

INTRODUCTION OF SOME PRINCIPLES OF ELECTRONIC LEARNING IN THE EVALUATION OF THE EFFICACY OF EDUCATION IN THE FIELD OF REHABILITATION IN BULGARIA

I.B. Koleva¹, R.D. Yoshinov², B.R. Yoshinov¹

¹ Medical University of Sofia (BULGARIA)

² Bulgarian Academy of Sciences - Sofia (BULGARIA)

Abstract

Current article presents the introduction of computer-based technologies in the education and the evaluation of the theoretical knowledge and practical skills in the field of rehabilitation in Bulgaria – in the special disciplines: Physical therapy, Kinesitherapy, Massage and Soft tissue techniques, Occupational therapy.

A bank with approximately 1000 questions for evaluation of professional competences in the field of rehabilitation was created. After a tailored approbation we created a computer-based system, capable to make an automatic structuration and quantitative evaluation of tests (groups of questions), oriented to different types of staff in the rehabilitation field (students and workers): medical doctors – specialists and during specialization in Physical and Rehabilitation Medicine (PRM), students and specialists in Rehabilitation, Medical Rehabilitation and Ergotherapy, Kinesitherapy. We effectuated too an exploration of student's opinion and worker's opinion on some organization problems of Bulgarian rehabilitation.

Some of principles of structuration of the ICT programme are presented.

During the period September 2006 – September 2016 the quality of education of a total of 1276 students of the rehabilitation field (students, doctors during specialization, and specialists during long life learning) was investigated. Current article presents the evaluation of the level of competences (theoretical knowledge & practical skills) in the field of the basic disciplines: Kinesitherapy, Physical therapy, Massage, Occupational therapy – of the students of bachelor's degree [specialties Rehabilitation, Medical Rehabilitation and Ergotherapy (MRET), Kinesitherapy (KT)] and master's degree [Medical Rehabilitation & Balneology, MRET and Medicine – course V] in different Bulgarian Medical Schools (3 Universities and 2 Colleges). We realized a comparison between students' competencies and workers' competencies (specialists in Rehabilitation, Medical rehabilitation & Ergotherapy, Physiotherapy; medical doctors – trainees and specialists in PRM).

Our work is the first step of creation of a total electronic system in the rehabilitation in our country. We consider that the modernization of didactic concepts should promote the education in the rehabilitation field and the adaptation of the education to the needs of clinical practice, respectively to the amelioration of quality of care of patients.

Keywords: Keywords: rehabilitation, holistic approach, educational plan, educational programme, innovative technologies.

1 PRINCIPAL BASES

1.1 Rehabilitation principles

Contemporaneous rehabilitation imposes the necessity of integrative and holistic approach to the patient, based on ICF and on clinical principles [9, 13, 21, 22]. We consider that in evidence-based practice (including clinical rehabilitation) is important to effectuate a detailed functional evaluation – realized at least before and after a treatment course. In clinical rehabilitation practice we use the *holistic approach to the patient*, and a *patient-centered approach*. Our work is based on the *team rehabilitation principle*: the *multi-professional* and *multi-disciplinary* rehabilitation team.

In Bulgarian rehabilitation clinical practice, we apply a lot of physical modalities:

- *From the group of natural physical modalities:* water (incl. mineral waters), air (incl. ions & aerosols), temperature (heat or cold); movement (active & passive); with the respective parts of PRM: *hydro / balneo / therapy, aero / iono / therapy, thermo / cryo / therapy, kinesi (physio) therapy, ergo (occupational) therapy.*
- *From the group of preformed physical modalities:* electric currents, magnetic field, light (including laser), ultrasound; with the respective parts of PRM: *electro- & magneto-therapy, light -therapy, laser-therapy, ultrasound-therapy.*

We apply the *complex rehabilitation principle* (fig.1) and the synergic combination of different physical modalities (fig.2).

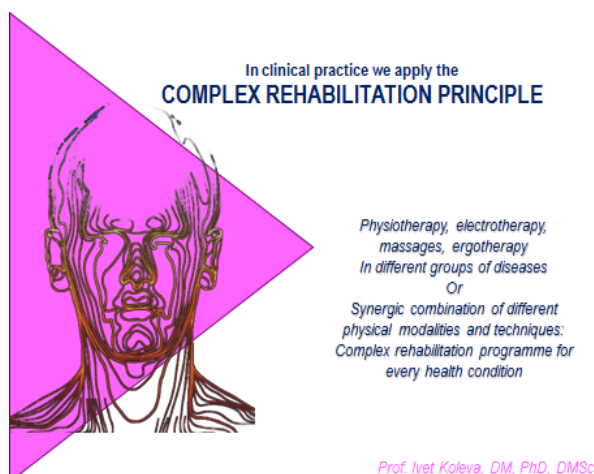


Fig.1. Rehabilitation principle.

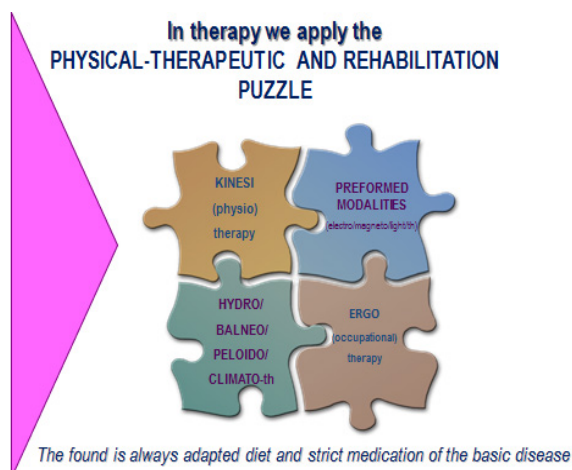


Fig.2. Rehabilitation puzzle.

Our opinion is that the complex rehabilitation plan must include physical and drug therapy, position therapy, diet, self-control of the patients. In our clinical practice we combine (*synergically*) one (maximum two) electro-therapeutic and one hydro / balneo / cryo-therapeutic procedure with two (or three) kinesi-therapeutic methods and some occupational methods [1].

1.2 Functional evaluation in rehabilitation clinical practice

Health is the level of functional or metabolic efficiency of a living being. The *World Health Organization (WHO)* defined health in 1946 as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity".

For measurement of components of health WHO apply *classification systems* (WHO Family of International Classifications), like *International Classification of Diseases (ICD)* and *International Classification of Functioning, Disabilities and Health (ICF)* [13, 14, 15, 16, 17, 18]. The ICF is considered as a WHO's framework for measuring health and disability at both individual and population levels. The ICF was officially endorsed by 191 WHO Member States in the Fifty-fourth World Health Assembly (resolution WHA 54.21). ICF is used in Member States as the international standard to describe and measure health and disability [1, 7]. Philosophy of the ICF is defined in 2001 [15] (figures 3 and 4).

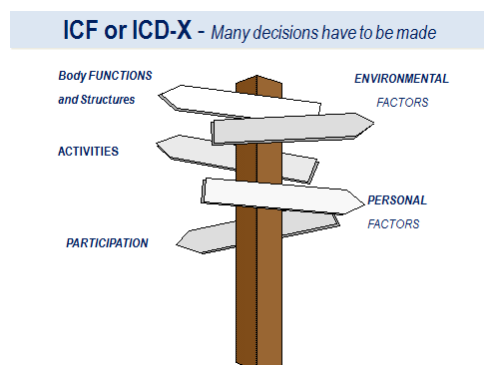


Fig. 3. ICF principle.

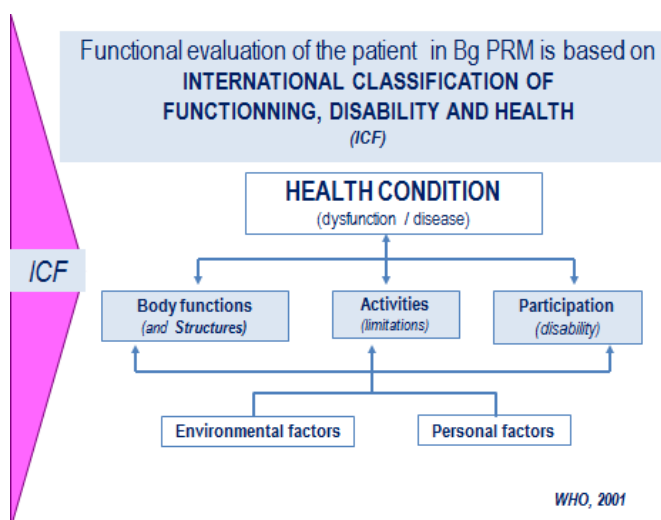


Fig. 4. ICF elements (WHO, 2001).

We estimate the significance of ICF for qualitative evaluation of efficacy of rehabilitation, especially in patients with socially important invalidating OT conditions, respectively with a reduced health related quality of life.

According to ICF principles the *complex functional evaluation* must include: *body functions* (pain, range of motion, motor weakness, coordination alterations); *activities* (mobility, grip, gait, activities of daily living - ADL, travelling); *social activities* (family relations, leisure, social life, political activities); *environmental factors* (living and working conditions, access to transportation, family and friends, health care and health insurance, social relations); *personal factors* (life-style, comorbidity, age, sex).

During clinical investigation we analyse: *cognitive capacities* (orientation, attention, memory, capacity for collaboration in the therapeutic interventions, safety measures); *pain* (localization, type, intensity - verbal or visual analogue scale, activities increasing the pain); *range of motion of joints* (active and passive); *muscle force / muscle weakness, motor deficiency*; *coordination* (static, locomotor and dynamic ataxia); *mobility* (necessity of instruments, canes, batons, aids, devices, instruments); *fatigability* (endurance to exercise, need of rest during investigations and functional activity); *autonomy in activities of everyday life* (bathing, dressing, footing, personal hygiene); necessity of assistance in activities of daily living (ADL).

The evaluation of patients' problems could be both qualitative and quantitative, concerning range of motion of joints; muscle and joint contracture or hypotrophy, fatigue, motor weakness; alterations of posture, gait and grip; pain; conscience of necessity of technical aids; difficulties in ADL; limitations of functional mobility [1, 2, 4, 8, 10, 11, 12].

1.3 Learning and E-learning

The main goal of contemporary education is to prepare the future **Digital citizens** of the Information society. An **information society** is a society where the creation, distribution, uses, integration and manipulation of information is a significant economic, political, and cultural activity. Its main driver are digital information and communication technologies, which have resulted in an information explosion and are profoundly changing all aspects of social organization, including the economy, education, health, warfare, government and democracy [5, 6].

Education is based on learning. **Learning** is a process of adaptation and generation of problem solving capability through acquiring knowledge, skills, attitudes, or values, based on study, experience or teaching, leading to long-term changes in personal behaviour.

The commonly used learning models can be summarized as [19, 20]:

- *Learning, viewed as a process of accumulation*, is often described as an *ongoing cycle*, where the outcomes of previous learning provide the starting point for further learning - Kolb's "experiential learning model (1984), Dewey's model (1998), Engeström's model (1999).
- *Communal constructivism* as an unifying theory for aspects of ICT pedagogy.

Communal constructivism encapsulates the ways in which ICT enables learners not only construct their own knowledge (Constructivism) as a result of interacting with their environment (Social Constructivism), but are also actively engaged in the process of collaboratively create knowledge for their learning community.

Tools used to support e-learning cover a wide range of different applications, including discussion forums, chat, file sharing, video conferences, shared whiteboards, e-portfolios, weblogs and wikis. Such tools can be used to support different activities involved in the learning process.

The real question here is: *'Do social software tools enable a different way of using the web within an educational context?'*

For a long time, in pedagogical science there lived the perception that expert teachers are those who combine deep knowledge of the subject with experience and the ability to choose the most beneficial forms of presentation of this knowledge. A long way from traditional learning scheme, where the teacher was the central figure in the learning process, using the "follow me" approach for delivering concepts, hypotheses, and models data toward the learner to student-centered environment has been passed. It is the *way from traditional classroom to flipped classroom, where learner is the center of educational process*. **Flipped classroom** is instructional strategy and a type of blended learning that reverses the traditional learning environment by delivering instructional content, often online, outside of the classroom. Flipped classrooms also redefine in-class activities, moving including those that are been traditionally considered homework, into the classroom. They may have varying differences in the method of implementation. One of them is *Peer instruction* - an evidence-based, student-centered, interactive teaching method that involves flipping the traditional classroom by moving information transfer out and moving information assimilation, or application of learning, into the classroom.

Applied to e-Learning, we evolve from Shulman's Pedagogical Content Knowledge (PCK, 1987) model to Technological Pedagogical Content Knowledge model of *Mishra and Koehler* (2006) and *Koehler and Mishra* (2008), reflecting the general scheme of e-learning using learner centred pedagogy (fig.5). We combined this model with Porter's model of five forces – the result is presented in figure 6.

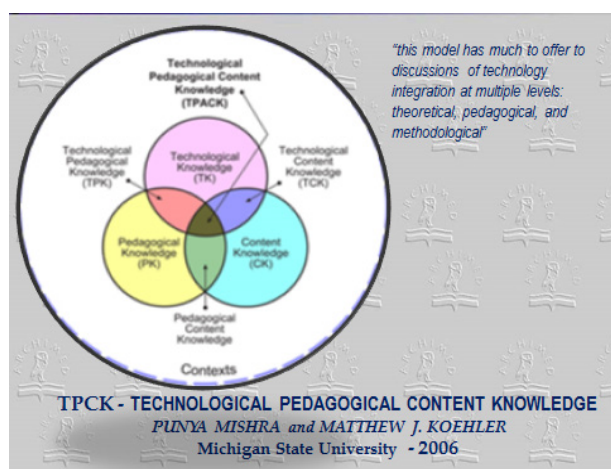


Fig. 5. Model of Mishra & Kohler.

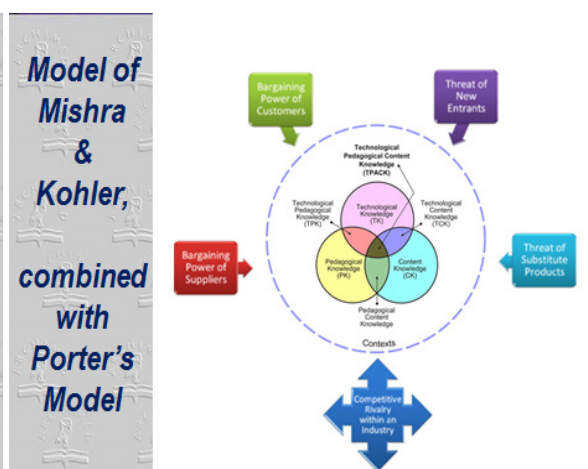


Fig. 6. Combination with Porter's model.

1.4 Education and long life learning in the field of rehabilitation

«Non scholae, sed vitae discimus.»

Latin proverb

In Bulgarian rehabilitation practice a lot of different specialists participate in rehabilitation, respectively – in the education. A *minimal level of competences of members of this multi-professional rehabilitation team* is needed. During last years we included in the e-learning process and evaluation of competences (in the Medical Universities of Pleven & Sofia, Sofia University; Medical Colleges of Sofia and Stara Zagora) different types of students and trainees [20, 21, 22]: students in Medicine (Vth course – discipline Physiotherapy), trainees (medical doctors during the specialization in Physical and Rehabilitation Medicine), students in Rehabilitation (professional bachelor's degree), students in Kinesiotherapy (bachelor's degree), students in Medical rehabilitation and Ergotherapy (bachelor's

and master's degree), students in Medical Rehabilitation and Balneotherapy (masters); medical doctors - specialists in PRM and physiotherapists (during the process of long life learning /LLL/).

For quantitative evaluation of the level of competence of students and trainees we applied series of electronic tests, especially created for the rehabilitation practice and adapted to the role of different members of the rehabilitation team: medical doctors - PRM specialists and PRM trainees; specialists and students in Rehabilitation, Physiotherapy, Medical rehabilitation and Ergotherapy, Medical Rehabilitation & Balneology. The schematic presentation of the educational system is in figure 7 [13].

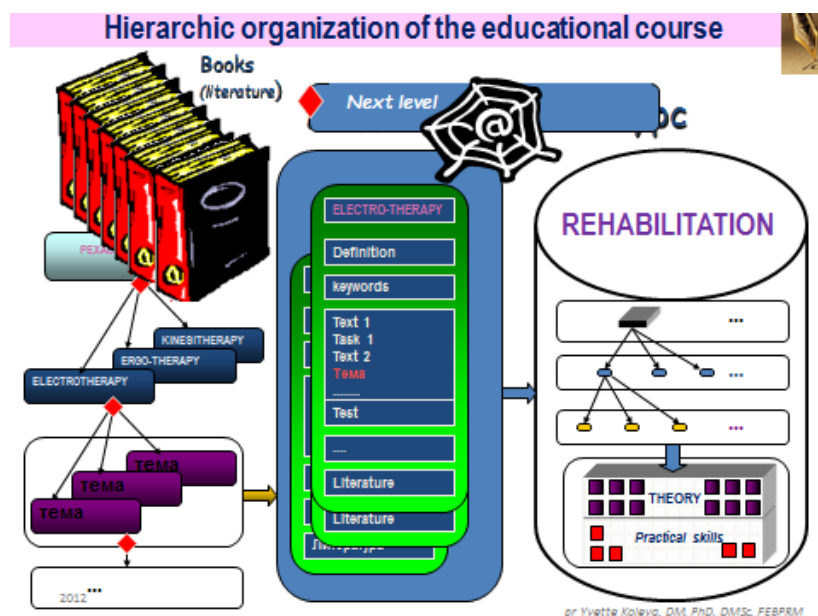


Fig.7. Structuration of the ICT course in the field of rehabilitation.

For these reasons, a bank with approximately 1000 questions for assessment of professional competences in the field of rehabilitation was created. We made tests for evaluation of theoretical knowledge and practical skills (case studies and quiz) in the basic special disciplines: Physical therapy, Kinesiotherapy, Massage and Soft tissue techniques, Occupational therapy; and in common clinical disciplines: neurorehabilitation and orthopedical-traumatological (OT) rehabilitation.

After a tailored approbation we created a computer-based system, capable to make an automatic structuration and quantitative evaluation of tests (groups of questions), oriented to mentioned different types of staff in the rehabilitation field (students and workers). We effectuated too an exploration of student's opinion and worker's opinion on some organization problems of Bulgarian rehabilitation.

2 GOAL OF CURRENT STUDY

Our objective was the introduction of innovative methods and computer-based technologies in the education and the evaluation of the theoretical knowledge and practical skills in the field of rehabilitation in Bulgaria – in the special disciplines: Physical therapy, Kinesiotherapy, Therapeutic Massage and Soft tissue techniques, Occupational therapy.

3 TASKS OF THE CURRENT STUDY

- Structuration and introduction of tests for evaluation of students, trainees and specialists;
- Computer - based evaluation of results of these tests;
- Adaptation of educational plans and programmes in special disciplines: Physical therapy, Kinesiotherapy, Therapeutic massage, Ergotherapy – for the students in Rehabilitation, Kinesiotherapy, Medical Rehabilitation and Ergotherapy, Medical Rehabilitation and Balneology;
- Introduction of new educational disciplines and adaptation of educational plans for specialization of medical doctors in Physical and Rehabilitation Medicine;

- *Introduction of new courses for the long life learning of specialists in the field of rehabilitation;*
- *Elaboration of a computer-based test's system, adapted to the needs of the education in special fields of the rehabilitation: Physical therapy, Kinesiotherapy, Massage, Ergotherapy; Neurorehabilitation, OT rehabilitation, etc.*
- *Evaluation of the level of professional competences of students, trainees and specialists, with the final objective – adaptation to the needs of the clinical practice.*

4 MATERIAL

During the period September 2006 – September 2016 the quality of education of a total of 1276 students of the rehabilitation field (students, doctors during specialization, and specialists during long life learning) was investigated.

- ✓ *55 medical doctors – specialists in Physical and Rehabilitation Medicine (PRM) during the post-diploma courses (long life learning);*
- ✓ *22 medical doctors – specialists in Physical and Rehabilitation Medicine (PRM) during the exam for obtention of speciality ,*
- ✓ *141 medical doctors - trainees – colloquia and exams (during the specialization): 11 - specialization in PRM, 7 – in Neurology, 123 – in General Medicine;*
- ✓ *284 students in Medicine – educational discipline Physiotherapy;*
- ✓ *95 physiotherapists during the post-diploma courses (long life learning);*
- ✓ *303 students in Rehabilitation (professional bachelor's degree);*
- ✓ *36 students in Kinesiotherapy (bachelor's degree);*
- ✓ *315 students in Medical Rehabilitation and Ergotherapy (bachelor's and master's degree);*
- ✓ *25 students in Medical Rehabilitation and Balneotherapy (master's degree).*

5 PHASES OF THE STUDY

The study was effectuated during the period September 2006 – September 2016, in following phases:

- Definition of categories of investigated staff: specialists, trainees and students;
- Formulation of tests and questionnaires (650 closed questions – for the minimal level of competencies; and 350 open questions – for the higher levels of staff);
- Testing of questionnaires;
- Elaboration of testing;
- Elaboration of results,
- Analysis of results;
- Discussion;
- Adaptation of the ICT programme.

6 RESULTS AND ANALYSIS

Current article presents the evaluation of the level of competences (theoretical knowledge & practical skills) in the field of the basic disciplines: Kinesiotherapy, Physical therapy, Massage, Occupational therapy – of the students of bachelor's degree [specialties Rehabilitation, Medical Rehabilitation and Ergotherapy (MRET), Kinesiotherapy (KT)] and master's degree [Medical Rehabilitation & Balneology, MRET and Medicine – course V]; trainees and specialists (during LLL) in PRM - in different Bulgarian Medical Schools (in 3 Universities and 2 Colleges).

We realized a comparison between students' competencies and workers' competencies (specialists in Rehabilitation, Medical rehabilitation & Ergotherapy, Physiotherapy; medical doctors – trainees and specialists in PRM).

6.1 Physical therapy (pre-formed modalities and balneology) – theory (fig.8) and practical skills (fig. 9)

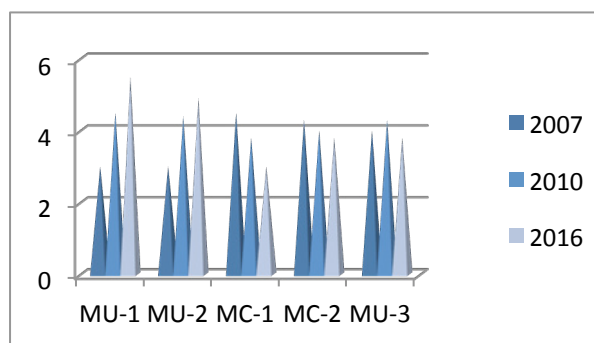


Fig. 8.

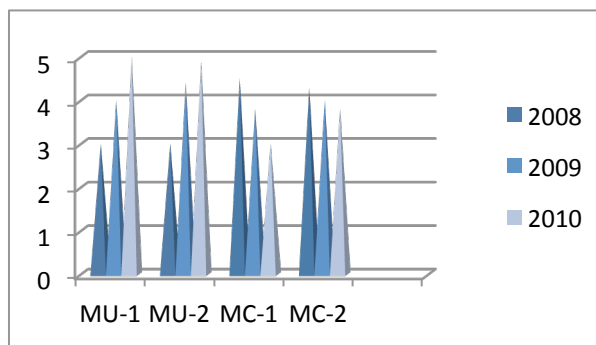


Fig. 9

6.2 Ergotherapy – theory (fig. 10) and practical skills (fig. 11)

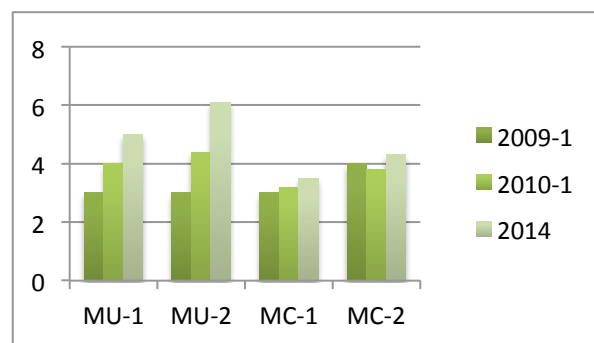


Fig.10.

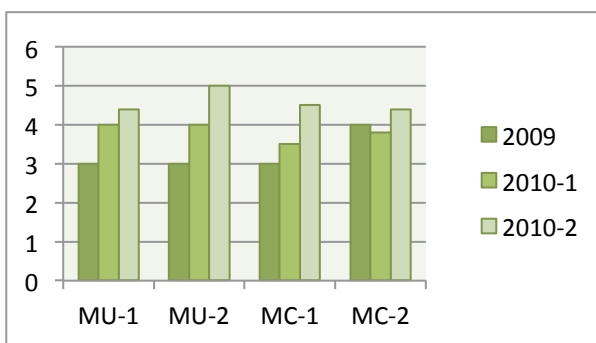


Fig..11

6.3 Kinesiotherapy – theory (fig.12), specialized methods (fig. 13), high level methods (fig.14)

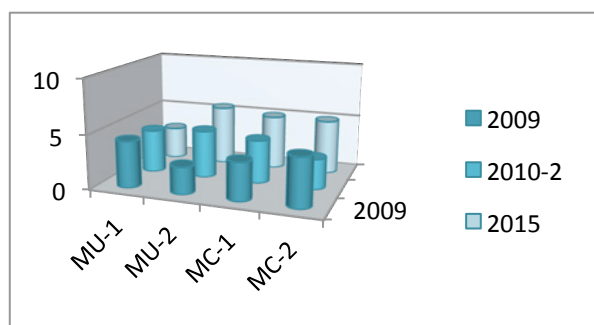


Fig. 12.

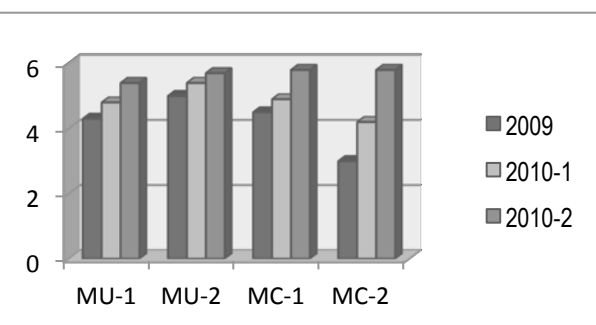
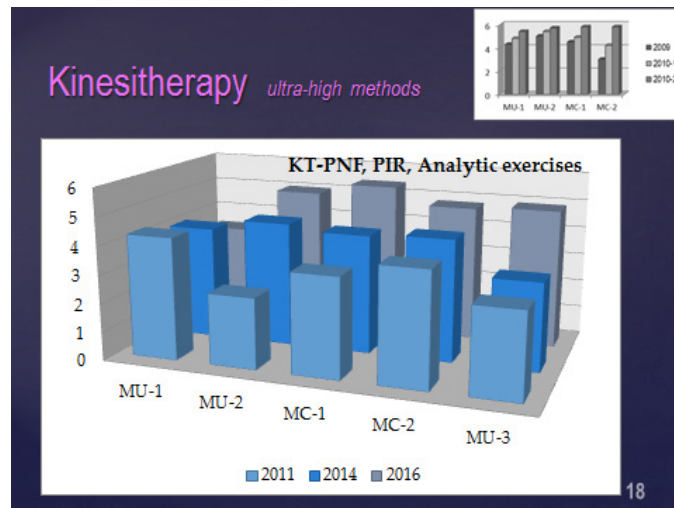


Fig.13



6.4 Therapeutic massage – theory (fig. 14), practical skills (fig.15), and soft tissue techniques (fig.16)

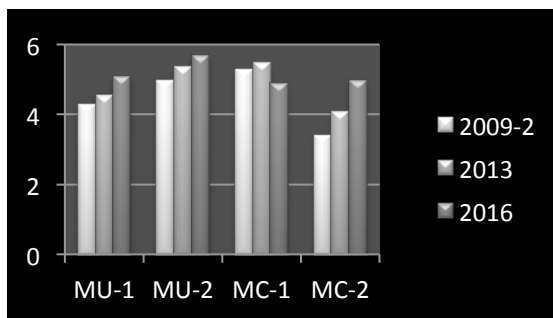


Fig.14.

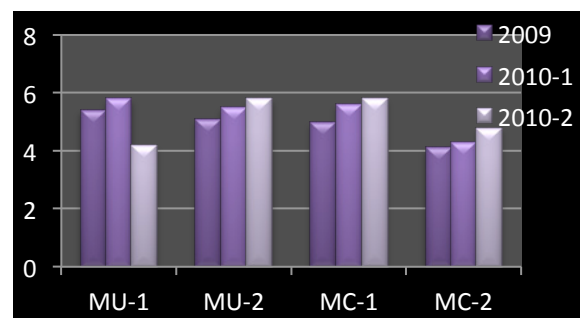


Fig.15.

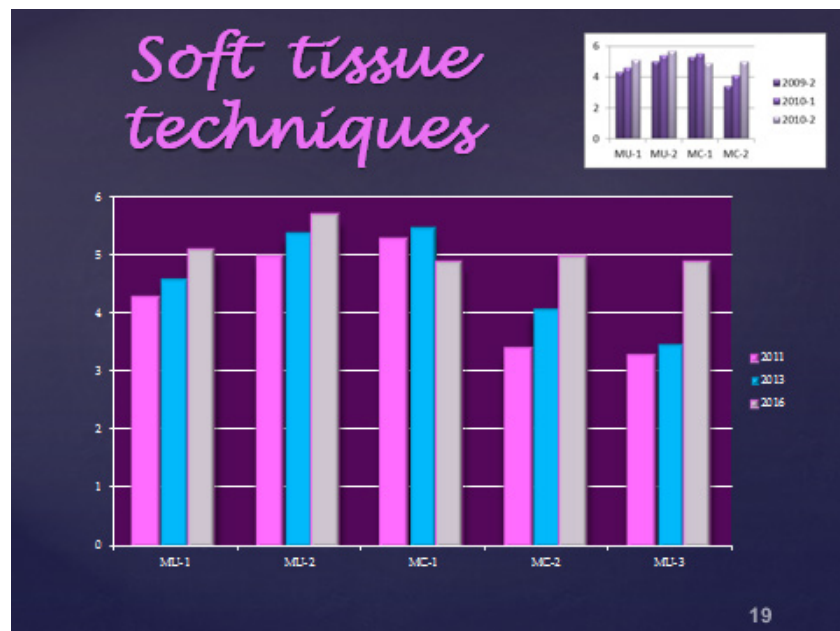


Fig.16. Soft tissue techniques.

7 DISCUSSION

We consider that the modernization of didactic concepts should promote the education in the rehabilitation field and could adapt the education to the needs of clinical practice, respectively to the amelioration of quality of care of patients.

The systematic introduction of principles of ICT technologies and e-learning is the necessary step for the augmentation of the quality of education, respectively – for the increase the level of competences of the rehabilitation staff (fig. 17).

A multi-disciplinary approach for these processes is needed.



Fig. 17. Necessary elements for quality of education and quality of rehabilitation care.

8 CONCLUSION

Our work is the first step of creation of a total electronic system in the rehabilitation in our country. We consider that the modernization of didactic concepts should promote the education in the rehabilitation field and the adaptation of the education to the needs of clinical practice, respectively to the amelioration of quality of care of patients.

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