Chapter 3

Applications in Predictive Analytics: Ubiquitous Management Methodology for Predictive Maintenance in Medical Devices

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ABSTRACT

According to the World Health Organization, Healthcare Technology (HT) is defined as the application of techniques and knowledge in the way of devices, medicaments, vaccines, procedures, and systems in order to develop solutions for healthcare problems and enhance the quality of life. Clinical Engineering has emerged as an interdisciplinary profession in the areas of medical equipment and technology management. With the correct support of Information and Communication Technologies (ICTs), these and others questions may be resolved through the ubiquitous environments and services that allow the acquisition, processing, diagnostic, transmission, and information-sharing in real time. Ubiquitous healthcare is a new paradigm that allows developing models and tools that improve the processes through monitoring, evaluation, prediction, and decision-making of the medical equipment condition. This chapter presents an ubiquitous management methodology for predictive maintenance with support of ICT and predictive analysis techniques that enhance decision-making in medical equipment.

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1. CLINICAL ENGINEERING AND TECHNOLOGICAL LIFE CYCLE OF MEDICAL EQUIPMENT

1.1 Traditional Model of Clinical Engineering

Medical equipment (ME) is defined by the World Health Organization (WHO) as a medical devices that require calibration, maintenance, repair, user training, and decommissioning — activities usually managed by clinical engineers (WHO, 2011).

Nowadays, Clinical Engineering (CE) performs support activities in ME through organized human work in conjunction with other healthcare professionals. However, these activities are influenced by the interaction of various elements, along which the CE must also act in a complementary manner and constituent with approaches that help management in ME through a process perspective. For the CE, this perspective should reflect the interaction of ME with human resources for patient care (Moraes, 2007).

Therefore, the technological process in health is defined as the interaction between human resources, infrastructure, ME, methods and technical standards required for the transformation of the health of the patient within a health care environment. Figure 1 shows the traditional model of CE, highlighting the areas of infrastructure, human resources and ME; which support the quality in the appropriate use of ME.

This model is part of the Center in Management and Development of Medical Equipment (Ceged-TMH) of the Biomedical Engineering Institute (IEB-UFSC) and allows the managing of