percentages of 22% and 23.6%, respectively. Specialists in PRM were also found to perform electrodiagnostic evaluation at a higher rate in terms of the number of studies per a specialist than other providers.[43]

Treatment

Pharmacological treatment

Oral pharmaceutical treatment will not be described here because of the commonality of practices in all disciplines interested in the treatment of CTS. However, injection therapies, an important part of interventional PRM approaches, will be discussed in detail. It should be noted that the peripheral joint injections as well as botulinum toxin injections were noted among those competencies for which the PRM trainees felt the most prepared.[20]

Injection therapies

Local corticosteroid (CS) injections are a common treatment choice utilized by PRM physicians for the management of CTS. A Cochrane review (CR) provided confirmatory evidence for the efficacy of local CS injections for severe CTS for symptom relief in the short term when compared with placebo.[44]

An interesting article comparing CS and/or anaesthetic injection practices of orthopaedic surgeons, rheumatologists, PRM physicians, and primary-care sports medicine (PCSM) physicians for soft tissue pathologies around shoulder is worth mentioning. This article pointed to variation in anaesthetic use between physicians, surgeons using larger volumes of anaesthetics than non-surgeon specialists. Fluorinated CSs, were used more frequently by orthopaedic surgeons (37%) and rheumatologists (17%) than by PRM/PCSM physicians (8%). Regarding any change of practice in diabetic patients such as CS type or dose modifications or arrangements of glucose monitoring accordingly, PRM and PCSM physicians ranked at the top in this respect (13.5%) followed by rheumatologists (10%) and orthopaedic surgeons (8.6%) among those who altered their practice in patients with diabetes mellitus (10%).[45] Since both non-fluorinated such as methylprednisolone acetate and fluorinated compounds such as triamcinolone hexacetonide and betamethasone sodium phosphate as well as anaesthetics such as lidocaine have also been used in local CS injection trials for CTS[44] and many patients with diabetes mellitus can have CTS,[46] this information may be of importance in reflecting the attitude of PRM physicians in local injection treatment as well as the need for uniform guidelines for injection therapies.

Nonpharmacological treatment/PRM interventions

Nonpharmacological interventions within the scope of PRM are being used widely in the management of rheumatic disorders, including soft tissue MSDs [47] as is the case for CTS.

Regarding evidence-based practice, a recent SR with MA well summarized the evidence of effectiveness of nonpharmacological interventions within the scope of PRM in patients with CTS, where ultrasound, electromagnetic fields, splinting at night, ergonomic keyboards (*vs.* standard keyboards), and cupping therapy *(vs.* heat pads) were found effective in the short term based on strong and moderate evidence and ultrasound also in the midterm based on moderate evidence.[48] Further evidence for PRM interventions came from the most recent CRs. Mobilisation interventions and exercise were indicated to be beneficial (however, based on limited and low quality evidence) and safe for patients with CTS.[49] Regarding splinting, the CR confirmed the short-term effectiveness of night splints compared with no treatment.[50] Therapeutic ultrasound was still found more effective than placebo for pain reduction in the short and long-term based on low quality evidence.[51] Recent RCTs provided support for the use of low-level laser therapy,[52] high-intensity laser,[53] local microwave hyperthermia,[54] and delivery of nonsteroidal anti-inflammatory drugs (NSAIDs) or CSs using therapeutic ultrasound (phonophoresis) [55] for improving pain or function or electrophysiological parameters in CTS. Manipulative therapy has also been suggested as a useful adjunct to traditional treatments in CTS.[56] Additionally, a recent SR demonstrated encouraging evidence for acupuncture for the treatment of CTS.[57] However, a 2012 RCT was not able to show superior effects of acupuncture over placebo acupuncture used with bracing.[58] It should be noted that acupuncture was reported to be the most used complementary and alternative medicine (CAM) treatment in rehabilitation medicine.[59, 60] A significant proportion of PRM specialists and pain management specialists are known to provide acupuncture treatment for their patients,[61] acupuncture being one of the specialized PRM procedures incorporated in PRM residency programmes.[20] Among CAM therapies, mesotherapy, the injection of drugs/substances into the mesoderm, has also a place in the treatment of CTS as well as in some other MSDs.[62]

Considering the findings that both conservative and surgical interventions are beneficial in CTS and surgical interventions may be associated with significantly higher complications when compared to nonsurgical treatments,[63] using nonpharmacological interventions within the scope of PRM as a first line treatment strategy in patients with CTS seems justifiable.

Modifying environmental factors: "Return to work"

MSDs in general are known to cause considerable disability among adults of working age that result in loss of productivity due to weakened work performance, sick leave, and loss of the job.[64] In a study in Finland, among workers with upper extremity disorders, the loss of productivity was reported in 56% of the workers which was associated with personal disease-related factors such as pain intensity, pain interference with work, and fear-avoidance beliefs.[65] An SR identified excessive repetition, awkward postures, and heavy lifting as biomechanical risk factors for work-related MSDs.[66] Therefore, interventions on contextual factors including personal and workplace factors are very important to limit the productivity-associated con-

sequences of MSDs and to facilitate "return to work" of patients with these disorders. It is well known that PRM physicians are not only interested in the management of disability by treating the underlying pathology and by improving body structures and functions, but they are also interested in promoting activities and participation as well as modifying contextual factors including environmental and personal factors with the aim of preserving autonomy and social integration.[18, 22] These task definitions of PRM specialists as well as their training that also covers workplace modification prescriptions [20] impose a significant role on PRM physicians in the aspect of "return to work" in addition to other components of the management of a disease. An educational review indicated that vocational rehabilitation is offered in many departments of rehabilitation medicine and cooperation between different medical specialties as well as between different health professionals within PRM teams are important aspects,[67] multidisciplinary teamwork being emphasized in PRM.[68] Another important information would be that few studies dealt with work-related outcomes until the establishment of rehabilitation medicine, active researchers in work disability area currently being physicians, epidemiologists, vocational rehabilitation experts, and some other allied health professionals as well as health economists and health policy experts as revealed in a review assessing work disability prevention research.[69] It is also noteworthy that in a review on acute MSDs in workers, the management of MSDs by a physician, either a specialist in PRM or a physician specialized in occupational medicine, were found to have a positive impact on work outcomes in all studies evaluated.[70] In a literature review analyzing "return to work" rehabilitation programmes, work environment interventions were identified as an essential component and the significant role of rehabilitation professionals in a multidisciplinary team acting as a link between the injured worker and the employer and other parties in "return to work" process was emphasized.[71] Other practitioners such as primary care practitioners may certainly have a role in evaluating work ability. However, a survey in the US revealed that the work ability assessments of primary care practitioners largely relied on patient input and observations. Direct communication with employers was occasional, 65% requesting only `light duty' or indicating `out of work' and 34% providing detailed descriptions of work restrictions of the patients.[72]

Regarding evidence-based workplace interventions for CTS, a very recent MA brought attention to the increased risk for CTS with exposure to excess vibration (a 5-fold increased risk), hand force (a 4-fold increased risk), repetition or their combination (a 2-fold increased risk) and suggested the implementation of workplace interventions to avoid excess exposure to these activities.[73] A very recent data synthesis paper revealed statistically significant association between high wrist angular velocity and CTS.[74] Another very recent SR provided implications for the importance of psychosocial risk factors such as stress, support, job control or satisfaction for work-related MSDs including CTS.[75] While two relatively earlier SRs were able to demonstrate limited to moderate evidence of effectiveness of ergonomic/modified keyboards when compared to standard keyboards in improving CTS symptoms and/or hand function in patients with CTS,[48, 76] the very recent CR failed to provide sufficient evidence on the usefulness of ergonomic keyboards for CTS.[77] A very recent CR provided evidence for ergonomic interventions for preventing neck/shoulder MSDs (a mouse with arm support); however, this was not the case for other work-related MSDs such as CTS.[78] Given the importance of workplace interventions for CTS, there seems to be a facilitating role for PRM specialists in "return to work" process for the patient with CTS for which there is a need for more high quality research.

In summary, a PRM physician may play a significant role in the management of soft tissue MSDs, as exemplified in a patient with CTS, encompassing proper assessment approaches based on the ICF, instrumental diagnosis including MSUS as well as electrodiagnosis and a wide range of nonpharmacological treatments within the scope of PRM supported by evidence of effectiveness and also extending to environment including the workplace.

The role of PRM physicians in the management of other local soft tissue MSDs and injuries

There are a very wide range of PRM interventions trialled in studies or reflected by expert opinion in the management of the upper and lower extremity soft tissue MSDs and injuries other than CTS. These are outlined in Table II.[6-8, 11, 12, 73, 76, 77, 79-136] This table clearly shows the extent of the contributions of PRM specialists to a patient with a soft tissue MSD or injury.

TABLE II.—*PRM treatment options for local soft tissue MSDs or injuries.*

Soft tissue disorder	PRM interventions
Bursitis of the elbow	Ice, activity modification, and local CS injection.[79]
Lateral epicondylitis	Education, activity modification, wrist orthoses, stretching, massage, ice, iontophoresis, US, [80] taping, PEMF, mobilisation, Mills manipulation,[81] resistance exc.,[82] laser,[83] ESWT,[84] acupuncture,[85] microcurrent therapy, radial SWT, leech therapy,[86] injections (CS, sodium hyaluronate, prolotherapy, botulinum toxin, platelet-rich plasma, autologous blood, glycosaminoglycan, polidocanol).[87]
Medial epicondylitis	Ice, avoiding offending activity, local CS injections, iontophoresis with CS, ROM, stretching, strengthening exc.[88]
Cubital tunnel syndrome	Education (avoid pain provoking activities), nocturnal splints, nerve gliding exc.[89]
Radial tunnel syndrome	Low intensity US, iontophoresis, CS injections, nerve gliding, gentle stretching, strengthening exc., splints, ergonomic interventions (keyboard modifications).[90]
Carpal tunnel syndrome	CS injections[44], splinting, US, laser, magnets, PEMF, tendon, nerve gliding exc., yoga, mobilisation, manual thrusts, massage, heat wrap therapy, cupping therapy,[48] acupuncture,[57] ergonomic keyboards,[48, 76, 77] education on avoiding exposure to excess vibration, hand force, repetition or their combination.[73]
Guyon canal syndrome	Cessation of provocative activities, splinting.[91]
de Quervain's disease	Ice, splinting, physical modalities,[92] CS injections.[93]
Intersection syndrome	Ice, bracing, taping, myofascial release techniques, massage, acupuncture.[6]
Other tendon disorders of the wrist/ hand	Education on avoidance of offending activities, rest, arm and hand support, ice or heat, TENS, US, iontophoresis, local CS injections, myofascial release, deep friction massage, stretching, strengthening exc., workplace modifications.[94]
Ext. retinaculum impingement	CS injections.[7]
Ganglia	Immobilization, rest, aspiration, CS injection.[7]
Dupuytren's disease	Splints, mobilisation,[95] collagenase C. histolyticum, IFN-gamma, CS inj., ESWT.[96]
Trigger finger	CS injections, splinting.[97]
Hand–arm vibration syndrome	Education for keeping away from cold and vibrating tools, work modification, nocturnal splints.[94]
Trochanteric bursitis	CS injections, rest, ice or heat, stretching, strengthening, US, ESWT,[98] home training (piriformis, iliotibial band stretching, gluteal strengthening, straight leg raise, wall squat exercises with ball), radial SWT.[99]
Iliopsoas bursitis	Strengthening, stretching (hip flexors and rotators), myofascial release, proprioceptive neuromuscular facilitation, CS inj. with US guidance.[8]
Femoroacetabular imp.	Sensory motor control, core strengthening exc., physical modalities.[100]
Snapping hip syndromes	Internal type: strengthening and flexibility (hip abduction and external rotation); External type (iliotibial band syndrome): manipulation, a multicomponent programme (neuromuscular exc., electrical stimulation, massage, mobilisation, stretching, shoe modification,[101] advice on running style and surface.[102]
Osteitis pubis	US, cryomassage, progressive exc.,[8] compression, CS inj., prolotherapy.[103]
Sports hernia	Rest, heat/ice, massage, strengthening, stretching (hip adductors), endurance, coordination exc., (trunk/hip muscles), TENS, interferential current, CS, anaesthetic inj., prolotherapy,[104] mobilization/ manipulation for lumbar and hip regions.[105]
Adductor strains	ROM, strengthening, stretching.[8]
Hamstring injuries	PRICE, moist heat, stretching, slump stretching, strengthening, resistance, trunk stability, agility exc., electrotherapy, massage, mobilisation, manipulation of SIJ.[106]
Prepatellar bursitis	Ice, modification of activity, CS inj.[79]
Anserine syndrome	Education on weight loss, rest, cryotherapy, US, TENS, stretching, strengthening exc., CS inj.[107]
Medial collateral ligament injuries	RICE, brace, pain-free quadriceps exc., elbow crutches (acute stage), sliding board/ static bike, weight-bearing exc., rotational stress exc., jogging.[11]
ACL injuries	RICE, elbow crutches, strengthening, proprioceptive neuromuscular training,[11, 108, 109] open, closed kinetic chain exc.,[110] electrical stimulation,[111] educational interventions,[112] platelet rich plasma.[113]
PCL injuries	A brace for 6 weeks for partial tears.[11]
Patellar tendinopathy	Rest, education, eccentric exc., transverse friction mobilisation, stretching, strengthening/resistance training, progressive jumping activities, low level laser, orthotics, taping,[114] platelet rich plasma,[113] CS, polidocanol, lidocaine/ epinephrine inj., squat training, concentric exc., step exc., US, hyperthermia, ESWT.[115]
'Shin splints'	Rest, NSAIDs, ice, electrotherapy, manual techniques,[12] custom-made biomechanical insoles,[116] ESWT[117]
Chronic exertional compartment syndrome	Rest, ice, arch support orthotics (in pes plano valgus), stretching, US, deep tissue massage, myofascial release, strain–counterstrain manipulation.[118]
Calf strains/injuries	Education, measures on non-weight bearing, gentle stretching[12]
Ankle soft tissue impingement	ROM, strengthening, proprioceptive exc., sport specific training, mobilisation techniques, external supports (bracing, taping).[119]
Acute lateral ankle ligament injuries	Immobilisation, compression, ice, ice + exc., functional treatments, exc. therapy, manual mobilisation, US, laser, electrotherapy, short wave therapy,[120] proprioceptive neuromuscular training,[109] manipulation.[121]
Chronic ankle instability	Neuromuscular training, external supports.[122]
Achilles tendinopathy	Rest, cold, electrotherapy, splints, strengthening, stretching, massage,[12] eccentric- concentric exc., ESWT, laser, microcurrent therapy, US, in-shoe orthoses,[123, 124] platelet rich plasma.[113]
Achilles tendon rupture	Cast immobilisation, electrotherapy, ROM exc., strengthening,[12] orthotics.[125]
Achilles bursitis	Ice, education on activity modification.[79]
Plantar fasciitis	CS inj., customised foot orthoses,[126] dry needling,[127] manual therapy,[121] taping,[128] ESWT,[129] botulinum toxin.[130]
Delayed onset muscle soreness	Cryotherapy, stretching, low intensity exc., massage,[131] hydrotherapy (cold/contrast water),[132] acupuncture,[133] microcurrent,[134] interferential therapy,[135] whole body vibration.[136]

ACL: anterior cruciate ligament; CS: corticosteroid; Exc.: exercise; ES: electrical stimulation; ESWT: extracorporeal shock wave therapy; PCL: posterior cruciate ligament; PEMF: Pulsed electromagnetic fields; PRICE: protection, rest, ice, compression and elevation; ROM: range of motion; SIJ: sacroiliac joint; TENS: transcutaneous electrical nerve stimulation; US: ultrasound

TABLE III.—*Systematic reviews providing evidence for the effectiveness of PRM interventions in local soft tissue MSDs and injuries.*

Soft tissue MSD/injury	PRM intervention	Evidence of effectiveness	Author, year (ref.)
Lateral epicondylitis	Ultrasound, PEMF, deep friction massage, mobilisation, exercise	Effective in the intermediate and in the long-term with medium-to-large effect sizes when compared with CS injections	Barr *et al.*, 2009 [81]
	Resistance exercises	Substantial pain and grip strength improving effects	Raman *et al.*, 2012 [82]
	Low-level laser therapy	Effective on pain, grip force, ROM	Chang *et al.*, 2010 [83]
	ESWT	Little or no benefit	Buchbinder *et al.*, 2006 [84]
	Acupuncture	Possible pain relief with needle acupuncture	Green *et al.*, 2002 [85]
	Injection therapies (comparison)	CS inj. effective up to 8 weeks; botulinum toxin with marginal benefit; platelet-rich plasma, autologous blood, hyaluronic acid, prolotherapy superior to placebo; glycosaminoglycan, polidocanol (no effect vs. placebo)	Krogh *et al.*, 2013 [87]
Cubital tunnel syndrome	Education on avoiding some movements, positions	Effective in reducing subjective discomfort	Caliandro *et al.*, 2012 [89]
Carpal tunnel syndrome	CS injections	Effective for symptom relief in the short term	Marshall *et al.*, 2007 [44]
	Ultrasound, PEMF, splinting, cupping therapy, ergonomic keyboards	All effective in the short term, ultrasound effective in midterm as well	Huisstede *et al.*,2010 [48]
	Exercise and mobilisation	Evidence on beneficial effects (limited and very low quality)	Page *et al.*, 2012 [49]
	Splinting	Night splinting effective than no treatment in the short term	Page *et al.*, 2012 [50]
	Therapeutic ultrasound	More effective than placebo for improvement in symptoms	Page *et al.*, 2012 [51]
	Ergonomic interventions	Ergonomic keyboards helpful in reducing pain (insufficient evidence)	O'Connor *et al.*, 2012 [77]
	Acupuncture	Encouraging evidence for effectiveness	Sim *et al.*, 2011 [57]
de Quervain's disease	CS injections	Relieve pain when compared to a thumb spica splinting	Peters-Veluthamaningal *et al.*, 2009 [93]
Dupuytren's disease	Collagenase C. histolyticum, IFN-gamma, CS inj., and ESWT	Benefits on increasing ROM, contractile force, decreasing the need for surgery, and prevention of progression, respectively	Mafi *et al.*, 2012 [96]
Trigger finger	CS + lidocaine injections	Effective than lidocaine alone for pain (silver level evidence)	Peters-Veluthamaningal *et al.*, 2009 [97]
Trochanteric bursitis	CS injections	Beneficial in symptom relief and return to activity	Lustenberger *et al.*, 2011 [98]
	Low-energy ESWT	Superior to other nonpharmacological approaches	
	Strength, stretch, squat exc., radial SWT	Beneficial effects with almost 80% success rate in the long term	Del Buono *et al.*, 2012 [99]
Iliotibial band syndrome	Hip strengthening exc., mobilisation, advice on running style, shoes, surface	May be beneficial for runners	van der Worp *et al.*, 2012 [102]
Osteitis pubis	CS inj, physical therapy (exc., compression), prolotherapy	58.6% (CS), 91.7% (exc.), and 97.6% (prolotherapy) of athletes returning to sports in a mean of 8, 9, 9.55 weeks, respectively	Choi *et al.*, 2011 [103]
Hamstring injuries	Trunk stability, agility, stretching exc.	Limited evidence for a favourable effect	Reurink *et al.*, 2012 [106]
ACL injuries	Proprioceptive neuromuscular exc.	Effective in improving function and decreasing recurrence	Zech *et al.*, 2009 [109]
	Open and closed kinetic chain exc.	Favourable results	Glass *et al.*, 2010 [110]
	Electrical stimulation + exc.	Improves quadriceps strength and function after surgery	Imoto *et al.*, 2011 [111]
	Neuromuscular, educational approach	Prevention: ~ 50% reduction in incidence rate	Gagnier *et al.*, 2013 [112]
	Platelet rich plasma	Potential efficacy in improving pain and function	Taylor *et al.*, 2011 [113]
Patellar tendinopathy	1. Eccentric exc., 2.heavy slow resistance exc,3.sclerosing injections, 4. ESWT	Strong evidence for the efficacy of the first, moderate for the second, limited evidence for the third and fourth interventions	Larsson *et al.*, 2012 [115]
	Platelet rich plasma	Significant improvements in pain and quality of life	Taylor *et al.*, 2011 [113]
'Shin splints'	Insoles	Effective in reducing symptoms in military recruits	Yeung *et al.*, 2011 [116]
Acute lateral ankle ligament injuries	Ice, ice + exercise	Short term effect on pain and swelling	Kerkhoffs *et al.*, 2012 [120]
	Compression	Conflicting evidence of effectiveness	
	Immobilisation	10 days of plaster or similar rigid support reduces pain and swelling	
	Functional treatments	A lace-up or a semirigid brace or taping recommended; braces associated with return to work and sports at a shorter time	
	Exercise therapy	Prevents recurrence in the long term (up to one year)	
	Manual mobilization	Limited favourable outcomes in the short term	
	Ultrasound, laser, electrotherapy, SWT	Ineffective	
	Manipulative therapy	B level of evidence for short term effectiveness; C for long term	Brantingham *et al.*, 2012 [121]
	Neuromuscular training	Efficacious in improving function and decreasing recurrence	Zech *et al.*, 2009 [109]

TABLE III.—*Continues from previous page.*

Soft tissue MSD/injury	PRM intervention	Evidence of effectiveness	Author, year (ref.)
Chronic ankle instability	Neuromuscular training	Promotes ankle function	de Vries *et al.*, 2011 [122]
Achilles tendinopathy	Eccentric loading exercises± laser, ESWT	Strong evidence of effectiveness; significant effects of adding laser	Rowe *et al.*, 2012 [123]
	Active rest, bracing, concentric exc.	Moderate evidence of effectiveness	Sussmilch-Leitch *et al.*, 2012 [124]
	Microcurrent ES, US, in-shoe orthoses	May be effective (limited evidence)	
	Platelet rich plasma	Showing promise	Taylor *et al.*, 2011 [113]
Achilles tendon rupture	Conservative vs. surgical treatment	ST: reduced risk of rerupture, shorter time for sick leave, increased complications; No difference in return to sports; Insufficient evidence of difference in functionality	Jiang *et al.*, 2012 [137]
	Orthotics, ROM exercises	Unclear evidence for in-shoe flexible carbon fibre or rigid rocker-bottom orthoses. Unclear evidence for ROM exc.	Kearney *et al.*, 2012 [125]
Plantar fasciitis	CS injections, customised foot orthoses	Effective in reducing pain	Uden *et al.*, 2011 [126]
	Dry needling and injections of MFTPs	Limited evidence of effectiveness	Cotchett *et al.*, 2010 [127]
	Manipulative therapy	B level of evidence for short term effectiveness	Brantingham *et al.*, 2012 [121]
	Taping	Reduction in pain in the short term (limited evidence)	van de Water & Speksnijder, 2010 [128]
	Focused shock wave therapy	Medium and high-intensity with higher pain reduction	Chang *et al.*, 2012 [129]
	Radial shock wave therapy	Seems a better therapy	
	Botulinum toxin type A	Effective on pain reduction	Zhang *et al.*, 2011 [130]
Delayed onset muscle soreness	Cryotherapy, stretching, low intensity exercise, massage	Favourable effects only for massage on symptom relief; insufficient evidence to support the use of others	Torres *et al.*, 2012 [131]

C: clostridium; CS: corticosteroid; ES: electrical stimulation; ESWT: extracorporeal shock wave therapy; Exc.: exercise; IFN: interferon; MFTPs: myofascial trigger points; PEMF: pulsed electromagnetic fields; ST: surgical treatment; US: ultrasound

It should be noted that not all of the interventions listed in Table II are evidence-based. It is the Table III which demonstrates an overview of the evidence on the effectiveness of interventions within the scope of PRM in patients with soft tissue MSDs and injuries based on the latest SRs and/or MAs.

PRM assessments/interventions in lower extremity soft tissue MSDs or injuries, discussed not in a narrative way but given in tables in a "just to the point" approach, need more emphasis in two areas which are posture and movement analysis and orthoses.

Movement analysis not only allows us to understand injury mechanisms, but also helps us to identify undetected pathologies by routine clinical assessment particularly for those in the knee and ankle in athletes and may result in new insights in the prevention and treatment of sports injuries.[138] Supporting this notion, a recent trial showed postural sway deficits in ACL injuries which continued after ACL reconstruction.[139] Two trials stressed the necessity of walking and/or running gait assessment based on the detection of altered foot mechanics with these assessments in persons with lower extremity injuries [140] as well as in those with chronic ankle instability,[141] implying consideration of appropriate interventions such as orthotics prescription.

Regarding orthoses, knee braces are frequently used with the aims of preventing, rehabilitating, and improving function in those with knee ligament injuries. While there was some patient-reported evidence for functional orthoses for stability improving purposes, evidence lacked for the efficacy of preventive or rehabilitative knee braces.[142] However, later CR based evidence suggested better efficacy of custom-made insoles than no insoles for shin splints occurrence reduction.[116] An RCT pointed to beneficial effects of a water-filled soft brace on knee extension, effusion, and swelling after ACL reconstruction when compared to a hard brace.[143]

Conclusions

Soft tissue MSDs and injuries are challenging to treat and PRM specialists may play a significant role in the treatment of these conditions. It is obvious that the competencies of PRM physicians in assessing, diagnosing, and treating their patients with lo-

cal soft tissue MSDs and injuries in interaction with the environment, an aspect that is unique to the medical specialty of PRM, and the already available evidence of effectiveness of interventions within the scope of PRM well place them in the management of these types of disorders. It may be important for the patients to receive comprehensive care at a single specialty in terms of time and costs as well as for maximizing benefits of the diverse interventions including a wide range of pharmacologic, rehabilitative, and psychosocial interventions provided in a continuum by one hand. The skills, aptitudes, and competencies of PRM specialists in the management of soft tissue MSDs that step forward include the use of instruments such as MSUS and EMG in addition to a variety of specific tools for diagnosis, practical procedures such as injection therapies, other pain therapies including a wide range of physical agents/modalities, manual techniques, and exercise for improving physical function as well as education, psychosocial interventions, and occupational therapy/vocational rehabilitation and most importantly their focus on measurement of functional restrictions to provide necessary measures for successful activities and participation and thereby promoting quality of life.[16, 17, 144]

Action plan and recommendations

The role that PRM specialists may play for the best care of patients with local soft tissue MSDs and injuries is described thoroughly in the previous sections of this paper. However, it may not be possible that all PRM physicians are at the same competence level in providing all diagnostic and treatment approaches covered in this paper due to the huge breadth of the medical specialty of PRM, compelling some PRM specialists to be competent in certain areas of practice and not in all areas. Moreover, basic education and training of the PRM specialist, which forms the basis of professional practice as in every specialty,[145] may be the most important influencing factor in this aspect. Therefore, there is a need for harmonizing training in PRM. To meet this need, the PRM Section and Board, the official body of the Specialist Section of the UEMS is putting great efforts in defining the basic elements of a training programme in PRM throughout Europe for providing required knowledge and technical competence available to PRM physicians European-wide and harmonizing training to this end in order to ensure common provision of PRM care.[146, 147] Continuous medical education/continuous professional development (CME/CPD) is another influencing factor for competencies of PRM physicians. However, there are also differences regarding CME/CPD activities in European countries, certain CME credits per a certain period for PRM specialists being mandatory in some but not in others that points to the need where there is the same assessment system of CME/CPD activities of the PRM specialists for enabling a more balanced recognition of the competencies of each PRM specialist.[148]

Other factors that may influence skills, aptitudes, and competencies of PRM specialists at the mesolevel include facilities, programmes, settings in which they work and equipment that may also vary from country to country as well as from setting to setting.[145] For example, PRM services for MSDs may be excellent in one facility while neurological rehabilitation in another. As another example, lack of equipment, i.e. MSUS, in a facility may be a barrier for diagnostic procedures. If these issues are dealt with satisfactorily, it will be possible to expect similar approaches for the best possible care of patients with soft tissue MSDs and injuries from the majority of PRM specialists who are interested in treating patients with these disorders.

Additionally, PRM specialists should be aware of the evidence of effectiveness of interventions within the scope of PRM already available to them through SRs and/or MAs. SRs are well known as the cornerstone of evidence-based practice, SRs with homogeneity of high quality RCTs at the top in the hierarchy of best research evidence.[149] Considering the findings that physicians in general (not specific to PRM specialists) may fail to integrate evidence-based medicine (EBM) into their clinical practice to a large extent despite their satisfactory knowledge and considerable positive approaches, as revealed in a survey in Italian physicians,[150] PRM specialists should be encouraged in knowledge translation obtained particularly from SRs and/or MAs into practice for the best care of their patients. The incorporation of EBM into training programmes in PRM is considered a priority[151] and the promotion of EBM in PRM is in the action plan of UEMS PRM Section and Board.[146, 147] Ongoing efforts of the official journal of the European Society of PRM, the European Journal of PRM, for providing evidence-based practices [152]

with continuous updating of CRs in rehabilitation [153] are noteworthy.

Furthermore, there is also a need for more rigorous research for developing additional reliable evidence of the effectiveness of PRM management and treatment strategies in the era of EBM [154] in all conditions with which PRM specialists deal including those associated with MSDs in the framework of the ICF that allows us inter-/multi-/ transdisciplinary research options in distinct fields that range from human functioning sciences to professional rehabilitation sciences.[155]

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Shoulder pain management

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Shoulder pain management. The role of physical and rehabilitation medicine physicians. The European perspective based on the best evidence

A paper by the UEMS-PRM Section Professional Practice Committee

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One of the objectives of the Professional Practice Committee (PPC) of the Physical and Rehabilitation Medicine (PRM) Section of the Union of European Medical Specialists (UEMS) is the development of the field of competence of PRM physicians in Europe. To achieve this objective, UEMS PRM Section PPC has adopted a systematic action plan of preparing a series of papers describing the role of PRM physicians in a number of disabling health conditions, based on the evidence of effectiveness of the physical and rehabilitation medicine interventions. According to the PCC of the UEMS-PRM Section, the role of PRM physician in the management of shoulder pain (SP) has to be situated inside the general pain management field. SP is a common condition that can place limitations on the activity and restriction in social life participation of sufferers. A variety of shoulder problems, commonly including subacromial impingement, calcifying tendinitis, frozen shoulder, acromio-clavicular disturbances, gleno-humeral instability and gleno-humeral arthritis, can cause pain, and patients should be assessed and treated in order to relieve symptoms and reduce disability. This position paper describes the role of the PRM specialist in the management of such patients. Many assessment methods and treatment interventions are usually used in the management of patients with SP. Depending on the process, disability and patient characteristics, some intervention modalities have reported evidence in pain relief, movement and daily life activity (DLA) restoration, thus permiting a patient early recovery and social participation. Oral medications, local injections, physical therapy modalities and exercises are normally used for the management of SP. The PRM specialist should, always use this best medical evidence to decide how to efficiently and effectively reduce SP-related disability. An adequate therapeutic algorithm is also proposed in order to channelize the above mentioned evidence and reach the best results.

KEY WORDS: Shoulder - Shoulder pain - Soft tissue injuries - Physical therapy modalities - Physical and rehabilitation medicine.

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Shoulder pain (SP) is a cause of disability in many people with musculoskeletal problems, commonly imposing important limitations on their

TABLE I.—*Musculoskeletal disturbances that can cause shoulder pain.*

Subacromial syndrome
Frozen shoulder
Rotator cuff tendonitis and tear
Calcifying tendonitis
Biceps large portion tendonitis and tear
Gleno-humeral instability

activities and participation in different areas of life. Almost 50% of the population suffers from SP at least once a year.[1] The prevalence of SP accompanied by disability is approximately 20% in the general population over 70 years of age [2] about 1.2% of all patients who visit their doctor. Prospective studies in Europe have shown that approximately 11 out of every 1000 patients seen by a general practitioner (GP) have SP.[1, 2] Over 50% of patients diagnosed by a GP to have shoulder tendinitis are referred for physical therapy.[3] After low-back and neck pain, SP is the third cause of disability of musculoskeletal origin.[4] Musculoskeletal disorders such as subacromial syndrome (SS), frozen shoulder (FS) and gleno-humeral instability (GHI), etc., can all cause SP (Table I).[5, 6] The physical and rehabilitation medicine (PRM) specialist/physician is well placed to prevent, assess, treat and follow-up many of the problems in the acute, post-acute or chronic phase, and thus help the affected patient be more socially active.[7]

Depending on the Country, a GP, a PRM specialist, an orthopaedic surgeon or a rheumatologist, etc., might be the first to examine a patient suffering from SP. However, the PRM specialist should become involved as soon as possible, even when the process is in the acute phase,[8] and should continue to provide care during the post-acute and long-term phases.

Role of the PRM specialist in the assessment of shoulder disability

The role of the PRM specialist in the assessment of all disabilities is well documented by the *White Book of Physical and Rehabilitation Medicine in Europe*, published by the UEMS-PRM Section and Board, and the European Academy of PRM.[7]

Pain, reduced range of motion (ROM) and weakening are the most common symptoms of shoulder problems. However, the manifestation of this health condition, and its associated functional limitation, may vary from patient to patient. Different pathologies may also coexist, further compounding the difficulty of coming to a diagnosis. It is therefore important to independently quantify the consequences that a patient's symptoms may have on his or her activities and participation in normal life.[9]

TABLE II.—*Some clinical assessment maneuvers for SP.*

Neer test	Sub-acromial impingement
Sprinter test	Sub-acromial impingement
Palm-up-test	Bicipital tendinitis
Jobe test	Supraspinatus tendinitis
Dropping-sign test	Infraspinatus tendinitis
Lift-of test	Subscapularis tendinitis
Patte test	External rotators test
Press belly test	Internal rotators test
Anterior apprehension test	Anterior capsular instability
Positive re-centration test	Anterior capsular instability
Sulcus test	Inferior capsular instability
Posterior apprehension test	Posterior capsular instability

A range of clinical tests should be performed by the physician to better identify the exact cause of SP,[10] including the palm-up, Jobe, Patte, dropping sign, lift-off, belly press, apprehension, recentration, and sulcus tests, etc. (Table II). Shoulder assessment scales are normally used to describe the "total shoulder disturbance" independent of the diagnosis. These scales mainly assess pain, ROM, muscular strength and overall function.[11-13]

Pain is a subjective symptom that has to be objectively quantified during patient assessment. Different factors should be assessed, including dosage of medication needs, the presence of nocturnal pain, and interferences in sport, work or daily life activities (DLA).

The patient's ROM should be assessed both passively and actively: active shoulder elevation from the sitting position, passive shoulder elevation from the "lying face-up" position, active and passive internal rotation depending on the point on the back reachable by the patient's thumb, and passive and active external rotation (first with the arm beside the trunk and then with 90° of shoulder abduction).[14]

The most common method for strength assessment is the manual muscle testing (which provides a score of 0 to 5); the patient's age, gender and mor-

photype should, of course, be taken into consideration in such testing.[15]

Shoulder functional assessment scales

To determine the functional capacity of the shoulder, and the patient's limitations and restrictions, a list of functional activities should be examined. The PRM specialist should select the most useful scale in each case and follow-up the patient's clinical evolution during treatment.[16, 17] While some such examinations are more general, others are more specific (Table III). Some can easily be completed by the patient alone.

The Simple Shoulder Test

This involves asking the patient 12 questions concerning performance in DLA.[18, 19] Some researches suggest that the Simple Shoulder Test (SST) may be too imprecise for following the evolution of some patients with very low or very high scores.[20, 21]

The Shoulder Rating Questionnaire

This includes 6 separately scored domains: global assessment (assessed using a visual analogue scale), pain, DLA, recreational and athletic activities, work, and satisfaction.[22] A final non-graded question allows the patient to indicate the two domains in which he believes improvement is most significant.

The Shoulder Pain and Disability Index

This is a self-administered questionnaire that analyses the severity of pain and the difficulty of performing various functional activities requiring the use of the arms. However, some limitations of the scale have been described.[20, 23, 24]

The Constant-Murley Shoulder Assessment Scale

This scale is widely used and has the advantage that it can be employed to examine all shoulder processes (except for shoulder instability).[25] It involves both patient-completed and clinical components. The former include the assessment of pain and the ability to perform DLA or gestures. A modified version of the The Constant-Murley Shoulder Assessment Scale (CSA) has recently been proposed.[26] However, the overall reliability of the score has been reported as low.[27] The CSA shows a high correlation (R^2>90) with the Shoulder Severity Index (SSI) of Patte.[28]

TABLE III.—*Some shoulder functional assessment scales.*

Simple shoulder test	General scale
Shoulder-Rating Questionnaire	General scale
Shoulder Pain and Disability Index	General Scale
Constant-Murley Scale	Shoulder specific scale
American Shoulder and Elbow Index	Shoulder specific scale

TABLE IV.—*Basic goals for painful shoulder rehabilitation.*

Pain relief and inflammation reduction
Movement preservation and restoration
Muscular strengthening
Functional restoration

The American Shoulder and Elbow Surgeons' Shoulder Assessment Form

This involves a self-evaluation and a clinical examination. The clinical examination assesses shoulder motion (active and passive), signs, strength and instability.[29]

Complementary diagnostic methods

These may be necessary for the PRM specialist to complete the assessment of the patient, including X-rays, ultrasound imaging, magnetic resonance imaging or CT scans. In some cases, scintillation scanning might be necessary, as well as an EMG to check for any cervical or local neuropathy.[30-33]

The rehabilitation process

The rehabilitation process relies on the continued clinical assessment of the patient, and complementary diagnostic methods when needed.

The aims of the PRM specialist should be clear from the first stage of the rehabilitation process. The work of an interdisciplinary team involving physiotherapists and occupational therapists is often needed, which the PRM specialist is well placed to lead.[7, 34] Sports exercise, under medical supervision, may be needed to increase strength and endurance.

Some basic goals should be considered (Table IV).

Pain relief and reduction of inflammation

Pain relief is one of the most important goals of the PRM specialist in shoulder disturbances. Upper limb rest, modifications to DLA, oral medication, local injections, iontophoresis, and physical therapy modalities of pain reduction, etc., should be prescribed as soon as possible. Cryotherapy, massage, infrared, ultrasound or transcutaneous electrical nerve stimulation (TENS) are the most commonly used physical modalities for reducing pain and inflammation.[35]

Movement preservation and restoration of the postural trunk muscle to restore scapulo-humeral rhythm

Once the inflammation has been reduced, the PRM specialist should prescribe therapeutic exercise to stretch the soft tissues. Such exercises should include passive and assisted shoulder movements, plus joint capsule stretching if needed. Shoulder mobilization should always be performed within the painless ROM.[36]

Muscular strengthening and endurance

This can be achieved by active, static and dynamic exercises, as well as by electrical stimulation.[36]

Functional restoration

This is the final objective of the rehabilitation process. The goal of the PRM specialist is, through the use of a variety of interventions, to enable the patient's DLA and social participation without restriction.[37]

Evidence-based medicine regarding interventions for SP

Numerous rehabilitation interventions are available for the management of SP, including oral medication, local injections, physical modalities, and therapeutic exercises.[3]

Physicians may follow many different approaches for treatment, probably because of the uncertainty surrounding the efficacy of many interventions.[38] Further, the interpretation of SP research is complicated due to the broad inclusion criteria followed in many studies, which allow for mixed samples of SP of different aetiology.[39]

Oral medication

The short-term effectiveness of non-steroidal inflammatory drugs (NSAIDs) over placebo has been reported.[3, 40, 41] Side effects of NSAID administration can be taken into account.[42] Systemic corticosteroids can only be used in the early phase of SP, for short periods.[43]

Local injections

Subacromial infiltrations are reported to be effective in the treatment of SS and rotator cuff disturbances, but no more so than oral NSAIDs. Intra-joint infiltrations plus physiotherapy have been found more effective in the treatment of SP than physiotherapy alone.[44, 45]

Suprascapular nerve block (SSNB) has been shown effective as an analgesic for FS.[46, 47] It is more effective when performed in conjunction with a rehabilitation program.[48] It provides an attractive choice for pain relief and allows physiotherapy to be performed in subjects suffering from sharp SP.[49]

Physical modalities

Laser therapy has been reported to be more beneficial than placebo administration for FS, at least in the short-term, as well as for SS. However, no differences were seen between laser+physiotherapy and placebo+physiotherapy.[43]

In terms of pain relief and ROM recovery, ultrasound therapy has not been shown more effective than placebo treatment in patients with subacromial impingement syndrome, and in those with calcifying tendonitis.[3] However, other studies have reported it to be beneficial in these conditions.[50, 51]

Extracorporeal shock wave therapy (ESWT) is effective in patients with calcifying tendinopathy of the rotator cuff. Most studies report it to provide significantly better results in terms of shoulder function, pain and size of calcifications. Haake *et al.*[52] underline the need for accurate focusing. The treatment was found to be highly effective when accurately focused using fluoroscopic guidance. In a systematic review, Mouzopoulus *et al.* concluded that better clinical results, including

pain relief and deposit resorption, are associated with the use of high energy levels.[53] A more recent review, based on 54 randomized clinical trials, found that both high-energy ESWT and radial SWT to be effective in treating chronic rotator cuff syndrome with calcium deposits.[54] The duration of effectiveness is some 2-3 years, with a better response seen in patients with grade II disease according to the Gartner classification (inhomogeneous calcification with a sharp outline or homogeneous with no defined borders), in whom the results are comparable to those achieved by surgery.[55] Radial SWT is also effective: in one study, calcification disappeared completely in 86.6% of patients thus treated, compared to just 8.8% (who showed only partial resorption) in the control group.[56] In a recent study, Galasso [57] reported good results with low intensity SWT.

Iontophoresis with acetic acid for the treatment of calcifying tendonitis has been reported not to be superior to control group.[51]

TENS, superficial local heat, or deep local heat, as well as local cold, may be beneficial for pain relief and muscle relaxation before and after exercise, however ultrasound, laser and interferential therapy have not proved to be effective as adjuvants to exercise therapy in SP.[1-3, 59, 60]

No significant differences between acupuncture and placebo,[61] in the treatment of rotator cuff disturbances, have been reported; although in some trials very small short-term improvements were seen with this technique.[62]

Therapeutic exercise

It lies at the heart of conservative treatment.[59] A systematic review (SR) concluded exercise to be the only demonstrated effective treatment for improvements, in this disease process.[61] Another SR,[63] concluded that physical exercise improves many symptoms, including pain, the limitation of function, lack of strength and ROM.

One controlled trial, compared exercise with arthroscopy and placebo laser.[64] Those treated with arthroscopy or exercise improved significantly over those administered the placebo. Haar *et al*.[65] reported a high quality trial that compared arthroscopy with exercise programs in patients who had suffered SS for more than six months. Both groups improved significantly, with no significant differences observed between them over the 12 month follow-up period. Thus, exercise programs, if well designed, can lead to improvements similar to those achieved with surgery in SS.

Another study [66] showed it is better to have patients perform simple exercises at home, with periodic medical checks, than to have patients follow a course of intensive physiotherapy.

Choosing the right PRM program

Subacromial impingement

Studies have documented the universal presence of degenerative changes and conditions, including full avulsions without symptoms.[6] During the acute phase of the associated SP, relative rest is necessary to avoid damage to healthy anatomical structures. Rest has to include restriction of all damaging activity, such as avoidance of all arm elevation above head level. Slings are not recommended since they could encourage FS. Medication can be prescribed for short periods of time. In some cases, local injections can be administered if pain is severe and not relieved by pain-killers or NSAIDs after several days or weeks.[39] Self-passive exercises, such as Codman exercises, should be prescribed soon after injury in order to maintain ROM.[67] Once the acute pain has been relieved or diminished, specific exercise programs are recommended with passive and assisted physiotherapy to maintain or improve the ROM. Later, a resisted physiotherapy program should be prescribed to strengthen the rotator cuff muscles and thus improve humeral head stability. The patients should also be prescribed scapula stabilizer muscle strengthening.[68] If pain or other symptoms cannot be controlled, surgery may have to be considered. Younger patients with rotator cuff tear respond better to surgery than older patients.[59]

Acromio-clavicular disturbances

Treatment consists basically of analgesic medication and activity modifications, such as avoiding all repetitive activities involving maximal horizontal adduction of the arm and elevation over head level. Physiotherapy with the aim of maintaining shoulder ROM is important, as is muscle strengthening. The injection of corticosteroids into the acromio-clavicular joint can be of great help. If PRM treatment fails, surgery should be considered.[67]

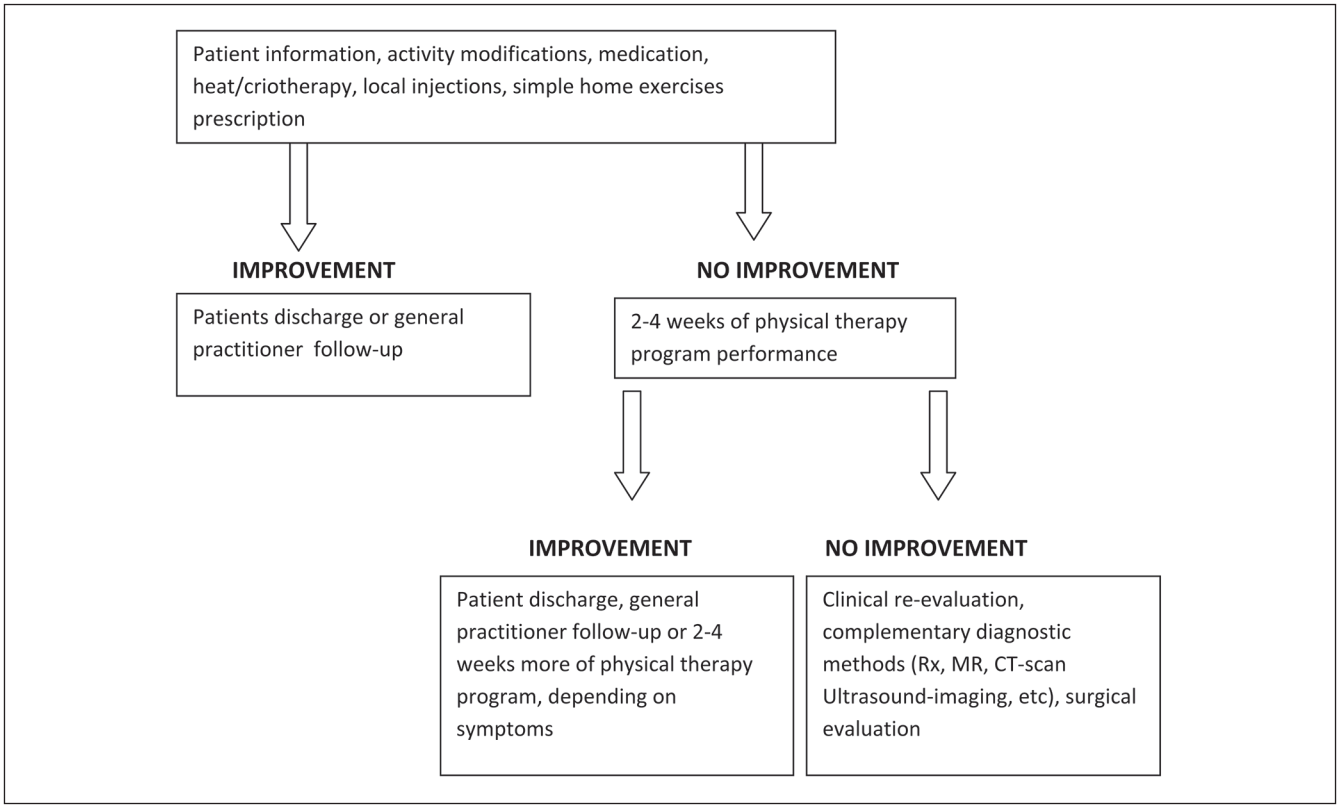

Figure 1.—Therapeutic algorithm. Modified from Nuevo-Vega S., 2004.[74]

Calcifying tendinitis

Ultrasound therapy has been shown to bring pain relief and functional improvement within two months of treatment. Reductions in calcification have also been observed.[39] Shock waves have been used with good effect in pain relief and the reduction of calcification.[52-58]

Frozen shoulder

PRM treatment depends on the stage of the disease. Pain should be relieved by medication. Intra-articular cortisone up to three or four times, with 10-14 day intervals between injections, can be very effective in pain relief, if no contraindication is present. Local injections may allow physiotherapy to be started early. A specific exercise program should be prescribed as soon as possible, starting by stretching of the joint capsule, joint mobilization and active movement within the ROM. Later, muscle strength recovery exercises should be considered. Treatment can last eight weeks or more, especially in patients with diabetes or hypothyroidism. Spontaneous recovery after 18 months may occur.[69]

Gleno-humeral instability

Muscle strengthening prevents gleno-humeral dislocations during DLA. This can be useful in patients with lax joints. The aim of PRM treatment is to strengthen the stabilizing muscles. When there is anterior instability, the specific muscles for strengthening include the internal rotator and adductors (pectoralis major, subscapularis, latissimus dorsi and teres major); when there is posterior instability, the external rotators, *i.e.*, the posterior deltoideum, infraspinatus, and teres minor, are the main muscles to be exercised. Results depend on patient age as well as the type of instability. In some cases, surgery should be considered.[70-73]

Gleno-humeral arthritis

Treatments include medication, activity modification and exercises to maintain the ROM as well as strength.[10, 36, 39]

The PRM specialist's therapeutic algorithm

As mentioned above, patients suffering from SP may first be seen by a PRM specialist, an orthopaedic surgeon, a rheumatologist or a GP, depending on the Country and medical centre. According to some authors,[74] several intervention stages need to be passed through for the best results to be achieved (Figure 1). After patient assessment, the first stage is the provision of information to the patient, the prescription of medications and/or local injections, the recommendation of activity modifications, and the performance of simple home exercises. Should disability diminishes, the patient can be referred to a GP or even completely discharged. If symptoms do not improve, or worsen, evidence-based physical therapy (therapeutic exercises and/or physical modalities) should be prescribed for a period of some weeks. Should the patient improves, physical treatment can be continued for some further weeks, depending on syptoms, after which the patient could be discharged to a GP follow-up or even to home. If symptoms do not regress and disability persists or worsens, the patient should be clinically re-evaluated and complementary diagnostic methods be considered (X-rays, ultrasound-imaging, magnetic resonance imaging, CT Scan, EMG, etc.). In such cases, surgery should be considered.[75]

Conclusions

Shoulder pain is a cause of disability in many people with musculoskeletal problems, commonly imposing important limitations on their activities and participation in different areas of life. Even though treatment can differ according to the different health conditions, patient symptoms, as well as the level of disability, age, etc., after first diagnosis and from the first stages of the pathology, it is important to relieve pain, protect/increase ROM and maintain DLA. Following this line of action in evidence based medicine (Table V), oral mediction, local injections, simple home exercises, DLA modifications, etc have to be prescribed and supervised when necessary. If symptoms do not improve or worsen, then applications of physical modalities and therapeutic exercises have to be considered, followed by patient re-evaluation.

The PRM specialist has a key role to play in the care of patients suffering from any kind of disability caused by SP. His job is to identify the best medical evidence to guide, assess, treat and rehabilitate the patient. It should be remembered that some patients suffering from SP are at greater risk of further disability, and would benefit from the early intervention of the PRM specialist.

TABLE V.—*Summary of evidence.*

- — Non-steroidal antiinflammatory drugs are effective in the short term [3, 40-41]
- — Systemic corticosteroids can be used in the early phase for short periods [43]
- — Subacromial infiltrations are effective in the treatment of SS and rotator cuff disturbances [44, 45]
- — Suprascapular nerve block has been shown effective as an analgesic for FS.[46, 47] Effectiveness increases when performed with a rehabilitation program [48]
- — Laser therapy is more beneficial over placebo for FS & SS, in the short-term [43]
- — Some studies have reported ultrasound therapy to be effective for subacromial impingement and calcifying tendinitis,[50, 51] but others have not [3]
- — ESWT is effective in patients with calcifying tendinopathy of the rotator cuff,[54, 55] especially when performed using fluoroscopic guidance [53]
- — Both, high-energy ESWT and radial SWT are effective for chronic rotator cuff syndrome with calcium deposits [54]
- — Therapeutic exercise improves many symptoms: pain, functional limitation, lack of strength and ROM [59, 61]
- — Therapeutic exercise programs, if well designed, can lead to improvements similar to those achieved with surgery in SS [65]
- — Simple home exercises performance with periodical medical checks could be more effective than intensive physiotherapy [66]

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Musculoskeletal Disorders Management and the Role of Physical and Rehabilitation Medicine Physicians. The European Perspective Based on the Best Evidence.

Musculoskeletal perioperative problems

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Musculoskeletal perioperative problems. The role of physical and rehabilitation medicine physicians. The European perspective based on the best evidence.

A paper by the UEMS-PRM Section Professional Practice Committee

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One of the objectives of the Professional Practice Committee (PPC) of the Physical and Rehabilitation Medicine (PRM) Section of the Union of European Medical Specialists (UEMS) is the development of the field of competence of PRM physicians in Europe. To achieve this objective, UEMS PRM Section PPC has adopted a systematic action plan of preparing a series of papers describing the role of PRM physicians in a number of disabling health conditions, based on the evidence of effectiveness of the physical and rehabilitation medicine interventions. According to the UEMS-PRM section, the role of PRM physician in musculoskeletal perioperative settings has to be situated inside general pain management. Musculoskeletal surgery (MSS) represents a frequent medical situation among patients suffering from musculoskeletal disorders (MSDs), in which PRM physicians need to be involved. A wide number of MSDs have to be operated in order to diminish disability and relieve symptoms, thus improving the patient´s functioning and social participation: Joint replacements, spine decompressions, vertebroplasties, internal fixation of unstable fractures, arthroscopies for tendon and joint repairs, and others. This paper describes the role of the PRM physician during the perioperative period. A well-coordinated rehabilitation programme followed by a good home rehabilitation programme results in pain reduction, faster recovery with better patient participation and increased cost effectiveness. PRM physicians have to identify patients at risk of continuing activity limitation and participation restriction who will benefit from an early rehabilitation process and formulate a PRM programme of care taking into account each patient's environmental factors.

KEY WORDS: Musculoskeletal system - Surgical procedures, operative - Arthroplasty - Physical therapy modalities - Pain management - Physical and rehabilitation medicine.

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Musculoskeletal surgery (MSS) represents an important therapeutic intervention for many people with musculoskeletal disorders (MSDs).[1] For all types of joint replacements, arthroscopies for tendon and joint repairs, internal fixation of unstable fractures, soft tissues surgery, body deformities operations, spine surgery, and so forth, MSS offers the potential for better functioning and social participation, relieving disability by alleviating pain as well as functional impairment. [1,2] An important number of patients experience pain, lack of movements as well as other kinds of symptoms following surgery.[3] In many cases, these disturbances are present only during the peri and early postoperative phase, while in others, they may persist even in the post-acute and long term settings. Rehabilitation moves from impairment towards helping the patient achieve normal functioning in the presence of disability.[4] The aim of this paper is to discuss the particular role of the PRM physician in managing people with MSDs during the perioperative period.

General outline of the problem

Joint replacement surgery is increasingly performed worldwide, including total hip replacements (THRs) as well as total knee replacements (TKRs). THR represents the most widely performed joint replacement in orthopaedic practice and the number of persons requiring such procedure as well as other interventions has increased with the aging population.[5] The risk of fractures shows an exponential increase with age in patients with osteoporosis[6] and many of the patients with hip fracture require surgery. Almost 50000 TKR interventions are performed in the USA yearly.[7] Osteoarthritis (OA) prevalence is raising, affecting 9.6% of men and 18% of women aged over 60 years worldwide, and it is estimated to be the fourth leading cause of disability in the next decade due to the increase in life expectancy.[6] In Spain, there are almost 130-200 cases of proximal femur fractures per 100000 inhabitants and 45000 hip fractures per year; 20000 TKRs and 17000 anterior cruciate ligament (ACL) plasties, among many other MSS interventions, are performed yearly.[8] In Rwanda, some 50000 children are estimated to require corrective orthopaedic surgery. [9]

TABLE I. —*Disturbances that can be present in patients suffering from chronic processes previous to MSS.*

Musculoskeletal pain
Joint lack of movement and ankylosis
Muscle atrophy and retraction
Postural imbalance
Uncoordinated movement
Joint swelling
Pressure ulcers
Osteoporosis
Cardio-respiratory dysfunction
Circulatory venous dysfunction
Pneumonia and other infection

Patient problems regarding MSS

Patients requiring surgery may be divided into two main groups, depending on the health condition:

— patients with chronic musculoskeletal conditions such as arthrose, arthritis, and spinal stenosis

— patients with acute musculoskeletal conditions such as recent fractures, tendon tears, and others

In the first situation, patients usually suffer from some activity limitations for a prolonged period before MSS due to the presence of a variety of disturbances resulting from chronic processes (Table I). In the second situation, although these disturbances do not occur, other health conditions such as concomitant Parkinson´s disease, hemiplegia, and osteoporosis may interfere with recovery. This is important to take into account, because the aims of the rehabilitation procedure can differ from one to the other of these situations. In the first situation, patients will need some assessment of their function followed by a PRM programme in order to alleviate these problems as much as possible. For example, PRM interventions may be introduced to increase joint range of motion (ROM) and prevent muscle atrophy as well as massage or some kind of electrotherapy for relieving pain, and walking and balance exercises for reducing activity limitations. According to the American College of Rheumatology, if a well-coordinated rehabilitation programme is applied, disability during the perioperative period will be significantly reduced, thus permitting the patient an early recovery and return to social participation. [10]

TABLE II.—*PRM objectives in the perioperative setting.*

— To permit the patients to reach the surgical act in the best possible physical condition
— To achieve the best results in the less time possible after surgery
— To diminish complication risks as much as possible
— To permit patients to enter into further rehabilitation settings as soon as possible
— To permit an early recovery with subsequently returning home with full social participation and without activity limitations

TABLE III.—*Prerequisites for a good patient recovery previous to MSS.*

Best possible joint range of motion (ROM)
Best possible muscular strength
Best possible movement coordination and balance
Best possible cardiorespiratory function

Perioperative setting and rehabilitation idea

The perioperative setting is defined as the period before, during, and after the surgical act. It can last from few days to several weeks depending on the health condition of the patient as well as the kind of surgery. In this period, PRM physician has to be very actively involved if we want to achieve the best results in patient recovery. PRM programmes of care include medical interventions, exercise therapy, physical modalities, aids and appliances as well as occupational therapy.[11] Improvements in patients can depend on patient selection as well as their expectations, the surgical technique, the choice of surgical components, perioperative complications, family support and environmental factors, particularly at home. [2,4]

There are some important rehabilitation objectives in the perioperative period (Table II) in order to maximize the chance of an early recovery and subsequent entry into further rehabilitation settings and return home with full social participation. Predictors of good outcomes include good ROM and muscle strength, good pain and swelling relief, absence of respiratory and venous disturbances and an early patient mobilisation.[11] In order to achieve these, rehabilitation treatment protocols need to be interdisciplinary [12] and have to focus on controlling pain, increasing joint ROM, and muscle quality as well as improving performance in walking and daily life activities.[4] Rehabilitation can improve health outcomes, reduce costs by shortening hospital stays, reduce disability, improve quality of life and is cost-effective as has been recently discussed in the 2011 Word Report on Disability.[13]

The role of PRM physician in the preoperative setting

Intervention during preoperative period is crucial to enhancement of functional capacity.[14,15] However, the benefits of exercise training before surgery are less well explored, particularly in older patients, and there is a lack of standardised rehabilitation protocols for the preoperative setting. There is a little evidence about the benefit of preoperative education/instruction of exercises in order to achieve the best results after hip and knee replacements, except for reducing anxiety.[16] A clear causal link between exercise training and improved outcome has yet to be demonstrated. [17,18] In a 2009 review, [17] the results were inconclusive about the benefits of preoperative exercise in cases of TKR or THR because of the very few studies with small sizes investigating the effects of a preoperative exercise programme as a single intervention. Some other authors [19] have seen a faster rate of improvement in ambulatory function in patients who participated in preoperative exercises after THR, compared with the routine care control group. On the other hand, in a systematic review (SR) conducted in 2009 for THR,[20] the authors suggest that preoperative exercises may facilitate quicker functional recovery postoperatively, but also point to the need for multi-centre and well-designed randomised controlled trials (RCTs) with appropriate outcome measurements to establish their effectiveness.

Some characteristics reduce the risk of complications and promote patients early recovery after surgery (Table III). These include optimizing ROM available as well as a good muscular mass and strength and well-coordinated movements. Assessment of pulmonary and cardiac function is also relevant as some cardiorespiratory rehabilitation may also be needed. Home circumstances (i.e. need for and presence of careers, access to bathroom, and kitchen) should also be considered prior to surgery. Any modification needed to make the return home easier during convalescence should be planned preoperatively, particularly if a long-term activity limitation is anticipated after surgery.[4]

Patients therefore need to be assessed by a PRM physician, prior to operation.[21]A rehabilitation pro-

gramme that includes: exercises to increase ROM as well as muscle mass and strength, massage and/or electrotherapy to relieve pain and swelling, balance treatment, and respiratory physiotherapy can then be implemented. While in some cases patients may carry out a program by themselves, a physiotherapist guidance could be needed in some others such as the elderly. The PRM physician has to be clear about the aims of the treatment and coordinate the programme with other health professionals if they are needed. [12]

The role of PRM physician in the postoperative setting

The postoperative period can be considered in two parts: an early phase and the secondary postoperative phase. The role of PRM physician in acute settings has been very well described by Ward *et al.*[22] Rehabilitation intervention may even be relevant when the patient is in the recovery room to help prevent some complications such as excess of bronchial secretions by prescribing chest physiotherapy, muscle atrophy and lack of ROM by prescribing cautious isometric muscular contractions along the operated area or some passive and active joint movements, if no contraindication is present, as well as postural standard treatment for joint deformities and limb swelling prevention. The PRM physician will need to coordinate with a range of other professionals to achieve this. Team working will be much more effective if it is carried out in an interdisciplinary way.[12] This PRM management should be continued later when the patient has recovered from anaesthesia and been transferred to a normal hospital room or to his/her residence. During the following days, after MSS, depending on the different countries and centres, the patient may be transferred to the rehabilitation department, to the orthopaedic surgery department, to home or even to a middle or long-term care centre in some cases. In the case of a minor ambulatory surgery, patients may continue physical therapy themselves at home with the guidance of a peripatetic physiotherapist. The PRM physician should periodically assess patient recovery until therapeutic objectives are achieved.[22]

Subsequently, the aims of the rehabilitation treatment are (Table IV): pain relief, avoidance of complications, increases in ROM and strength as well as functional recovery and social reintegration and participation.[4] According to some authors,[23, 24] the ramifications of undertreated pain can include: increased risk for cardiovascular events, depression, sleep disturbance as well as decreased responses to interventions for other disease states. Pain control is important to allow a more intensive physiotherapy/exercise performance. This can be achieved even by using local, regional, or systemic analgesia as well as physical agents, some psychological techniques or combination of these methods.[2] A 2011 SR [25] has shown that nerve blockades were effective in reducing acute pain after hip fractures, but insufficient data do not allow to make definitive statements about the beneficial effects or harms of many other pain management interventions for these patients. In the same SR, [25] some physical interventions such as TENS, acupressure (manual pressure applied to trigger points), and relaxation therapy as well as physical therapy applied after surgery have been suggested to be beneficial in reducing pain during movement and in increasing quality of life after hip fractures; however, the evidence was not sufficient. Another RCT showed that stretching and strengthening of the spinal and psoas muscles, with the aid of a physiotherapist, provides more pain relief than standard care in patients with hip fractures and low back pain.[26] An SR published in 2007 [27] showed short term after discharge benefits of functional exercises in patients with TKR with small to moderate effect sizes and without long term beneficial effects. In another 2009 SR, the same authors [28] reflected that insufficient evidence exists to confirm the effectiveness of exercise programmes after THR for OA with implications for some potential benefits. In 2010, some authors [29] supported the use of neuromuscular electrical stimulation combined with exercise during the first 4 weeks following ACL reconstruction to improve quadriceps strength, thus permitting lower treatment amounts and fewer sessions and achieving a good cost-effectiveness.

Depending on the kind of MSS performed, dif-

TABLE IV.—*Aims of the rehabilitation process in the postoperative setting.*

Pain relief or pain diminishing
Complication avoidance
ROM and strength increase
Functional recovery as well as walk, transfers, and social integration

TABLE V.—*Important principles for the PRM physician in the postoperative setting.*

— Knowledge of the surgical technique
— Recognition of soft tissue and bone structures which need to be protected, the way these structures are stressed, and their healing rate
— Suitable selection and application of techniques to pass on variable levels of stress to the healing tissues
— Suitable management of the immobilisation period at the beginning and ROM progression rate
— Modified from ref. n. 31

ferent PRM interventions can be used. In the case of a lower limb bone fracture that has needed internal fixation with a plate and screws, walking with full weight–bearing needs to be delayed at least for 4 to 6 weeks, depending on the kind of fracture as well as bone healing. This is not the case, for instance, when a hip or knee prosthesis has been inserted; if no contraindication is present, walking will be permitted a few days after surgery. Similarly, the period of latency before free or resisted exercises varies depending on the nature of the MSS procedure and the PRM physician has to have a clear understanding of any prerequisite and period of latency for different movement degrees and directions to avoid, for instance, a tendon, ligament or capsule suture tear, a hip or shoulder prosthesis dislocation, and so forth.[30,31] Some principles which will guide the PRM physician in the postoperative settings are shown in Table V.[31] The presence of a peripheral nervous damage, an early loosening or vulnerability of an internal fixation, or a soft-tissue problem such as an unhealed wound should be assessed by the PRM physician together with the orthopaedic surgeon during this period. Additional diagnostic tests may be required. In addition, a walking test could be needed in some cases of lower limb surgery. The different physical modalities used to achieve the objectives of rehabilitation during this period are described in Table VI.[2,4,11] In some cases, for example, joint stiffness following knee surgery, it may be necessary to refer the patients to the orthopaedic surgery department in order to consider a manipulation under anaesthesia or even an arthroscopy performance for ROM improvement.

Patient discharge from the perioperative setting

Discharge criteria after surgery, used in many trials are: uncomplicated surgical healing, good return of joint ROM, independent walking with or without aids, independence in daily life activities as well as a good knowledge of the rehabilitation programme. In the case of a THR or TKR, patient age, marital status, the necessity of aids to adopt sitting and standing position or for transfers, to reach 80° of joint ROM as well as the possibility of walking 300 meters on a flat surface may influence hospital discharge. Whilst according to some authors, the most frequent problem to delay hospital discharge was impaired surgical wound healing during the early postoperative setting, [32,33] others cited four key areas including mental attitude, loss of independence, functional impairment and activity limitations, and how well patients are coping with pain.[34]

Patient discharge could be to home or even to

TABLE VI.—*Rehabilitation objectives and relevant PRM interventions in the postoperative setting.*

Rehabilitation objectives	PRM interventions
Pain control and complication avoidance	Medications, infiltrations for analgesia, nerve blockes (if needed), physical modalities (TENS, laser, infrareds, contrast baths, cryotherapy, therapeutic ultrasound, short waves, pulsed magnetic fields, shock waves), postural treatment, exercise, yoga, manual therapies, compression garments, splints and education
Increase in ROM and strentgth	Exercises, continuous passive mobilisation, manual therapies, hydrotherapy, electrical stimulation including NMES, splints use, and assistive technologies
Functional recovery, walking, and social integration and participation	Exercises, gait training, hydrotherapy, occupational therapy, splints, assistive devices and technologies, social worker and psychologist assistance, and environmental modifications including home, sport, school, and workplace adaptations

NMES: neuromuscular electrical stimulation; TENS: transcutaneous electrical nerve stimulation

another centre if social circumstances are complex. Some trials assert that quality of life obtained by a home rehabilitation programme after a THR is less costly than either a short or extended stay in a rehabilitation facility.[35] A rehabilitation programme using exercises as well as daily life activities performance, prescribed and coordinated by a PRM physician and under a physiotherapist and occupational therapist supervision, carried out at home or in groups, has been demonstrated to be more effective in cases of hip and knee replacements. These programmes, which comprise 45-minute sessions, three days a week for 6 weeks, yield good functional results. [36,37] A paper supports the use of a telerehabilitation programme and indicates that it may be beneficial and potentially cost saving for patients with TKR living at long distances from rehabilitation facilities after hospital discharge. [7]

Normally, in 3 to 6 months, patients will reach their best possible functional recovery; however, in some cases, this could be delayed until one year. In the case of a THR, home measures, in order to avoid a joint dislocation, have to be continued for 3 months after surgery.[38] PRM physician needs to advise the patient about the kind of physical activity he/she can safely perform and possible risks, all based on scientific knowledge. Activities such as swimming, cycling, and walking are often recommended. Other kinds of sport such as football and basketball in patients with an ACL plasty may need to be delayed for 6 months in order to avoid a suture tear; but swimming, cycling or jogging may be permitted at 3 months. In all cases and depending on different MSS and patients' conditions, the PRM specialist has to be able to give clear advice regarding physical activities and sport recommendations for the future. [39, 40]

Conclusions

Rehabilitation clearly reduces cost by shortening hospital stays, increases favourable health outcomes, reduces disability, and improves quality of life. If a well-coordinated programme is applied, then many operated patients will have reduced disability, thus permitting them an earlier recovery and social participation. It is necessary to increase research regarding rehabilitation benefits in the preoperative phase. However, postoperative early rehabilitation benefits have been well demonstrated by many authors for reducing pain and its consequences using different PRM interventions as well as social measurements relevant to the symptoms and circumstances of the patient.

For all the reasons above mentioned, in the perioperative setting, the PRM physician has a key role. The PRM physician needs to identify patients at greater risk of further disability who will, therefore, benefit from an earlier rehabilitation treatment and he/she should select interventions based on the best available evidence. Home and social circumstances of patients have to be considered as part of this procedure as well as the fact that PRM specialist should lead an interdisciplinary rehabilitation team when needed.

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