Chapter 5
Modeling Clinical Engineering Activities to Support Healthcare Technology Management

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ABSTRACT

Biomedical technology is a valuable asset of healthcare facilities. It is now universally accepted that, to assure patient safety, medical devices must be correctly managed and used, and that the quality of healthcare delivery is related to the suitability of the available technology. The activities that guarantee a proper management are carried out by the people working in a Clinical Engineering (CE) department.

In the chapter we describe a model to estimate the number of clinical engineers and biomedical equipment technicians (BMET) that will constitute the Clinical Engineering department staff. The model is based on the activities to be simulated, the characteristics of the healthcare facility, and the experience of human resources. Our model is an important tool to be used to start a Clinical Engineering department or to evaluate the performances of an existing one. It was used by managers of Regione Piemonte to start a regional network of Clinical Engineering departments.

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INTRODUCTION

Biomedical technology is strategically important to the operational effectiveness of healthcare facilities. During the middle of the 60s technology started to spread inside the hospitals. The instruments were definitively simpler than today but their ability to auto-detect failures was small and the problem of their management was mostly concerned with electrical safety or fixing. In the last fifty years the performances and the potentialities of technology increased dramatically and this change significantly affected biomedical instrumentation. Medical devices became more sophisticated and safer, but the number of devices increased significantly. Testing electrical safety turned into one of the activities, and the principal problems became to correctly manage the devices maintenance, to purchase the most suitable instrument, to plan device substitutions, to ensure the correct functioning of the instruments, and to guarantee the availability of critical devices every time they are needed. It is now universally accepted that to assure patient safety medical devices must be correctly managed and used, and that the quality of healthcare delivery is related to the suitability of the available technology.

The activities related to both technology management and to support physicians and nurses to properly use the devices are carried on by clinical engineers and biomedical technicians, usually employed in Clinical Engineering Department. When a new Clinical engineering department must be established, the healthcare managers must decide the staff composition. In the past, they used to decide the personnel taking into account only the number of beds. With the growing differences among medical devices that are associated to the complexity of the clinical activities this rule is not appropriate. Several more indicators must be taken into account to ensure that the Clinical engineering department has the proper staff.

In our chapter we will describe a model to be used to estimate the number of clinical engineers and biomedical equipment technicians (BMET) that will constitute the Clinical engineering department staff. A simulation model was chosen because we wanted to guarantee not only that the number of working hours needed to perform all the activities was available, but also to guarantee customer satisfaction, meaning that customers will have a quick and right answer to their demands.

BACKGROUND

The Italian National Health Service (NHS) follows a model similar to one developed by the British National Health Service since it provides universal health care coverage throughout the Italian State as a single payer. However, the Italian NHS is more decentralized, because it gives political, administrative, and financial responsibility regarding the provision of health care to the twenty regions (Maio and Manzoli, 2002). Each region must organize its services in order to meet the needs of its population, define ways to allocate financial resources to all the Local Health Agencies (LHAs) within its territory, monitor LHAs' health care services and activities, and assess their performance. In addition, the regions are responsible for selecting and accrediting public and private health services providers and issuing regional guidelines to assure a set of essential healthcare services in accordance with national laws.

The LHAs form the basic elements of the Italian NHS. In addition, in 2000, there were ninety eight public hospitals qualified as "hospital trusts." Hospital trusts work as independent providers of health services and have the same level of administrative responsibility as LHA. Based on criteria of efficiency and cost–quality, the LHAs might provide care either directly, through their own facilities (directly managed hospitals and territorial services), or by paying for the services delivered by providers accredited by the regions, such as independent public structures (hospital agencies and university-managed hospitals) and