

A METHODOLOGICAL APPROACH TO IMPROVE THE PERFORMANCE IN OPERATING ROOM MANAGEMENT

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This research seeks to improve the service quality provided in Operating Rooms through a Key Performance Indicators (KPI) system based on the analysis of processes and resources used in three surgical units in Chile. This methodology integrates two frameworks: Lean Healthcare and Activity Based Costing.

We analyzed these Operating Rooms to establish standard procedures and surgical costs. The proposed methodology includes the following four stages: (i) Identifying macro-processes in the Health Care Unit; (ii) Describing the macro-processes and their healthcare objectives; (iii) Analyzing and standardizing the described processes; and (iv) Generating indicators aimed at cost-control and indicators aimed at reducing activity-duration variability. The KPIs support the reduction of surgery variability, maintain low overhead costs, and set appropriate goals for the: (i) pre-operative; (ii) intraoperative; and (iii) postoperative stages. The implementation of Activity Based Costing, Ishikawa Diagram, and Value Stream Map allowed to identify the resources used in each activity performed, the costs of the activities, and the processes required to provide each surgery.

Sample results, of the methodology and proposed application, include the identification of the three most expensive activities, which are: Provide total intravenous anesthesia, Perform postoperative nursing care and Monitor vital signs. These activities represent 29% of the total cost of an operating room. In addition, twelve process indicators were defined, such as Patient transfer time to OR and Extended use of OR. All of these indicators, processes and cost indicators, will likely improve the management of the operating rooms.

Keywords: healthcare Quality Management, Operating Room Management, Activity Based Costing.

1.- INTRODUCTION

Escalating healthcare costs in Chile and worldwide, requires the use of new approaches to control them. Among the principal sources of costs are the surgical processes. This is due to the introduction of new technologies and supplies, the requirement of highly specialized professionals and multimorbidity in chronic diseases of the population [1] [2].

The literature shows that the indicator systems used by regulatory institutions to evaluate performance in health institutions mainly generate negative actions, such as punishments or fines for not meeting goals [3] [4]. Whereas, indicator systems developed by internal sources, mostly trigger positive actions. In the last case, most of the time, the focus is on creating training initiatives to improve practices from a continuous quality improvement viewpoint [4]. In one of these initiatives, in the Chilean case, the use of five dimensions of health performance indicators is reported [5] in its work plan: technical quality, effectiveness, efficiency, insurance relations, and client relations. In this case, it shows a high preference for technical quality indicators that do not include process analysis to manage health institutions.

Furthermore, the development of effective indicator systems in healthcare is difficult due to the limited literature available on methodologies used to improve and control processes. There are research works related to specific disciplines that mainly focus on disease control [6] [7] and works related to guidelines for indicator development [8]. However, only a few authors propose methodologies to design performance indicator systems focused on the quality processes in order to reduce variability in health care processes and costs [8]. In this case, the objective of this research is focused on the development of a new approach to identify Key

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Performance Indicators (KPIs) to control the processes related to surgery based on Activity Based Costing (ABC) and Lean Healthcare (LH). These two approaches were selected in order to achieve a higher participation of the professionals involved in an OR through the generation of positive actions, such as described by [4]. The innovative aspect of the proposed methodology is the analysis of clinical processes from a process perspective that considers activities, time and resources from an engineering perspective to re-design processes in a way that reduces costs, time and increases the quality required by health care specialists.

In the following section, we describe why ABC and LH were chosen to develop a new methodology to generate indicators. Then section 3 describes the proposed methodology and depicts an application in a standard hospital. In section 4, we discuss the results.

2. WHY CHOOSE ABC AND LEAN HEALTHCARE

The proposed methodology seeks to improve the quality of services offered by hospitals in their surgeries, using an indicator performance system based on the process and resource analysis. Unlike what is proposed in [7], this methodology is not only based on the clinical aspects of the discipline, but it also includes the activities performed, resources used and an analysis of their duration. The ABC system developed by Kaplan and Cooper has been applied in various health institutions to determine and control the costs of activities in surgical procedures [8], because indirect costs are higher than direct cost components. ABC systems seek to determine costs more accurately for each treatment [9] [10]. The information generated by the ABC system is beneficial for making decisions in the Operating Room (OR), due to the breakdown of the information provided. It is broken down into knowledge and identification of activities performed in surgery, and identification of non-value activities. ABC also has the potential to generate indicators for assessing the quality or effectiveness of the activities carried out in the different subunits [11].

The ABC approach is complemented by the use of LH framework, in particular Value Stream Maps (VSM) and Ishikawa Diagrams (ID). The applications of VSM in the healthcare processes have allowed for the reduction of patient waiting times, an increase of process performance, and the strengthening of the capacity of health institutions without adding personnel or equipment. They have also allowed for the treatment of unscheduled patients and a reduction of the stress levels in the system [12]. The application of VSM in the sterilization unit demonstrates the benefits of analyzing healthcare processes using this technique, reporting the reduction of wastes, inventory levels, and production lead times [13]. The ID supports the identification of the main factor leading to the cancellation of surgery [14] and to improve the quality of surgery.

In short, VSM & ID make it possible: (i) to know which activities are adding value and identify opportunities to improve them in order to achieve higher efficiency levels; (ii) to identify the activities that do not add value, in order to eliminate or minimize their impact on resource consumption; and (iii) to identify the causes of the problems affecting the achievement of performance targets [15] [16] [17]. Consequently, the proposed methodology includes ABC and LH approaches because they are appropriate for institutions that provide services such as ORs.

3. METHODOLOGY AND APPLICATION

3.1.- METHODOLOGY

The proposed methodology includes, the following four stages, (i) Identifying macro-processes in the Health Care Unit; (ii) Describing the macro-processes and their healthcare objectives; (iii) Analyzing and standardizing the described processes; and (iv) Generating indicators aimed at cost-control and indicators aimed at reducing activity-duration variability (see Figure 1).

The **first stage** seeks to define the Macro-Processes in the Health Unit under study to recognize the main objective or services for which the unit is responsible. Likewise, at this stage it is important to identify the macro-process necessary to adequately reach the unit's objective. In the **second stage**, it is necessary to describe the macro-processes and their health objectives in order to standardize the activities and expected results of each macro-process.

After describing and defining the macro-processes, the **third stage** aims to analyze and standardize all identified macro-processes. This stage begins with interviews and field investigations to observe the activities carried out within each process. Second, the physicians and nurses verify the activities in the flowchart and validate the supplies and medications identified by the research team. Then, to estimate the duration of the activities, at least 30 samples of data are required through direct observation. As a result, the following information is recorded in a table: activity name, activity start time, activity end time, and activity duration measured in minutes. Third, physicians and nurses are interviewed to review activities and their duration, the maximum and minimum duration, and the main reasons for differences in the duration of activities. All of this information is summarized in a final table to generate the VSM, flowchart, and activity dictionary for the costing model.

The **fourth stage** pursues generating performance indicators. The set of performance indicators, developed in this stage, support the