EDUCATION

The role of medical physics in the scheme of diagnostic and therapeutic processes by keeping safety and hygienic regulations

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Abstract

According to Standards of European Union the pregradual education should tend toward preparation of multidisciplinary working teams that can manage the health service using principles of evidence-based medicine, nowadays.
The primary aims of teaching process is to direct the students to acquire, identify, analyze, process and select the reproducible results of physical measurements, to that the medical interpretation will be assigned.
Our scientific research was directed at the existing conditions for professional use of different types of medical technique in the surgical and internal disciplines in health service institutions in all the regions of Slovakia. It also looked at the possibilities of eliminating the various unwanted effects of certain physical factors *(Fig. 3, Ref. 9)*.
Key words: Medical Physics, diagnostic and therapeutic processes, health professionals.

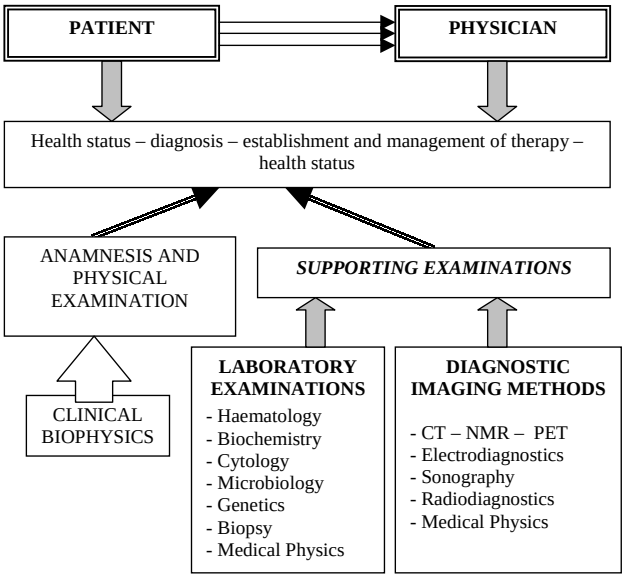

Fig. 1. Scheme of diagnostic process (Kukurová, 2001).

At the present, a high number of physical equipments is used for the medical purposes in research, prevention, diagnostics and therapy. Physicians enable to obtain additional information to basic examination by means of physical laboratory examinations. Using them they can measure and evaluate quantities, which are not detectable by human senses. They are useful also in special cases, for example when it is necessary to evaluate space and time dynamics of given biological process and its relation to external environment. The result of laboratory examination should confirm or exclude physician's diagnostic hypothesis. Subsequent effective therapy is a result of complex and right diagnostics.

For the health protection of the patient and the staff all medical equipments must be in accordance with the relevant technical and hygienic norms. The examination conditions must be established to ensure reproducibility of measurement results.

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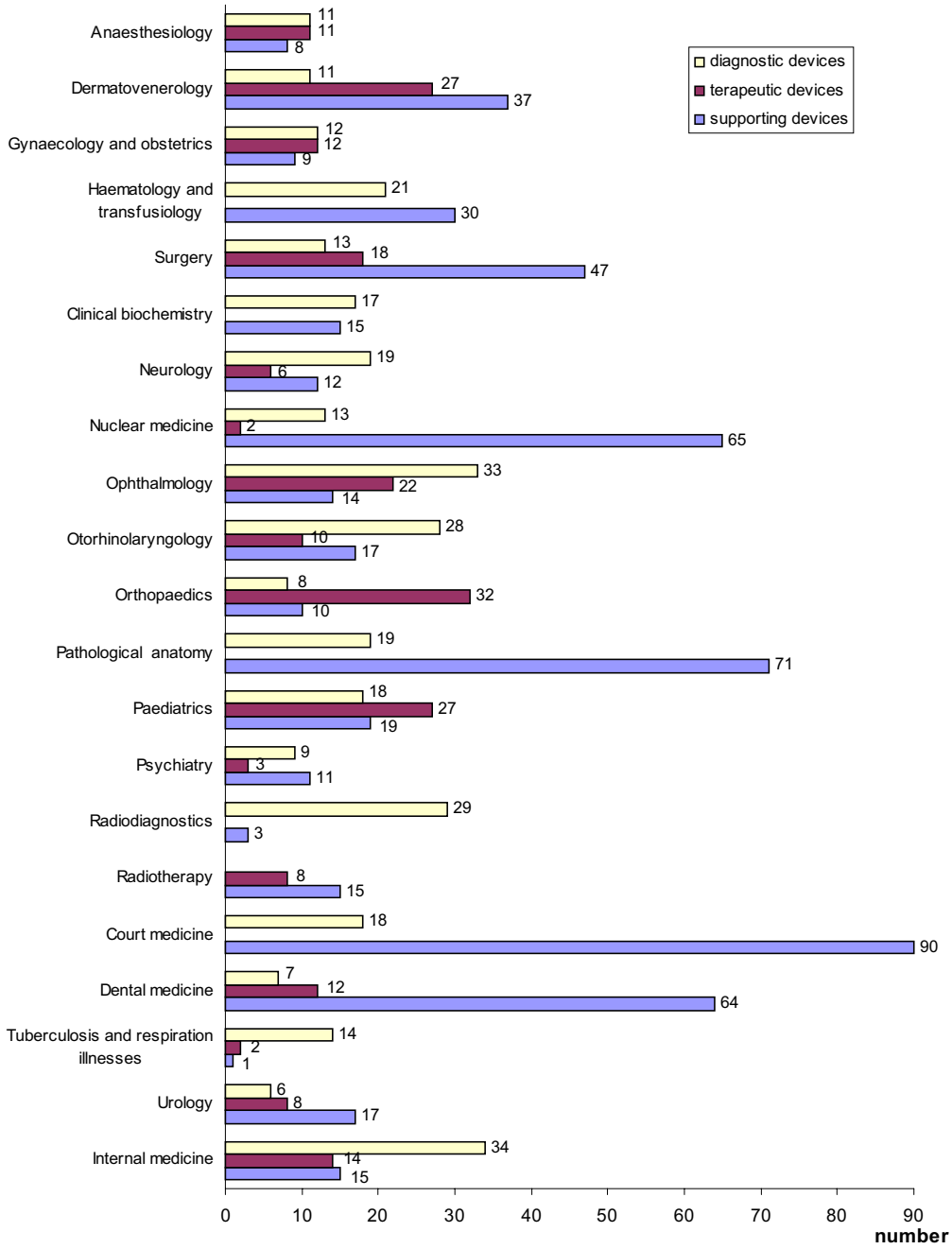

Fig. 2. Medical equipment categorized according to individual medical branches and purposes of its use.

Therefore the physicians and health service staff have to be acquired with technical abilities of equipment and physical principle of given diagnostic method. Their technical knowledge and skills in correct operation of devices become very necessary.

It is very important:

1) to maintain all devices in good technical condition,

2) to keep all rules of physical therapy,

3) to keep special safety rules.

Thus it is very important that students of branches concerning health care are acknowledged with basic technical principles and measurement methods already during the study. They acquire necessary knowledge and skills on the begining of their education, which can be used later in professional practice (Fig. 1).

Classification of diagnostic and therapeutic methods

Diagnostic and therapeutic methods can be divided according to following criteria:

a) used means:

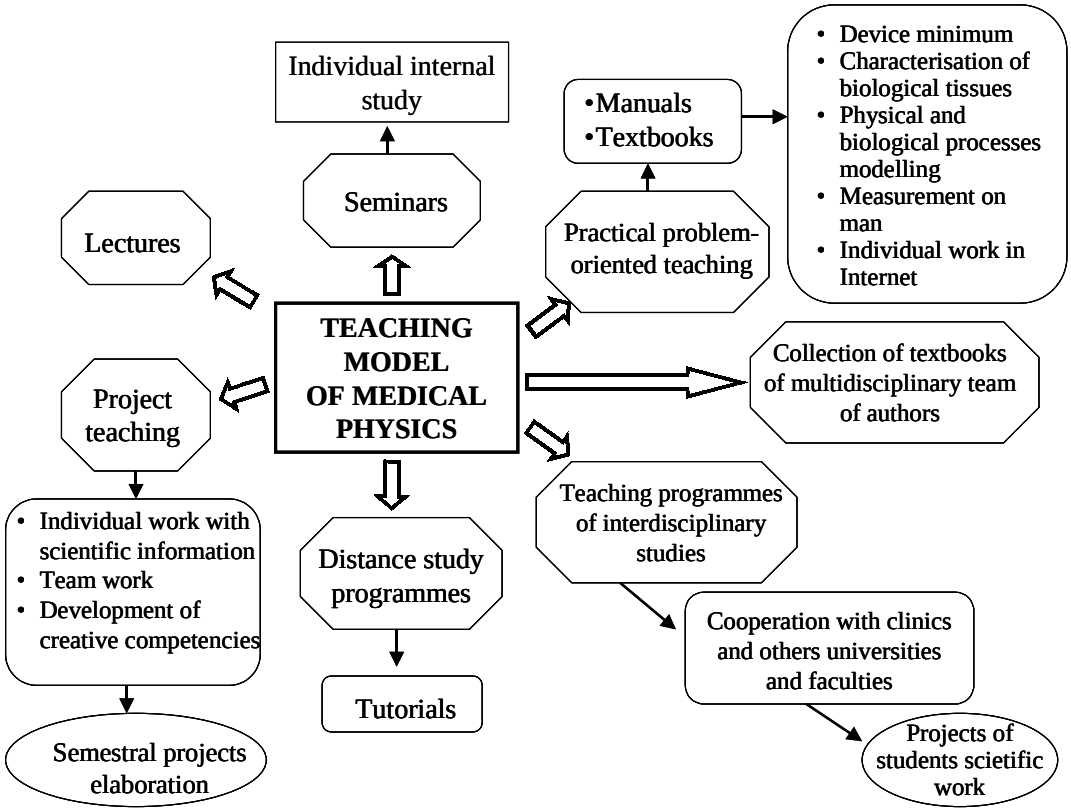

Fig. 3. Teaching model of Medical Physics.

– manual methods (based on human knowledge and skills),
– technical methods – based on technical principles (medical equipment),
– other – the main principle of these methods is for example some chemical substance or microbiological cultivation procedure, and the device is only a way of laboratory realization.

b) used in individual branches.

This classification enables to conclude some statements based on the proportionality and importance of technical and non-technical devices in diagnostics and therapy in internal, surgical branches and in urgent medicine (1–6).

Our research was directed on the study of conditions for professional using of different types of medical technique in the surgical and internal disciplines in health service institutions in the all regions of Slovakia and possibilities of elimination accessory ineligible effects of physical factors.

According its the using frequency of medical devices and methods in 2001st was in diagnostics (17±2.9)/day, therapy (13±3.1)/day, helping devices (27 + 5)/day and totally (54± 5.1)/day.

Results obtained by analysis of questionnaires (number of respondents n=250) in academic years 2003–2004 and 2004–2005 show the current state in medical equipment in individual medical branches in Slovakia and purposes of its use (Fig. 2).

Teaching model of Medical Physics

The whole practical learning of Medical Physics and other physically oriented teaching subjects was managed via textbooks in form of minute-based knowledge (1–7) (Fig. 3).

Physical-derived issues are being solved by means of two approaches in contexts with the following:

– functional anatomy and physiology of organ systems,
– diagnostic and therapeutic procedures performed in healthcare.

Textbook (6) in the form of schemes and algorithms of solutions is not only a guide for full-time, distance and individual students, but can serve beneficially in their future self-education, including the use of information and communication technologies (ICT). The aim is not only to be able to use them for their own purposes but also to be able to instruct the patients how to use them in favour of their health and preventing the diseases.

There is still other didactic form supporting the independent creativity and preparation of students to work in teams, namely the processing of already mentioned term projects in the frame of project training. The latter training is a modern training method. In frame of full-time, distance or external training in disciplines forming the curriculum of university or post-graduate healthcare studies it is more effective than classic forms of training

especially in adults. The current trends in interpersonal relations between the teacher and students, the results of their mutual work using progressive forms and measures of theory of teaching as e.g. cooperative learning or discussion are a convincing proof of durable knowledge gaining. Project training is used in all forms of education in compliance with strategic WHO and EU documents.

The projects can be divided per type into: problems, constructions, evaluations, and drills. Their spreading is enable by ICT, namely teleprojects carried out from distance. Educative and formative targets of project learning develop especially the abilities and habits of working independently and creatively, planning work and completing it, defending work and overcoming obstacles, processing information, presenting work, experessing oneself properly, giving justified arguments, co-operating, communicating, tolerating and accepting other opinions, evaluating ones own work and the work of colleagues.

The objective of project training is to support the struggle of students to manage the future co-operation with workers of various qualifications in solving mutual tasks, e.g. in therapeutic process since the work in health-care is always a team work and the members of team must understand and supplement each other. The more they are able to apply the latter, the more rational are their results.

In the last two academic years the external students of nursing have elaborated term projects. A task was to suggest an optimal solution how to bring the personnel at a particular health-care facility to comply with safety and hygiene regulations. The results have confirmed abundant practical experience of external students that they have gained during their practice at all types of health-care facilities, including social welfare homes. The analysis of term projects indicates, that in protection of health they lay a significant emphasis especially on preventive measures. They have proved the importance of economic of individual health-care facilites. Owing to the fact that among the students there are matrons and ward nurses who can to a great extent contribute to amending and implementing the regulations.

Conclusions

Medical Physics is not an easy subject. The main task of teaching is to prepare the students to understand those physical laws that are applied in medicine. Students get knowledge on basic principles of methods and devices using in medical practice. It can be applied and improved in other medical sciences as physiology, pathophysiology, internal medicine, neurology, dermatovenerology, ophtalmology, otorhinolaryngology, internal medicine, pneumophtisiology and other related subjects that use methods and devices based on physical principles (1, 6). In the same time the training of working with modern computer-based devices that nowadays is an inevitable part of basic equipment of any more or less specialized medical workplace is important (8).

This is a stringent requirement but with the application of proper learning methods it is a soluble problem. Up-to-date demands in medical knowledge represent important education aim and cannot be imagined without thorough study of applications of physical sciences in medicine and their methods.

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