



## IS THERE A SPECIFIC PROFESSIONAL ACT FOR CLINICAL ENGINEERS?

Gnahoua Zoabli, P. Eng., M.Eng., Ph.D.  
<sup>1</sup>*CISSS des Laurentides, St-Jérôme, Quebec*

### ABSTRACT

In hospitals, biomedical engineer has several names: adviser in biomedical engineering, biomedical technology advisor, biomedical engineer, clinical biomedical engineer, clinical engineer or simply engineer. Biomedical engineering exists in Quebec hospitals for over forty years. The recent transformation of Quebec health network in Integrated centers of health and social services, and in Integrated academic centers of health and social services, revealed that the role of biomedical engineers in hospitals is misunderstood. Moreover, to date, there does not seem to exist a reserved professional act for clinical engineer while his counterpart medical physicist has a field of practice in radiation therapy, radiation protection and dosimetry. Given this state of facts, we suggest to share some reflections that may help to better understand some of the clinical engineer's roles that are similar to reserved tasks or exclusive professional acts.

**Keywords:** Clinical Engineer, Professional Act, Exclusive Field, Preferential Field of Practice.

### INTRODUCTION

The observations described in this document are derived from our 20 years experience of clinical engineering and from exchanges with peers. Indeed, several other healthcare professions have played roles in the acquisition of medical devices, drafting technical specifications to an extent that some clinical, technological or administrative managers choose to limit their biomedical department to a maintenance workshop; technical specifications being developed through regional or provincial procurement corporations.

Training in human physiology, modeling, health and hospital systems and clinical placements during university courses allow a clinical engineer to properly "talk" in the clinical or medical language and to understand accurately the needs expressed in order to translate them into appropriate technological configuration for the benefit of the patient. It is possible that the exchanges that follow allow solving an inherent problem whose discovery requires additional technological knowledge specific to clinical engineering.

Another activity that is related to continuing education, but which is not one, is the presentation of products or equipment by sales representatives. In the absence of a clinical engineer in such activities, technological discernment could fail and

possibly it would cause the acquisition of an inappropriate technology configuration.

If the role of the clinical engineer was correctly understood by healthcare professionals, he would be more solicited and involved in all medical technology projects, from planning to replacement. Here are some observations that we hope will bring a first insight into the roles and responsibilities of a clinical engineer.

### MATERIALS AND METHODS

Most of our years of experience took place in healthcare facilities that had biomedical engineering department without an engineer. By introducing the dimension of engineering, we have taken time to gradually make changes in the practices, and to better understand the added value of the profession. A biomedical engineering undergraduate program was started at Polytechnic Montreal in 2008. We participated in developing the content of the program and we are an invited teacher. We now try to address the particularities of biomedical engineering in hospital environment according to our experience of last twenty years. In short, we seek roles of the clinical engineer that resemble professional tasks or actions that would be better executed if they were reserved to him.



## RESULTS

We found that, for medical devices, the following tasks would be better realized if exclusively or primarily dedicated to a clinical engineer:

- 1• Health Canada compliance verification and analysis;
- 2• Medical devices risk category compliance verification;
- 3• Canadian Standard Association compliance analysis;
- 4• Technological visits to different managers of clinical and medical healthcare departments (head-nurse, doctors, pharmacists, dentists) to plan the technological needs in connection with the corresponding clinical reality without budget constraints, and later with financial constraints;
- 5• Analysis of the clinical relevance of a new medical technology;
- 6• Medical device technical specifications' configuration;
- 7• Management of radiation protection
- 8• Management of electromagnetic interferences;
- 9• Quality control of post acquisition clinical and technological training program;
- 10• Final acceptance of medical devices, before closing an acquisition project;
- 11• Formal declaration of technological or clinic obsolescence;
- 12• Investigations and recommendations following an incident / accident;
- 13• Management of alerts and reminders;
- 14• Certification of the modification of medical devices, in agreement with the manufacturer.

### **Tasks managed in a professional partnership**

- A• Planning for the development of care areas (architect, facility maintenance project manager);
- B• Electrical safety of medical equipment (biomedical technologist, master electrician);

- C• Medical beds entrapment safety (housekeeping, nursing);
- D• Safety of Laser (medical physicist);
- E• Dosimetry (medical physicist);
- F• Metrology (medical physicist);
- G• Technical design and drafting (building technician);
- H• Provincial, regional or local call for tender (procurement officer).

## DISCUSSION

### Possible explanation for the profession misunderstanding

At the bedside are three "people": the doctor, the nurse (or technologist) and medical equipment. Although the process of acquiring such equipment is coordinated by the clinical engineer, when the unit will default this will be the biomedical engineering workshop to be sought, a biomedical technologist. It is difficult to "materialize" a clinical engineer in the care area. This has implications for the understanding of his role and responsibilities.

### Clinical Engineering in Quebec Health network reform

Biomedical engineering is the only clinical department to have multiple directorates in CISSS and CIUSSS, with different attachments from a region to another, denoting a misunderstanding of the profession. This observation triggers our will to explain the profession to the general public and hope induce the creation of a distinct directorate of clinical engineering in each Quebec health authority.

### Technology watch and quality control

Even today, at least one of the acts mentioned above is omitted during most technology management processes in general or academic healthcare institutions. If these roles are officially vested in the clinical engineer, this could encourage a better technology watch, thus improving the safety of the use of medical devices.

### Periodic update of clinical knowledge

The increasing computerization of medical technology accelerates the obsolescence of medical



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equipment and systems. This commands a clinical engineer to periodically update his clinical knowledge beyond the requirements of his professional Board.

#### Maintaining expertise in clinical engineering

Should a clinical engineer leave the hospital environment to go practice in the biomedical industry, given what we have already advanced, we believe that his clinical engineering expertise will no longer be valid after a very long hospital absence, depending on the nature of the new work. If he plans to return to work in a clinical settings again, after a long period of time (reasonably between 3 and 5 years), a professional probation (short orientation or specific training) would be appropriate. This will reflect changes in medical or clinical practice and in technology during his absence. We therefore recommend a clinical engineer who practices outside the hospital to have a legal obligation to update his "clinical" knowledge periodically.

#### Need for a clinical engineering whitepaper

After this brief presentation of the profession according to personal views, it will be important to draft in a document, in a concerted manner, with a clear explanation of each suggested action and its benefits while done by a clinical engineer. It will better assess the need for a knowledge update in connection with the evolution of clinical and medical practices. The guidelines of the document will result in possible proposals for the current academic programs.

#### Impact on the university degrees required

When professional acts reserved to a clinical engineer will legally be established, and their detailed content published, it will become necessary to revise the existing academic biomedical programs to make the graduated students well prepared for these professional skills.

### **CONCLUSION**

The role of biomedical technologist is better known than the clinical engineer's and this is reflected in the different charts of Quebec CISSS and CIUSSS. This document is an attempt to shed light on the clinical engineering profession. If you are a biomedical engineer with a long working experience in hospitals and you still fail today at

least one of 14 acts listed above, or know others, I invite you to join me in working to writing a white paper on clinical engineering. We will therefore contribute to a public knowledge of this profession for the benefit of the safety of the medical technological act, and for the compliance of clinical engineering academic programs to these skills.