Poland

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1. State of Clinical Engineering (CE) - Health Technology Management (HTM) – Body of Practice (BOP)

History
Medical physics and medical engineering in Poland has almost 80 years of history and have the common roots in the Radium Institute established in Warsaw in 1932, thanks to initiative of Maria Skłodowska-Curie, the Nobel Laureate in 1903 and 1911. The assistant and collaborator of Maria Skłodowska-Curie, Prof. Cezary Pawłowski, has founded in 1934 the Physics Department of the Radium Institute and organized first courses on medical physics and biomedical engineering. After the Second World War in 1946 graduate studies were started at the Warsaw University of Technology, as the world’s first regular academic courses in electromedical engineering, organized by Prof. Pawłowski. The graduates have started collaboration with medical doctors in clinics as well as in construction of medical equipment.

Since the beginning of the '60s the first medical engineering laboratories in medical clinics were created. The engineers and technicians were responsible for service, and maintenance of medical equipment but also took part in the diagnostic examinations supporting the physicians.

Up to the 1990s it was customary for clinical departments to staff a few engineers and technicians, who took part in everyday work, as partners of medical doctors. They have prepared and performed examinations using medical equipment and analysed data. Due to economical limitations this model of coactivity is not continued.

Actual state of CE
Despite of a long tradition education and practice in clinical engineering has in Poland, a state of clinical engineering in the healthcare did not follow a trend of development towards the healthcare technology management and therefore does not meet today's model of activity in clinical engineering field. At present, in hospitals there are usually only small service teams. In a few hospitals mainly medical scientific institutes teams of medical engineers collaborate with medical doctors in research studies. The Health Technology Management and Assessment is not practiced.

Due to regulations of Ministry of Health from 2002 Medical Engineering is classified as a profession applied in healthcare which requires postgraduate specialization. The regulation of the Ministry of Health introduced the formal positions of medical engineers as consultants i.e. National Consultant and Regional Consultants. The consultants have several
duties and permissions such as to carry out supervision of the postgraduate education, perform tasks, provide opinion and advice for state administration, take part in the work of the commission for the implementation of health policies, control of the quality of medical equipment in health care, opinions on evaluation of human resources in respect to medical engineers, give their opinion in the field of medical devices. The regulations do not indicate, however, a role and degree of responsibility for this profession and therefore a demand for employment is not increased.

2. How would you suggest to show the Value of and from having CE-HTM program

Clinical engineers are unique specialists which have an interdisciplinary knowledge in technique and nature sciences and unique skills. They serve as a bridge between medical technology and medical personnel and patients. A healthcare system without clinical engineering has a gap in this place between technology and medicine and is unable to function effectively. CE-HTM program fulfills this space and guarantees effective and qualified healthcare.

There are several areas of benefits when applying CE-HTM program.

- First one - is an increase in quality and safety of patient’s treatment when using healthcare technology.

- Second - is economy and costs reduction due to optimization of medical equipment use from the very beginning - by a professional capable of recognizing needs, choosing much more proper units, through supervising during exploitation, careful service and maintenance - to the identification of a proper moment for replacement by a new unit. This activity provides a decrease in costs because it minimizes the expenditure on unused devices, and also minimizes the expenses for service and maintenance due to greater role of preventive maintenance in comparison with corrective maintenance.

- Third is a benefit of research and development which can not be done by a medical staff only. Engineers have different point of view and therefore may propose original ideas and solutions. This is possible only in case when engineers are creative partners of medical team and take part in everyday activity.

The unique task of CE is understanding the concept on advanced level as well as the technology of medical equipment that requires knowledge from other fields and a different point of view.

The creative role is to plan holistic, interdisciplinary diagnostic procedures using various modalities and integrated interpretation of results in difficult cases. This requires understanding of relationships between anatomy, function and bioelectrical activity as well as principle of diagnostic methods necessary in the interpretation of measurements taken by medical devices. Moreover, this role requires engineering knowledge and tools out of the scope of the routine level. So, the task is to integrate the knowledge and experiences within the medical environment that require high qualifications and interdisciplinary knowledge.
The knowledge and understanding of advanced application of the laws of physics and mathematical knowledge, as well as engineering activities is applied to the interpretation of the results of medical examinations. In particular, the participation of an engineer is required in examinations involving techniques of different modalities, for example, simultaneous imaging synchronized with electrophysiological recordings. Collaboration of clinical engineers with medical teams at such a high level of competences in everyday practice improves health care delivery and is an important factor in creating new ideas and supporting development in medicine.

3. Example of success stories where CE supported patient outcomes
   No examples.

4. CE Education program available (levels and content) – Body of Knowledge (BOK)
   Education in biomedical engineering is actually offered at 16 high schools and more than 20 are working in this area. This is usually a speciality for existing fields of studies, such as electronics, mechanics, materials engineering, automatics or mechatronics. The development of new medical technologies required a new approach to biomedical engineering education. The program of education has been changed several times and finally has been established as a new field of studies, called “Biomedical Engineering” (BME). The BME teaching meets legal regulations including national standards for academic teaching set out by the Ministry of Science and Higher Education and according to the guidelines of the Bologna Process (including the Educational Credits Transfer System). The quality of education is assured by accreditation of Universities and their study program together with the standardization of program minimum enables the mobility of students between Universities. The current program offers the first degree study (engineer), the second degree (MSc) and third degree (PhD).

5. CE Association/Society and Credentialing/Certification program if available

Specialization in medical engineering – the postgraduate education. Certification

The regulation of the Minister of Health introduced in 2002, the specialization in medical engineering as a profession in clinical environment, (for engineers and medical physicists) is similar to that in medical education system. The postgraduate education program in Medical Engineering as well as medical procedure using technical means is being implemented under the auspices of the Ministry of Health, the Medical Centre of Postgraduate Education and the National Consultant in the field of medical engineering. The postgraduate study takes 2 - 3 years, including practice in various clinics. Institutions providing the training are accredited by the State Commission for Accreditation and should have appropriate facilities for training, experiment and competent staff as well as adequate medical equipment. The aims of medical engineering specializations are providing the practical experience, extending the trainees’ knowledge and maintaining of research awareness.

The candidates for this specialization are obliged to have MSc degree in one of the following fields: BME, automatics and robotics, mechanics, electronics and telecommunications,
electrical engineering, computer science, mechatronics. The training comprises 1500 working hours. Study structure consists of theoretical parts (lectures, laboratories and seminars - 680 hrs), and practical trainings in hospitals (24 weeks). The training program contains 11 modules: (1) Basic medical knowledge, (2) Biomechanics and rehabilitation engineering, (3) Fundamentals of medical electronics, (4) Radiological devices and radiation protection, (5) Automatics, robotics and healthcare telematics, (6) Signal processing, modeling and medical informatics, (7) Electrography, intensive care instrumentation and laboratory equipment, (8) Computer tomography (XCT, MRI, SPECT, PET) and USG, (9) Equipment for postsurgery intensive care units, (10) Biomaterials and artificial organs, (11) Clinical engineering regulatory and organization issues.

This course or scientific or professional achievements accepted as an equivalent of the specialization course is completed by a state exam. Positive result of the exam is awarded by the title specialist in medical engineering by Ministry of Health according to Polish legal regulations (see next subtitle).

The current state of specialization/certification

The academic education in biomedical engineering field results till now in 4000 graduated engineers. Some of them have started working in hospitals to complete one year practice necessary to begin specialization course. There are 10 persons nominated by the Minister of Health as specialists to serve as staff to lead the specialization courses.

The program of the specialization in medical engineering area at Warsaw University of Technology will be modified by using e-Learning platform (lectures, seminars and some practical trainings). Two academic years of the specialization course are divided into four 16 weeks long semesters. Each semester consists of 8 working meetings (Saturday and Sunday) with two weeks of examination session (two meetings).

The course is completed by a state exam (The State Examination Commission) consisting of a practical and theoretical part authorized by the Medical Examination Centre. The graduate obtains the Diploma granting the title of specialist in Medical Engineering area. Professional competence gained during postgraduate education entitles to work in a clinic as a medical engineer or clinical resident.

In 2017, new regulations related to the specialization in healthcare were released by the Ministry of Health, namely: the Act from 24.02.2017 on obtaining a title of specialist in fields applicable to healthcare (Journal of Laws – J.L. – from 20.03.2017, item 599) and Regulation of the Minister of Health from 13.06.2017 on specialization in fields applicable to healthcare (J.L. from 29.06.2017, item 217).

6. CE major challenges (think of 3 subjects)

Regarding the current situation in Poland including legislation, organization of healthcare, economic situation and human resources we may point:

- Adjust our specialization/certification program to the requirements of the CED international certification in CE. HTM and Ethics are main point to be completed.
- Showing to the authorities the benefits to the development of CE and application of HTM and to identify the Health Technology gaps in the healthcare system.
- To prepare projects for regulations that will define the role of CE-HTM in the healthcare system. Regulations should be developed towards indication of obligatory tasks and responsibility of CE in the healthcare and introduction of HTM organization and procedures.

7. What is the most important action you will support to increase CE recognition

_Further activity to improve CE state_

For several years we have been working on the restoration of the principal role of medical engineers to improve quality of healthcare in hospitals.

We propagate the knowledge of the clinical engineering by presentation and recommendations of CE on professionals meetings. Since 2012 we publish a journal, *Inżynier, fizyk medyczny* (in Polish) dedicated to medical engineers and physicists and intended for physicians working in hospitals and therefore dealing with mainly practical procedures and problems such as safety of medical equipment, introducing of new technologies, postgraduate education in medical engineering and physics.

Structure of education program of medical engineering specialization in Poland has been prepared according to medical needs, Bologna Declaration, IFMBE recommendations and practical possibilities. Further effort is needed to develop our postgraduated education and certification to requirements defined lately by CED-IFMBE. The main topics are Health Technology Management and Ethics.

We consider some possibilities of expanding the use of medical engineers: i.e. pilot programs that would introduce medical engineers in selected hospitals in a controlled and correct manner focusing on cooperation with other staff and on optimization of the use of medical equipment, to prove the cost reduction effects and the beneficial effect on functioning of the institution. We intend to exploit the experience of other countries.