

## SPECIAL ARTICLE ΕΙΔΙΚΟ ΑΡΘΡΟ

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# The application of lean management in the perioperative care of patients with colon cancer

Lean management is based on protocols that aim to organize, standardize, and exclude unnecessary steps that have no real value. In health, lean thinking translates as minimizing unnecessary actions, reducing delays, correcting mistakes, improving quality, but also reducing costs and working time. This study presents the application of lean thinking and management in the perioperative care of patients with colon cancer, through the enhanced recovery after surgery (ERAS) protocol, with a significant impact on the quality of patient care and the rational use of limited resources of health structures.

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Η εφαρμογή λιτής διαχείρισης στην περιεγχειρητική φροντίδα ασθενών με καρκίνο του παχέος εντέρου

Περίληψη στο τέλος του άρθρου

### Key words

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## 1. INTRODUCTION

In the 1950s, a large part of the automobile industry began to implement "lean thinking", where a set of functional ideas and techniques was aimed at increasing productivity and reducing unnecessary time, as well as improving customer and employee satisfaction.<sup>1</sup> The aim of this systematic approach was to change the established processes and wrong ways of thinking of the company, which in turn led to the transformation of the culture and behavior that had been established until then. The principles of lean thinking emphasize the examination of the client's needs, the direct involvement of the staff in the activities and the continuous improvement of the result. Lean management can be

used as a means of identifying and eliminating useless and unnecessary actions and activities, to minimize waste and improve the efficiency and productive volume of the organization, at the same time.<sup>2</sup>

In health, lean thinking translates as the effective use of staff, resources and technology to provide the highest possible level of service to the healthcare client, i.e. the patient.<sup>3</sup> It is obvious that lean management in healthcare is not simply focused on reducing costs and staff, but seeks patient satisfaction through improved procedures, protocols, services and actions. In other words, it focuses on how effectively the supplies are used, in order to provide multiple benefits. Things like eliminating or reducing waste,

improving procedures, flow rate and handling of patients, safer equipment and more reliable services and the use of standard protocols and procedures all produce positive results, productivity, better and faster services, as well as better resource management. In addition, staff morale is high, so that employees become more efficient.<sup>4</sup>

There are rules, standards and regulations related to the services that the respective health organizations must face while remaining within the framework of lean management. In an ideal healthcare center, focused on lean management, every employee should work every day thinking of ways to improve their work atmosphere and services, while reducing waste. They should think of ways to enhance continuous quality improvement, with minimal use of the provided equipment, the minimum space and the minimum time that staff needs for the performance of the respective service in the respective health unit.<sup>5</sup>

## 2. THE USE OF LEAN MANAGEMENT IN COLON AND RECTAL CANCER SURGERY

In recent years, enhanced recovery after surgery (ERAS) protocols for colon and rectal cancer surgeries have been highlighted with evidence of faster recovery time and improved postoperative results.<sup>6</sup> The use of the ERAS protocol aims to improve patient outcomes after colorectal surgery, maximize patient satisfaction, manage costs and promote innovation in colorectal surgery.<sup>7</sup>

In general, after these major operative procedures, patients require a long stay in hospital and readmission in hospital is not rare, due to postoperative complications. As a result, there is a negative impact on the total hospital expenses, as well as the total national health system costs. As a natural consequence, there is an excessive consumption of resources by the doctors and the rest of the hospital staff. At the same time, there is a need for the use of multiple drugs (analgesics, antibiotics, etc.) that result in the development of resistant strains of microbes.

The creation and implementation of an ERAS program based on lean thinking and lean management that can evenly reduce these complications, is a significant improvement in the quality of care, which promises improvement in patient's health, resources (medicines, equipment), savings and hospital staff (medical and nursing) satisfaction. There is also the possibility of hospital reward with government payment programmes.<sup>8</sup>

Having that in mind, ERAS protocols have been developed and implemented internationally, both in university medical centers and regional hospitals. The aim has been the

design of practices based on international data to reduce the length of hospital stay, to prevent complications and re-admission of patients after surgery, to minimize the rate of trauma infections and to improve the financial burden associated with payment programs of hospitals by the state.<sup>9</sup>

The ERAS protocol includes elements that focus on reducing perioperative stress, maintain normal postoperative function, and accelerate recovery after surgery. The use of (surgical stress minimization) approaches has been repeatedly shown to reduce morbidity rates, improve recovery and shorten the length of stay (LOS) in hospital after a major colorectal surgery. Consequently, it can shorten the recovery time and thereby minimize patient sick leave from work and increase productivity. In addition, the implementation of the ERAS protocol reduces pharmaceutical costs, workload of the medical staff and the total cost of operation for the hospital, the insurance company and the country in general.<sup>10</sup>

Since the first guidelines were published in 2005, more colorectal surgeries have been performed using minimally invasive techniques, such as laparoscopic surgery, with all the benefits of the latter.<sup>11</sup> In addition, evidence-based knowledge and research supporting all types of intraoperative care is in continuous development, a factor which requires frequent updates on a cognitive level.

The ERAS protocol is divided into three successive stages: preoperative, intraoperative and postoperative treatment of patients with colorectal cancer.

### 2.1. Preoperative examples of lean management to improve the status of the patient

General preoperative medical evaluation is important, but due to specific risk assessment tools the evidence of their clinical accuracy remains low. Smoking increases the risk of postoperative complications. It should be stopped preoperatively for at least 4 weeks to reduce respiratory complications and wound healing complications. Shorter periods of abstinence from smoking may bring fewer benefits. Intensification of recommendations and therapeutic nicotine replacement appear to be effective.<sup>12</sup> Preoperative dietary evaluation offers the opportunity to correct malnutrition using per os food intake for at least 7–10 days.<sup>13</sup> Anemia is also common in patients with colorectal cancer. Correction attempts should be made before surgery. Newer intravenous iron supplements have a low risk of side effects and are more effective than oral iron in restoring hemoglobin concentrations in both iron deficiency and anemia as a chronic disease. Blood transfusions have long-term

effects and should be avoided, if possible.<sup>14</sup> Intravenous antibiotic prophylaxis should be administered within 60 minutes prior to incision as a single dose to all patients undergoing colorectal surgery. In addition, oral antibiotics should be given to patients receiving laxatives. Finally, skin disinfection should be performed using chlorhexidine-alcohol based solutions.<sup>15</sup>

## 2.2. Intraoperative examples of lean patient management and treatment

The use of short-acting anesthetics, brain monitoring to reduce the risk of postoperative paralysis, monitoring of the level of consciousness and complete reversal of neuromuscular blockade are recommended. This will result in a reduction of hospital staff for these difficult to manage patients postoperatively.<sup>16</sup> It is also necessary to maintain fluid homeostasis, in order to avoid excessive fluid replacement and possible oedema that may compromise the anastomosis. Unnecessary use of serum leading to perioperative weight gain should be avoided and a perioperative fluid balance approach should be preferred. Targeted and strict fluid control should be adopted, especially in high-risk patients and those undergoing surgery with severe endovascular fluid loss (blood loss and protein/fluid displacement). The use of inotropes should be considered in patients with low contractility.<sup>17</sup> Reliable temperature monitoring should be performed in all colon surgeries. Methods to warm patients should be used to avoid hypothermia and postoperative morbidity problems and complications with prolonged hospitalization. The use of minimally invasive techniques (e.g. laparoscopic surgery) for the management of patients with colon and rectal cancer is considered the gold standard, as it has clear advantages for improved and faster recovery, reduced general complications, reduced complications associated with visceral hernia and fewer adhesion formation intraoperatively. Minimally invasive surgery (MIS) is also the key factor that allows the successful implementation of ERAS protocols, such as opioid analgesia and optimized fluid therapy.<sup>18</sup> Pelvic and peritoneal drainage does not affect the clinical outcome and should not be routinely used.

## 2.3. Postoperative protocols for lean patient management

Postoperative nasogastric tubes should not be used regularly. If they are inserted during surgery, they must be removed before the anesthesia is reversed. Thoracic epidural analgesia using low-dose local anesthetic and opioids is recommended in open colorectal surgery to

minimize the metabolic response to stress and to provide analgesia after surgery. Patients undergoing major colorectal surgery should have mechanical thromboprophylaxis with appropriate compression stockings and or intermittent compression therapy, and receive pharmacological prophylaxis with low molecular weight heparin once daily for 28 days after surgery in order to avoid severe and potentially fatal thromboembolic episodes of pulmonary embolism.<sup>19</sup> Regular transurethral catheterization is recommended for 1–3 days after colorectal surgery. The duration of this should be individualized based on known risk factors for retention: male gender, epidural analgesia and pelvic surgery. In patients at a low risk, the catheter should be removed on the first day after surgery, while patients at moderate or high risk require catheterization for up to 3 days. This involves faster mobilization from the bed and prevention of urinary tract infections.<sup>20</sup> A multifactorial approach to minimize the development of postoperative ileus includes limiting opioid administration using multifactorial anesthesia and analgesia techniques. With MIS, nasogastric tube placement is routinely used and there is targeted drug therapy. The use of opioid receptor antagonists may sometimes be indicated in the prolonged postoperative paralytic ileum so that the patient can return to normal diet and bowel function quicker.<sup>21</sup> Most patients may tolerate food from the first postoperative day. Finally, quick mobilization through education and encouragement of patients is an important component of rapid recovery after surgery, in order to accelerate bowel function, restore respiratory function and thus minimize the length of hospital stay.<sup>22</sup>

## 3. CONCLUSIONS

One possible way to reduce waste and inefficiency in hospital patient management is to adopt simple methodologies, such as total quality management, lean thinking and process management with a redesign approach and improvement of medical services offered. These organizational philosophies embrace the concept of “quality”, which consists in recognizing patients’ needs and identifying and reducing medical errors, while maintaining a global vision for progress and development in health services.<sup>23</sup> Lean thinking aims to eliminate waste of materials, medicines, services, and unnecessary staff activities in the hospital. This allows a better hospital performance, increasing both the efficiency and the quality of services, while reducing bottlenecks in hospitals, system defects and the length of stay in hospital. This management system is based on two pillars: Firstly the creation of value in specific functions, tactics and protocols of medical development and secondly

the elimination of waste and unnecessary procedures. The simple system encourages the hospital staff, while giving them roles to identify the currently reduced performance of services in patient management, and to set goals, actively participating in the continuous improvement of health services and patient satisfaction by providing quality services, lowering the total hospital costs, eliminating waste and at the same time reducing the time of unnecessary work.<sup>24</sup>

#### 4. PROPOSALS

It is suggested that the hospital administration should create an autonomous and impartial supervision unit of all departments in the hospital to carry out the mission of each department, to maintain the economy, the efficiency and the effectiveness of the department, eliminating at the same time abuse and waste. One of the biggest problems in healthcare is the costs and the fact that managers are not responsible for ordering and supplying consumable and non-consumable medical supplies. The clinics or the different departments of the hospital exceed the stocks, which are rarely used and the “responsible” managers allow

it to happen. Hospitals are usually prone to waste more sanitary equipment than would potentially be needed to. This equipment could be easily saved or replaced and used to help with other important hospital needs, so as to improve patient care and increase the level of public health. The maintenance, replacement and transfer of logistical health equipment to other health facilities is sometimes needed, providing a significant impact on the results of health services in hospital structures that do not have sufficient resources.

The application of lean management in healthcare organizations has the potential to create a system that is effective, efficient and responsive to the needs of patients, reducing and eliminating the waste of time, energy and money.<sup>25</sup> In order for lean management to be implemented successfully in any institution, the attitude and behavior of the management of the organization and in particular the way it perceives the quality of services, the ability to recognize the need for continuous quality improvement, the commitment to the goals, but also the uninterrupted support of the effort, are determinants for the formation of positive results with a long-term perspective.<sup>4</sup>

#### ΠΕΡΙΛΗΨΗ

##### Η εφαρμογή λιτής διαχείρισης στην περιεγχειρητική φροντίδα ασθενών με καρκίνο του παχέος εντέρου

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Η λιτή διαχείριση βασίζεται σε πρωτόκολλα που αποσκοπούν στην οργάνωση, στην τυποποίηση και στον αποκλεισμό περιττών βημάτων που δεν έχουν ουσιαστική αξία. Στην υγεία η λιτή σκέψη μεταφράζεται ως ελαχιστοποίηση των άσκοπων κινήσεων, μείωση των καθυστερήσεων, διόρθωση των λαθών, βελτίωση της ποιότητας, αλλά και μείωση του κόστους και του εργασιακού χρόνου. Η παρούσα μελέτη παραθέτει την εφαρμογή λιτής σκέψης και διαχείρισης στην περιεγχειρητική φροντίδα ασθενών με καρκίνο παχέος εντέρου, μέσω του πρωτοκόλλου enhanced recovery after surgery (ERAS), με σημαντικό αντίκτυπο στην ποιότητα της περίθαλψης των ασθενών και στην ορθολογική χρήση των περιορισμένων πόρων των υγειονομικών δομών.

**Λέξεις ευρετηρίου:** Καρκίνος παχέος εντέρου, Λιτή διαχείριση, Λιτή σκέψη, Περιεγχειρητική φροντίδα, Πρωτόκολλο enhanced recovery after surgery (ERAS)

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