

Assembly of surgical room based on Lean thought in a university hospital

Montagem de sala cirúrgica baseada no pensamento lean em um hospital universitário

Montaje de sala quirúrgica basado en pensamiento Lean en un hospital universitario

RESUMO

OBJETIVO: A presente pesquisa objetivou relatar a experiência de implementação de um checklist diário de montagem de sala cirúrgica baseado no desenvolvimento lean de produtos e processos. **MÉTODO:** Pesquisa do tipo relato de experiência. Utilizou-se com base metodológica, o pensamento lean de produtos e processos, voltado para a área da saúde. **RESULTADOS:** 240 checklists foram preenchidos diariamente por técnicos em enfermagem e compilados em um livreto. Este instrumento continha a quantidade de equipamentos e mobiliário necessários para a realização de procedimentos cirúrgicos adequados. Ele norteou a melhor organização das salas de cirurgias. Foi aplicada a metodologia lean ao longo do processo de preenchimento do instrumento e feitas avaliações qualitativas, por enfermeiros, da otimização das salas cirúrgicas ao longo dos meses. **CONCLUSÃO:** Com a padronização de montagem de sala operatória por um instrumento norteador, houve melhoria de indicadores principalmente no que se refere ao desperdício de tempo no início de cirurgias

DESCRIPTORES: Enfermagem de Centro Cirúrgico; Salas Cirúrgicas; Gestão da qualidade total.

ABSTRACT

OBJECTIVE: This research aimed to report the experience of implementing a daily checklist for operating room assembly based on lean development of products and processes. **METHOD:** Experience report research. It was used, with a methodological basis, the lean thinking of products and processes, focused on the health area. **RESULTS:** 240 checklists were completed daily by nursing technicians and compiled into a booklet. This instrument contained the amount of equipment and furniture needed to perform adequate surgical procedures. He guided the best organization of operating rooms. The lean methodology was applied throughout the process of filling out the instrument and qualitative assessments were made by nurses of the optimization of operating rooms over the months. **CONCLUSION:** With the standardization of operating room assembly using a guiding instrument, there was an improvement in indicators, especially regarding the waste of time at the beginning of surgeries.

DESCRIPTORS: Surgical Center Nursing; Operating Rooms; Total quality management.

RESUMEN

OBJETIVO: Esta investigación tuvo como objetivo reportar la experiencia de implementar un checklist diario para el montaje de quirófano basado en el desarrollo esbelto de productos y procesos. **MÉTODO:** Investigación de informe de experiencia. Se utilizó el pensamiento Lean de productos y procesos con base metodológica, con foco en el área de la salud. **RESULTADOS:** Los técnicos de enfermería completaron 240 listas de verificación al día y las recopilaron en un folleto. Este instrumento contenía la cantidad de equipo y mobiliario necesarios para realizar los procedimientos quirúrgicos adecuados. Guió la mejor organización de quirófanos. La metodología lean se aplicó durante todo el proceso de llenado del instrumento y las enfermeras realizaron evaluaciones cualitativas de la optimización de los quirófanos a lo largo de los meses. **CONCLUSIÓN:** Con la estandarización del montaje de quirófano mediante un instrumento guía, hubo una mejora en los indicadores, especialmente en lo que respecta a la pérdida de tiempo al inicio de las cirugías.

DESCRIPTORES: Enfermería del Centro Quirúrgico; Quirófanos; Gestión de la calidad total.

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ORCID: 0000-0003-1607-6483**INTRODUÇÃO**

Currently, one of the pillars for safe care in the intraoperative period is the correct execution of the Surgical Safety Checklist (SSC) proposed in Brazil by the Ministry of Health under the guidelines of the “Safe Surgery Save Lives” initiative, established by the World Alliance for Patient Safety as part of the global health mortality to reduce the Organization for surgeries worldwide.¹

The World Health Organization (WHO) defines that, in order to guarantee patient safety, there must be a reduction, according to acceptable standards, of the risk of unnecessary harm associated with health care.² In this sense, health institutions seek alternatives to minimize damage and improve the quality of health care. These are summarized in actions focused on six international goals: correct patient identification; effective communication between health professionals; safety in the prescription, use and administration of medicines; surgical safety; sanitization of hands; decreased risk of falls and pressure injuries.³

This proved necessary since harm to patients is preventable. Care should be based on safe assistance. The lack of this, in addition to bringing additional problems to the patient, increases the costs of health services. The lack of quality in care is considered a public health problem and it is necessary to search for better indicators in this aspect.⁴

In order to demonstrate the improvement of processes in perioperative care and the quality of services with regard

to the goal of improving surgical safety, the objective of this research is to report the experience of implementing a daily operating room assembly checklist based on the lean development of products and processes for the optimization of safe surgical care.

The present study is relevant to the scientific field since it brings a work process based on an innovative methodology in the health area. This, however, can configure a gap, due to the lack of studies in the area, but at the same time, it tends to serve as a basis for future studies in assembly and organization of work in the Operating Room.

METHOD

The present study is an original research, with a qualitative approach in the form of an experience report. This can be defined as a systematic description of reality and consists of a search for correlations between findings of this reality and scientific theoretical bases.⁵

The experience reported refers to a standardization of assembly of the Operating Room based on an innovative method in the health area. It was used as a methodological basis, the lean thinking of products and processes, focused on the health area (lean healthcare). This method aims to improve the safety and quality of care in the services.

In this method, the approach is used to understand the processes used, and based on that, continuously improve them. This management philosophy was applied at Toyota - an automobile company in the

USA - by Edwards Deming, an American statistician, as a daily business program. In healthcare, there was a renewal and lean thinking was shaped as a methodology for continuous improvement (Kaizen - in Japanese) of performance.⁶

There are many health benefits to using lean. The most common problems in the administration of the health system are improved with this method. By developing it, institutions are able to shorten the process; reduce errors; eliminate waste and optimize the use of resources.⁷

Also according to this author, when lean becomes the organizational strategy, the transformation can be profound and the associated gains in hospitals are not limited to saving resources, but directly impacting the safety of processes and the quality of services.

Lean Model or Methodology has the principle of offering better quality in service, optimizing resources in order to obtain more quality with fewer resources. Some of the key concepts introduced when applying Lean Methodology include.⁸

- Define customer value (quality control): The basis of this philosophy is that all departments, employees, suppliers, distributors and people with a relationship related to the process must actively participate in quality control, defined as the degree of customer satisfaction with the service received.

- Kaizen (continuous improvement): Applies insight (discovering problems), developing ideas (finding creative solutions), and making decisions, which

involves implementing them and verifying their effect.

- **Lean Six Sigma:** Lean Sigma is a combination of Lean methodology and six sigma elements, which manages to reduce defects before they appear.

- **Pull System:** This system consists in that, within the attention, the process is carried out without unnecessary interruptions (make it flow).

- **Just in time:** Adapt service to the pace of demand, achieving a reduction in time.

The research was carried out from April 2019 to April 2020 at the Surgical Center of the University Hospital of Piauí, which has a mixed Surgical Center configuration, with 10 Operating Rooms, where medium and high complexity surgeries are performed.

A daily checklist was used as an instrument that guided the assembly of the room, with fixed amounts of equipment and furniture, previously raised, according to the surgical procedures of medium and high complexity frequently performed in the institution.

The completion of the checklist was performed by Nursing Technicians of the institution. The nurses daily evaluated the organization of the operating room and the beginning of activities. At the end of the procedures, reports were prepared that served for a qualitative analysis of the activities related to the assembly of the operating room. Over 12 months, 240 instruments and 240 qualitative assessment reports were completed. The evaluations were read and discussed based on lived experience, relating the findings of this reality and with the scientific bases and lean thinking of products and processes.

RESULTS AND DISCUSSION

After evaluating the indicators of the implementation of the SSC at the University Hospital of Piauí (HU-UFPI), it was verified the absence of checking items regarding the assembly of the operating

Table 01: Operating room checklist

ROOM		DATA			
EQUIPMENT	QT	M	T	N	MOVEMENT
MULTIPARAMETRIC MONITOR WITH CABLE AND BATTERY	01				
ECG CABLE	01				
OXIMETRY SENSOR	01				
CAPNOGRAPHY MODULE	01				
PARENT MODULE	01				
NIBP Cuff	01				
TEMPERATURE SENSOR	01				
OPERATIVE BED	01				
ANESTHESIA CAR	01				
SERUM SUPPORT	02				
INSTRUMENTAL TABLE	03				
AUXILIARY TABLE	04				
MAY TABLE	03				
DUMPERS	04				
HAMPERS	03				
INFUSION BOMB	01				
SYRINGE INFUSION PUMP	01				
VACUUM METER + VACUUM BOTTLE	01				
PORTABLE VACUUM CLEANER	01				
CIRURGIC FOCUS	01				
AUXILIARY FOCUS	01				
ELECTRIC SCALPEL	01				
CUTTING DRILL BOX	01				
NEGATHOSCOPE	01				
PATIENT AUXILIARY LADDER	01				
ANESTHESIA CHAIR	01				
EMERGENCY CAR	01				
DEFIBRILLATOR	01				
EXTRACORPORAL CIRCULATION EQUIPMENT	01				
INTRA-ORTHIC BALLOON EQUIPMENT	01				
THERMAL MATTRESS	01				
STERNAL SAW BATTERY CHARGER	01				
SIGNATURE	MORNING	AFTERNOON	NIGHT		
SOURCE: RPA Surgery Unit - HU-UFPI/EBSERH					

room according to the scheduled procedure as well as the permanence and operation of equipment, materials and supplies before anesthetic induction and before the surgical incision.

With the patient's entry into the Ope-

rating Room (OR) and the beginning of the surgical procedure, as well as the completion of the SSC, the absence of certain equipment or essential material for the surgical procedure was perceived and the item related to this was not checked. This

was noticed by audits carried out.

The circulator in the room paused the execution of the SSC, there was a need to leave the operating room in order to solve the problem and continue with the execution of the instrument. There was no standardized and checked assembly prior to the surgery, leading to a performance subject to assistance risks and an increase in the time of induction and beginning of the surgical procedure.

It was in this context that the need arose for a standardization of room assembly, with regard to the permanence of equipment and furniture in adequate quantity and quality, so that there was no pause when completing the surgical safety checklist. The size, complexity and medical specialty involved in the surgical procedure were considered and the Lean development of products and processes was used as a theoretical basis.

In the first stage of lean development, defining the value for the customer (quality control), it was clarified that the patient must be fully assisted and have the surgical procedure free from damage and/or adverse events. That said, it is confirmed that a surgical procedure is an essential therapeutic modality in health. It is an integral part of healthcare and is considered the treatment of choice for many complex diseases, increasing the chances of cure. As such, it must be organized so that there is no difficulty in its development.⁹

In the second stage Kaizen (continuous improvement), the nurses of the Surgical Center and the head of the unit met and based on data from indicators collected by internal audits regarding the completion of the Safe Surgery Checklist, they raised the problem of not filling in the items referring to checking equipment and materials. From this, they developed the idea of implementing and verifying the effect of the operating room checklist.

The operating rooms were identified by number (1 to 10) and the number and the corresponding checklist were posted on the door of each room (TABLE 02). A book containing the checklist (TABLE

01), by date, for every day of the month, was placed in a fixed place to be filled in by the circulating room before the surgical procedures at each surgical time.

In the next stage, Lean Six Sigma, a meeting with a team of nurses and nursing technicians was held to improve and pass on important observations, so that problems could be anticipated and resolved before they happened. This step ensured that the lean method was presented as well as the work process instrument to be filled. It was a time of learning, professional growth and solving pertinent doubts.

In the vast majority of health institutions, the circulating room, supervised by the nurse, is responsible for performing the task of setting up the room. This professional must be specialized and must remain in the room throughout the intra-operative period. It records the events and materials used in surgery and is essential for patient safety protocols in the operating room to be properly executed.¹⁰

The LVSC guides surgical teams in reducing the number of adverse events. During the filling of this instrument, in the first and second stages, before anesthetic induction and surgical incision, among other things, equipment, materials and



supplies necessary to perform an anesthetic and surgical procedure are checked. These must be in the operating room, in good condition and, if they can be processed, they must be sterile.

Following the Pull system (make it flow), the checklist began to be implemented in April 2019 and was worked on for 3 months without interruption. After this period, the first evaluation of the work processes was carried out after the assembly of the room guided by a checklist.

It is worth noting that throughout the implementation process there was supervision and encouragement from the nurse. This attitude highlights the role of the nurse as a guide and educator of the team, contributing to the improvement and increase of the team's knowledge, in addition to the supervision and continuous evaluation of the process.¹

The results were satisfactory and there was an improvement in the work processes related to the preparation of the room with all the equipment and furniture necessary for the safe start of the surgeries. Just in time was achieved, that is, the adequate completion of the Checklist was adapted to the pace of the demand for safe

Table 02: Operating Room Board of the Operating Room Checklist

 MINISTRY OF EDUCATION BRAZILIAN HOSPITAL SERVICES COMPANY UNIVERSITY HOSPITAL / UFPI 			
OPERATING ROOM CHECKLIST			
EQUIPMENT	Qr	EQUIPMENT	Qr
MULTIPARAMETRIC MONITOR WITH CABLE AND BATTERY	01	SYRINGE INFUSION PUMP	01
ECG CABLE	01	VACUUM METER + VACUUM BOTTLE	01
OXIMETRY SENSOR	01	PORTABLE VACUUM CLEANER	01
CAPNOGRAPHY MODULE	01	SURGICAL FOCUS	02
PARENT MODULE	01	AUXILIARY FOCUS	01
NIBP CUFF	01	ELECTRIC SCALPEL	01
TEMPERATURE SENSOR	01	CUTTING DRILL BOX	01
OPERATIVE BED	01	NEGATSCOPE	01
ANESTHESIA CAR	01	PATIENT AUXILIARY LADDER	01
SERUM SUPPORT	02	ANESTHESIA CHAIR	01
INSTRUMENTAL TABLE	03	EMERGENCY CAR	01
AUXILIARY TABLE	04	DEFIBRILLATOR	01
MAYO STAND	03	EXTRACORPORAL CIRCULATION EQUIPMENT	01
DUMPS	04	INTRA AORTIC BALLOON EQUIPMENT	01
HOSPITAL HAMPERS	03	THERMAL MATTRESS	01
INFUSION PUMP	01	STERNAL SAW BATTERY CHARGER	01
ROOM:			

Source: RPA Surgery Unit - HU-UFPI/EBSERH

surgery regarding the care of equipment and materials, achieving a reduction in the time wasted with the unpreparedness of the OR.

The circulating room set up the Operating Room guided by a checklist and at the beginning of the surgeries, his departure to equip the OR decreased. This aspect brought improvements to the quality indicators in the Surgical Center as well as improved completion, without surgical pause, of the surgical safety checklist.

All these steps were followed so that the surgeries started without obstacles and the surgical safety happens satisfactorily. In order not to have complications or adverse effects related to the surgical procedure, the surgery must be performed safely. This safety culture has gained wide dissemination and implementation since 2008 with the Safe Surgery Saves Lives program.^{12,13}

CONCLUSION

The present research reported the field experience of implementing a daily operating room assembly checklist based on lean development of products and processes.

The work was based on the Lean Model or Methodology and applied the concepts of customer value definition (quality control), Kaizen (continuous improvement of care processes), Lean Six Sigma (reducing defects before they appear), Pull System (the process was carried out without unnecessary interruptions) and Just in time (adapting to demand, reducing waste of time).

With the implementation of such an instrument, based on the Lean methodology, there was an improvement in work processes, especially with regard to the

safe start of surgeries. The time of leaving the circulating room, to equip the room during the surgical procedures, decreased and with that there was an improvement in the quality indicators of the surgery unit and better completion of the surgical safety checklist.

The measurement of surgical time and the difficulty of following up the safe surgery checklists constitute a problem that needs more studies and more interventions. This can make it difficult to properly plan a safe care for the operative patient. The room setup checklist can be a tool based on the Lean methodology that will possibly allow the surgical team to provide a more efficient, safe and timely care. Additional studies will be needed to demonstrate its impact on the quality of care and its added value to it.

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