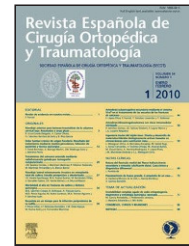


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REVIEW ARTICLE

Training for research in musculoskeletal disease: from the residency program to continuing medical education

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Abstract

Musculoskeletal disease makes up 10-20% of the usual clinical practice. Thus, research in this field is both a medical and social subject. Research, as an educational objective, continuously appears in all the documents that analyse specialised medical training and continuing medical education as a group.

The opinion of the authors is oriented towards favouring research both within and outside of the training period. Promoting the investigator figures within the health care services is essential for the transfer of dynamic knowledge to the setting, both to the peers and to the residents and students. The authors consider that this is the key element for successful training in research and the benefits are found not only on an individual level but also for the health care system as a group.

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PALABRAS CLAVE

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 Continuada;
 Investigación

Formación para la investigación en patología musculoesquelética: desde el MIR a la formación médica continuada

Resumen

La patología musculoesquelética constituye el 10-20% de la práctica clínica habitual por lo que la investigación en este campo es un tema tanto médico como social. La investigación como objetivo formativo aparece de manera constante en todos los documentos que analizan el periodo de formación médica especializada así como la formación médica continuada en su conjunto.

La opinión de los autores se dirige a favorecer la investigación tanto en el periodo formativo como fuera de él. La potenciación de las figuras investigadoras dentro de los servicios asistenciales es esencial para la transmisión de un conocimiento dinamizador a su entorno, tanto a sus compañeros como a los residentes y a los estudiantes. A juicio de los autores, este es el elemento clave de una formación exitosa en investigación y los rendimientos se sitúan no solo en el plano individual sino que benefician al sistema sanitario en su conjunto.

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Introduction

The musculoskeletal system enables movement and physical contact with our environment. Musculoskeletal pathology is second in frequency after the common cold; among all reasons for seeing a doctor, in most countries musculoskeletal concerns account for 10-20% of consultations in primary health care. Up to 60% of workplace absenteeism is due to musculoskeletal problems and, excluding trauma, these diseases account for almost 25% of total healthcare costs in Western countries.¹ Therefore, research in this field should be a medical as well as a social priority.

The main disciplines that provide care to patients with musculoskeletal disorders are orthopaedics and rheumatology; however, traditionally these areas are disconnected from each other, which has contributed to some confusion in the global approach to these processes.

Five years ago we created a musculoskeletal basic research unit in our centre, where orthopaedic surgeons and rheumatologists work to unite human and material resources in research. This effort allows for financing of public and private entities and publishing articles in the most important journals in our field. However, also, resident doctors and medical specialists in both specialties are brought together for varying periods of time. Perhaps the most important thing is that this joint structure leads, in both services, to better medical training for all participants, which undoubtedly has contributed to better patient care.

Research and specialised training. Current status

Research aimed at training consistently appears in all documents that analyse the period of specialised medical training. In Spain the "Internal Medicine Residents (IMR) system" has managed to achieve uniformity and high quality standards in this part of medical education. With origins dating back to the 1970s, Spanish Royal Decree 127/1984²

legislation repealed the existing structure and provided, among other innovations, the classification of specialties, hospital-based or not, in accredited training centre programmes, minimum requirements for teaching units, equal access to training, and replacement of the final exam by ongoing annual evaluations. On these bases, in Title II of the Spanish Law on Management of Health Professions (LOPS) (Law 44/3003 of 21 November),³ Specialised Training in Health Sciences is addressed. It is defined as formal training aimed at providing professionals the relevant knowledge, skills, abilities and attitudes corresponding to the specialty. It is carried out through the residence system in previously accredited centres and through activities planned by the steering committee in conjunction with local teaching commissions. Based on this foundation on which the LOPS was enacted, specific rules were later developed governing the labour aspects of Residence as well as other training areas (Spanish Royal Decree 1146/2006 of 6 October and Spanish Royal Decree 183/2008 of 8 February, respectively).^{4,5}

It is in the same LOPS, however, where the legislature's interest is clearly in building an inextricable triangular link between research activities and training with the patient care essence of the healthcare system. In Title I of the Practice of Health Professions, Article 11 is devoted entirely to research and teaching. If the objective of the law seeks to "ensure that all health professionals carry out their work with the necessary skills and knowledge" in this article, the header indicates "the entire health care structure of the system will be ready for use for health research and for the teaching of professionals". Furthermore, the article does not situate the health centre as a passive recipient of training and research activities but requires initiative and thus specifies "the health authorities, in coordination with education authorities, will promote research and teaching activities in all health centres as essential elements for progress in the healthcare system and for its professionals".

This introduction is necessary to show the legal framework in our country that reflects the fact, sometimes forgotten, that we cannot subtract professionals in our execution of any of the research-teaching-patient care elements. From here we can ask many questions that allow us to focus the role of resident physician on the field of medical research. These questions include: Is research mandatory for IMR? Should care work hours be added or subtracted? To what level do we develop researchers? Clinical or basic research? Who should fund it? These issues represent debates without a clear answer, and about which the authors next offer their opinions.

Research as a required activity during the residency period

The requirements and general organisation of the activities of the specialist in training are determined in the official programmes of the specialty. These documents are prepared by the National Commissions of the Specialty, and integrated into the National Council of Specialties in the Health Sciences. For nearly a decade this council has worked with programmes dating back to 1996, and in 2005 they began to renew the process and to the satisfaction of the professionals involved, specific sections on research were developed.

One of the first programmes to appear was the specialty of Preventive Medicine and Public Health, which specifies, "Public Health Research is a basic element of any quality system of healthcare. The specialist in Preventive Medicine and Public Health research should incorporate research into the professional practice of the specialty, by acquiring during training knowledge, skills and attitudes related to scientific research. In addition, a basic activity of the specialist is related to methodological support of research and knowledge transfer to other professionals". We might believe Preventive Medicine is an exception by its very nature and yet another of the new programmes in 2005 was Family and Community Medicine, which also clearly highlighted research training. The specialist in training will be given objectives to achieve. The resident, at the end of their IMR training period, will know the main sources of scientific literature and will have the skills to manage it, will be able to critically evaluate manuscripts based on the following: aetiology, diagnosis, therapy, prognosis, efficiency; will be able to understand the basic principles of the design of research projects and will have the skills to apply them to design a study on a question of interest to clinical practice; will know the ethical principles of biomedical research and will incorporate them both into the design of projects as well as into translation of the research results into clinical practice, and will have skills in presenting research results, both as a journal article and as presentations at scientific meetings.

We come to the case of Orthopaedics and Traumatology (SCO/226/2007 Order of 24 January, Spanish Official Journal [BOE] of 7 February 2007),⁶ which may represent the other surgical specialties but is also a surgery that requires extensive technical training, "learning the craft", according to long-time teachers. Therefore, the programme devotes a specific section within the contents to IMR research training.

This research training must enhance the professional mindset through observation, the search for and critical interpretation of data, the formulation of a hypothesis and the rigorous testing of it. The period of residence should awaken research interest, facilitating the acquisition of research tools and their application to everyday clinical practice.

It is clear from these examples that the IMR should be involved in research activities as a prerequisite to obtaining the specialist degree. Conversely, accredited services or training units must provide background research and maintain this effort continuously to be worthy of teaching accreditation.

Dedication to research during the residence period: add or subtract care hours

It is easy to theorise and describe a multitude of objectives for specialist training as an attractive list of good intentions, but the reality is quite different. Indeed, the daily clinical practice, the training requirements for specific knowledge and skills of the specialty and, finally, patient care needs in the centres leave little time for other activities. On the other hand, the duration of residence is limited and, although national specialty committees, in many cases, try to extend it, the maximum period allowed is five years.

At this point one might ask whether it is legitimate to subtract IMR hours in order to conduct research and abandon clinical training. However, the question is flawed in its origin and can and should be debated with various arguments. As a starting point the legislation again brings us closer to the actual situation of the IMR. The LOPS states that residence be conducted as a full-time activity, and is incompatible with any other occupation or training with the exception of doctoral studies. This situation on the one hand allows the resident to combine his/her third year studies during the period of specialised training with his/her training and research practice load. Furthermore, it indicates that time devoted to specialised training must exclude other activities that, in times of demand for specialists, such as now, attempt to prematurely release a doctor early into the labour market. Thus although the period of residence is limited in terms of meeting all requirements, full-time dedication should allow for all objectives to be met.

The next point to consider is that IMR training must allow for initiation and training in activities that, if not conducted at this time, will mean a reduction in future professional development. The specialist is then entitled access to continuous training period where supply and demand is much more practical in day to day clinical practice. If the IMR does not reach this stage with a wealth of research tools and perspective gained from the opportunities in their field, he or she is unlikely to be able to take initiative in this area.

The third argument is that progress in knowledge and clinical skills can and should continue following the years of IMR. Desirable skills will be realistic and should not result in complete absorption of the physician that prevents contact and progress with the other two legs of the professional triangle: training, teaching and research.

Skill level achieved in research during he period of residence. Basic or clinical research

When we come to the defence of a doctoral thesis by an IMR, inevitably the question arises of whether the residency is the appropriate period to complete the third level of university studies. In the view of the authors just as the period of clinical skills development must be adjusted so as not to offset to the time available for training, it is difficult to achieve the degree of Doctor without curtailing these other activities.

As indicated by the training programmes of the various specialties, the acquisition of competencies in research methodology must be started as soon as possible, completing those acquired during undergraduate training. Training in clinical epidemiology and statistics, evidence-based medicine, management of research, project design and evaluation and communication of results are just some of the basic areas in which to work. From this point on, the IMR should be involved in research projects. Their level of involvement will depend on many factors: first, the environment and, depending on the research development of his/her teaching unit they will be able to access projects of varying nature and complexity. Secondly, it will depend on their abilities and interests, and while training in research is necessary, it must adjust to the individual while meeting some minimum standards. In the end, the advisor, a major figure in the process of specialised training, is responsible for combining the individual and their environment. The advisor has the responsibility to obtain the best possible performance as well as to evaluate the specialist.

It is common to see the quantification of research activities during residency outlined as a requirement to complete one or more research projects. That may serve as minimum documentation and as an evaluation tool, but is often unnecessary since in a properly working teaching unit the IMR easily exceeds these requirements.

In terms of the type of research, basic or clinical, the latter is usually more directly embedded in the final practice of the resident. It is also recommended in the programmes, allowing the IMR to evaluate established protocols in the healthcare services. However, we recommend that whenever conditions permit contact with basic research it offers many advantages, such as the ability to assume a greater role by the interns in their research; to shape projects more rigorously by varying the experimental conditions more easily than in the clinical environment, and to make initial contact with laboratories or experimental operating theatres since later as a specialist, a lack of previous experience makes it much more difficult.

To close this section we will say the ideal level of research development during residency is a medium level. Residents can and should take advantage of university structures whenever possible, since in addition to being allowed by law, we can combine resources and advance in the third postgraduate cycle, overcoming steps such as the Spanish Diploma of Advanced Studies (DAS).

Research funding during the period of residence. Participation in scientific societies, research agencies and medical schools

The character inherent in the formal training period of residence makes funding for continuing medical education (CME) unavailable. The local teaching commissions do not manage financial allocations for training IMR. However, funding is essential. The two sections, both the acquisition of skills in research as well as the development of projects, require contributions to the teaching units in order to enable work in this direction.

Recently, the government agencies for studies have become aware of their responsibility by establishing cross-training programmes for residents, generically called Joint Complementary Training. Although they do not take individual actions, they promote course programmes, in both a centralised and decentralised way. Inevitably they include a number of courses focused on research training. Schools may apply for funding for those programmes that are more specific to local needs and that are not on the general offer. While we believe there are still deficiencies in guidelines and stable funding, they are an excellent resource that has come to fill the gaps in most centres, which were being addressed through local initiatives based on volunteering.

We find a failure to fund the second part of research training, the specific actions of the IMR in their early research projects. It is true that often the initial clinical projects are simple and due to their low cost, teaching unit resources may be used. On the other hand, resident involvement as a researcher in work teams means that the resources they consume are common to the group. Despite the above, it is important to take personal responsibility for the work that involves developing, obtaining, and managing resources. While in the current situation, the IMR may not appear as principal investigator on projects funded by the Health Research Fund (FIS), scientific societies and medical associations, among other relevant agencies, can fill this gap with actions aimed specifically at this group. It is clear that residents by definition do not have a consolidated CV established, and on the other hand, frequently their projects are located in the pre-competitive section. That is why we must choose restricted calls adapted to the type of specialised training. Of course this may come into play with any of the providers in the system. In particular, at the local level, the research foundations of health centres can channel funds into specific actions for resident group.

Value added to research during the period of residence. Specialised training as a reserve of researchers

So far we have considered the IMR as a non-contributory element to research activity, and only in his/her role as a student. While this simplifies the ideas, it is as false as to think that during the years of residence he does not contribute effectively to the care giving work of the centre. As mentioned previously, the involvement of residents in

clinical research services allows the continuous evaluation of their performance protocols, as well as the introduction of new technologies as monitored by the critical eye of the physician in training. As for basic research projects, many are affordable to the research teams through the provision of IMR work hours.

It is clear that this is a two-way relationship that benefits both parties, and that the health system receives immediate returns in terms of promotion of research activities of this group. But of course, the investment has a component of encouraging research as a vocation. It is true that this is not a primary goal for all physicians in training. However, inevitably there must be a small percentage of professionals who focus on their steps into research as the centre of their future activity. It is these individuals to whom assistance is offered as part of plans by R&D state agencies to hire health professionals who have completed specialised training. These "post-IMR" research contracts, now called Rio Hortega, represent a fundamental reserve of researchers and are structured around an individualised research training plan for the candidate to be carried out under the supervision of a research group at an accredited institution. The nature of the calls allows the physician to maintain involvement with patient care activity, thus again highlighting the unity of teaching-research-support in the system. Of course when the IMR chooses these contracts he must offer a competitive CV, but again, the teaching units and research structures of the centres must facilitate this process if they want to obtain the best professionals.

The nature of an article imposes limitations on the topic. It is outside the complex area of assessment of the resident. It is a topic continually under review. While we continuously discuss training assessment designed to stimulate learning and identify challenges, a summative evaluation that accredits their work is inevitable. This is the aim when training programmes numerically specify a minimum amount of activity both in patient care as well as research, in order to obtain the specialist license. The concern of the collective opinion of residents would be another aspect to assess. The assessment tools used in centres, such as satisfaction surveys, speak favourably of concern among IMRs regarding research. In our centre, Hospital Clínico San Carlos de Madrid, the last survey conducted on 402 residents with 85% participation and analysed in 2007⁷ showed that 89% of residents had begun their doctoral studies. Some 8% were prescribed courses in this cycle, 57% were in the stage of obtaining research sufficiency (DEA), 23% had begun their doctoral thesis and only 1% had finished. In the questionnaires they expressed their desire to increase facilities and resources for research and scientific publication. These requests stood out against others expressed in the areas of teaching and patient care.

For all the foregoing, the opinion of the authors is to promote, as a priority, activities in research training and research in this group of highly motivated professionals who are subject to regulation that allows and requires action in this field. The benefits of this work are situated not only at the individual level but also benefit the health care system as a whole.

Continuing medical education

Objectives of continuing medical education (CME)

CME is defined as all educational activities that serve to maintain, develop or enhance knowledge, skills, performance and relationships a physician uses to provide services to their patients, the public or to the profession. Despite the large number of CME activities, doctors usually use diagnostic and therapeutic interventions improperly, both in excess and by default by misuse of them. Thus it has been suggested that the CME, at least in its current form, is not effective to fill the gap between what is done in clinical practice and what should be done based on current knowledge.⁸

When we analyse the various tests to assess the real impact of the CME, and taking into account its complexity, if our immediate goal is a change in the interpretation or handling of situations, we must conclude that CME based solely on didactic methods has a very small or zero role. Within this context, the teaching methods should receive less credit than the most effective methods, or perhaps no credit. The reasons for the maintenance of these didactic educational activities include ease of design and organization, funding from pharmaceutical companies that promote the transfer of information regarding new medications, and reliance on traditional models of undergraduate education that are simple to organise and that generate easy income. Changing this CME system has serious implications for groups who wish to design effective CME.

Physicians should carefully weigh the loss of learning opportunities when they attend educational sessions that have been shown to be ineffective as opposed to participating in sequential activities that involve confronting challenges, and/or interactive features that will enhance their interpretive ability and thereby improve the health of patients, which is the most important result of all.⁹

The role of research in continuing medical education

There is general agreement that research activities are crucial in clinical practice and that patient care services that conduct research provide better care. Thus, research becomes a key element, and much more effective, in the puzzle of CME.

In recent years, social progress has allowed patients to be seen by a growing number of doctors; however the number of doctors who engage in research not only has been maintained but in some cases has decreased. This decrease in the number of medical scientists has been attributed to several factors:

- Rapid advances in biomedical sciences that have increased the complexity of basic biomedical work. This has led to clinical investigators having to dedicate so much time to staying up to date on biomedicine that the concept of part-time research is an unrealistic concept.
- The lack of planning and networking between the research work, patient care and education, accompanied by a lack

of economic incentives and/or professionals has produced a lack of motivation that undermines the path of the professional medical researcher.

All this has led to, in large part, medical research being conducted by pharmaceutical companies and/or carried out by a researcher who is distant from the real needs of patients. This dilutes the vital work to be performed by clinical scientists.¹⁰

We can define two types of medical researchers. The clinical scientist, a medical doctor who runs a basic research laboratory and whose clinical tasks should be reduced by approximately 80%. This clinical scientist works like a scientist not a doctor, but his broad medical knowledge plays an essential role in translational research.

The clinical researcher, which requires clinical knowledge and skills of clinical research. This researcher usually requires less time for his research than the clinical scientist, as their research activity can be more easily integrated into their usual clinical responsibilities. It is estimated that this type requires about a 50% reduction in their usual clinical duties.

Both figures are essential for dynamic transmission of knowledge to their environment, their peers, as well as residents and students. In our view, the empowerment of these figures is a key element of successful continuing education that would result in real benefits to both physicians and patients.¹¹

Designing effective continuing medical education

As we mentioned earlier, the use of traditional CME activities such as conferences or courses has been widely criticised. These criticisms seem justified because didactic educational interventions fail to achieve a change in attitudes and/or health outcomes. In contrast, interventions that use interactive techniques are generally more effective in changing final results.

There are other activities that seem effective although they fall outside what is usually considered CME. A first group of activities include, for example, the use of on-site education, provided by auxiliary health staff, with patient suggestions based on practice. This group also includes the use of methods of assessing the patient's objective needs, which seems essential for effective CME interventions. Both activities require collaboration between CME providers and data sources, both from an educational perspective and from a health service perspective.

A second group of activities is related to internal or intrapersonal aspects of participating doctors, always bearing in mind that the objective is a change in attitude, not merely knowledge. Individual commitment, of course, varies greatly although the immediate clinical value of information and the method by which such information is transmitted are predictors of change in attitude. Additionally, the interaction between members of different research groups can influence individual learning and change, perhaps because of the generation of dissonance between the knowledge acquired through contact with others as opposed to that learned directly by oneself.

In the end, doctors develop their own learning priorities based on internal and external forces; courses or conferences can be only one element, and probably not the most decisive in the puzzle of CME.^{12,13}

Effective continuing medical education

For everything mentioned above, the key factors in our view that determine effective CME are:

- Empowerment of researchers. Defining adequate channels for professional development, inside the services, both of scientists as well as of clinical researchers, is the key to research being translational and for the connection between teaching and research.
- CME activities. Interactive, sequential, and participative activities must be prioritised above those that are merely passive and didactic.
- Alternative CME activities. Alternative activities should be promoted that typically do not fall within the classic concept of CME. It is worth highlighting in this paper among others, on-site education about patients by auxiliary staff (nurses, aids, etc.), and the evaluation of patient needs.

Conflict of interest

The authors affirm that they have no conflicts of interest.

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