



# ***Patient-centred care in thoracic surgery: a holistic approach –*** **A review of the subjects of enhanced recovery after surgery, rehabilitation, pain management and patient-reported outcome measures in thoracic surgery**

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**Abstract:** The symposium *Patient-centered care in thoracic care: a holistic approach* was held on June 22, 2021, as a virtual event in the context of the European conference on general thoracic surgery. Its aim was to explore how to improve patient outcomes in thoracic surgery by using enhanced recovery after surgery (ERAS®) frameworks and collaboration within healthcare. During the four presentations, topics on patient mobilization and physical rehabilitation, pain management, and the role of chest drainage in facilitating perioperative care were discussed. Strategies to minimize opioid consumption and incorporate patients' experiences as quality indicators were described. There were two main ideas that were considered pivotal to achieve optimal care: (I) the use of simple, easily implementable perioperative protocols and practices to improve compliance from both patients and the healthcare team, and (II) promote a better recovery with early mobilization and reducing the patient's levels of pain. Among the key learnings that emerged from the presentations are the importance of taking the patient's experiences into account, including what they value the most after surgery, and how technology can enable better care. The use of digital chest drainage systems emerged as a way for improving patient outcomes and experiences across several key indicators.

**Keywords:** Enhanced recovery after surgery (ERAS®); patient mobilization; pain management; patient-reported outcomes and experiences; digital chest drainage systems

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## Background

The virtual symposium *Patient-centered care in thoracic care: a holistic approach* was held on June 22, 2021, as a part of the 29<sup>th</sup> meeting of the European Society of Thoracic Surgeons (ESTS). The goal of the symposium was to highlight how collaboration and teamwork within healthcare can make a difference to improve patient outcomes in thoracic surgery.

Although evidence-based guidelines can provide a framework for an optimized patient recovery pathway, emphasizing the role of a multidisciplinary healthcare team, there are still obstacles to overcome regarding the effective implementation of harmonized perioperative care protocols (1-3).

As data regarding the benefits of enhanced recovery after surgery (ERAS<sup>®</sup>) pathways on complication rates, length-of-stay (LOS), and cost continues to accumulate (4-6), some authors underscore the importance of simplifying protocols, focusing on the core pillars of ERAS<sup>®</sup> to shape the future directions of integrated healthcare in thoracic surgery (7). These core pillars include opioid avoidance, euvoemia, early mobilization, and early feeding, among others. The implementation of an ERAS<sup>®</sup> strategy can improve patient outcomes and streamline care, but it relies on effective teamwork and active leadership to be successful (8,9).

In this event aimed at thoracic surgeons, several key topics were addressed, including:

- ❖ Return to activities of daily living and its importance for patients;
- ❖ Patient satisfaction as a quality indicator;
- ❖ Early mobilization after surgery;
- ❖ Post-surgical pain management;
- ❖ The role of chest drainage on ERAS<sup>®</sup>;
- ❖ The importance of teamwork to improve patient outcomes.

This report summarizes the discussions, lessons learned, and future directions in patient care and recovery after thoracic surgery.

### Presentation 1: the role of physical conditioning before and after surgery for lung cancer

*Speaker: Prof. Vinicius Cavalheri*

The introductory session of the symposium discussed the effectiveness of physical exercise training in lung cancer, and how it is increasingly becoming a part of clinical management in this patient population. Professor Cavalheri started by addressing exercise training before surgery, also

called pre-habilitation. He noted that approximately half of the patients with lung cancer also have underlying chronic lung diseases, mainly chronic obstructive pulmonary disease, which further compromise the patients' lung pulmonary mechanics and gas exchange, affecting exercise capacity and consequently increasing the risk for both post-operative pulmonary complications and mortality.

There is a major concern about delaying treatment or surgery for exercise training, since there is no evidence for it, but patients can be enrolled in a physical exercise program while they're waiting for surgery. Usually, this strategy results in one to four weeks of exercise training, mainly aerobic. The aim is to increase VO<sub>2</sub> max, and the training frequency can go up to five days a week. According to recent clinical trials and a systematic review (10-12), the use of pre-habilitation exercise was important to preserve exercise capacity, which ultimately resulted in a 67% reduction on the risk of developing post-operative pulmonary complications in patients that exercised before surgery, compared to patients who did not exercise.

After surgery, the aim of exercise training is slightly different. The focus of post-operative exercise training is to improve the health outcomes affected by surgery, to promote health and develop a positive exercise behavior in patients. Professor Cavalheri noted that while patients understand there is a risk of post-operative pulmonary complications, they value the likelihood of a physical impairment as much more important and undesirable than pulmonary complications (13). This physical impairment is caused by a reduction in FEV<sub>1</sub> and VO<sub>2</sub> peak after surgery, and this is why early mobilization and physical exercise is important.

The benefits of post-operative exercise training include an increase in VO<sub>2</sub> peak, longer distance covered in the six-minute walk distance test, reduction in breathlessness, increased muscle strength, and greater quality of life (14,15). In face of these improvements, the question that naturally comes next is: how soon should patients start exercising after surgery? As soon as possible. The results of a randomized clinical trial involving 235 patients with operable lung cancer showed that patients who initiated post-operative exercise training early had less fatigue by 14 weeks, when compared with those who initiated the training program later (16).

This is an important point, and one where digital chest drainage systems can have a positive impact on patients' lives. Having a portable drainage system allows the patient to be out of bed and walking shortly after surgery, to go

home early and continue their physical exercise programs. Furthermore, reducing the patients' hospital stay will not only be beneficial for each individual patient, but also for those waiting for surgery, as better discharge planning allows for improved turnaround time in hospital care.

### **Presentation 2: enhanced recovery in thoracic surgery—the anesthesiology point of view**

*Speaker: Prof. Dr. Mert Şentürk*

In his presentation, Prof. Dr. Şentürk underscored the importance of anesthesiology as an important element of ERAS® multidisciplinary approach and explored the difficulties in implementation of ERAS® protocols in thoracic surgery.

For some authors, the usefulness of ERAS® protocols is questionable in certain conditions (17), since this area is perceived as still being in its infancy. This is mainly due to the outcomes chosen in many studies, since there is a focus on visual analogue scales (VAS) to measure the effects of analgesia on pain and on intraoperative PaO<sub>2</sub> to assess mechanical ventilation strategies. Another difficulty in the adequate implementation of ERAS® is the compliance with protocols.

One study (18) showed that even in optimal conditions, overall ERAS® compliance was only 76%. Nonetheless, the authors of this study were able to identify four elements that are essential to reduce the rate of post-operative complications: early removal of chest tubes, use of electronic drainage, opioid cessation on day 3, and early feeding. It is worth noting that more complex protocols tend to cause more difficulties with compliance, so we should strive for simpler ERAS® protocols in thoracic surgery to improve adherence.

One crucial component to improve patients' outcomes is pain management. Prof. Dr. Şentürk noted that the target should not be to achieve a completely painless patient, and the measured outcome should be more than patient comfort. Pain is a multi-component issue that benefits from a multimodal analgesia strategy, he noted. As an example, Prof. Dr. Şentürk mentioned that, in his opinion, chest drain pain deserves more attention. It is already known that using a single chest tube results in less pain compared to double chest tube (2), and that digital drainage systems lead to a shorter duration of chest drain placement, which can probably shorten the painful period too.

Another topic discussed was the possible impact of

pre-habilitation exercise programs on compliance with protocols. Although a longer period of exercise before surgery can be seen as beneficial, there are human factors to consider, and there should be a balance between and effective length of the program, and the need to keep the patient engaged. In the post-surgery rehabilitation exercise program, the focus goes to an early mobilization of the patient. Here, the burden of chest drainage can be reduced by using portable, digital chest drainage systems to promote patient's mobility.

In conclusion, to move forward with ERAS® protocols in thoracic surgery, there's a need for a higher number of adequately powered clinical studies, with pragmatic, rational outcomes, and involving a multidisciplinary healthcare team. In addition, simpler protocols will result in better compliance.

### **Presentation 3: pain management after VATS**

*Speaker: Shanda H. Blackmon, MD, MPH, FACS*

This session, presented by Dr. Shanda H. Blackmon, converged several topics regarding pain management after thoracic surgery, including strategies to reduce opioid-related adverse events, the use of regional blocks to minimize opioid use, and the role of ERAS® in pain management.

Pain pathways are complex, with multiple mechanisms involved, including nociceptive and neuropathic ones. There are several factors that can impact pain following a thoracic surgery, such as muscle splitting, injury to the parietal pleura, and the presence of the chest tube (19). Furthermore, surgery releases inflammatory mediators, such as prostaglandins and histamine, which enhance the activity of nociceptors. Given the multifactorial origin of pain, the logical step in tackling post-thoracic lung resection pain is to target different pathways, Dr. Blackmon said.

The pharmacological approaches to pain modulation include the use of gabapentin, acetaminophen (paracetamol), nonsteroidal anti-inflammatory drugs, ketamine, opioids, and local anesthetics. Despite the existence of alternatives, opioids are still widely used after major surgery. Patients who undergo thoracotomy have a 2.5-fold increase in prolonged opioid use risk, with those undergoing video-assisted thoracoscopic surgery (VATS) not far behind, with a 1.95-fold risk increase (20,21). In addition to opioid-related adverse events such as respiratory depression, somnolence, and nausea or vomiting experienced by patients, there are

also public health effects to be considered. The risk of addiction is higher than what clinicians suspected, there are still unknown effects on survival in lung cancer patients, and there is growing concern about the quantity of unused opioids that remain in the community (22).

One alternative to opioids is the use of regional blocks with local analgesia. Dr. Blackmon explained several techniques, such as the thoracic paravertebral block (TPVB), the serratus anterior plane block (SAPB), and the intercostal nerve block (ICNB), noting that the paravertebral and intercostal seem to have the least side effects combined with the best pain control profile (23).

Regarding ERAS<sup>®</sup>, Dr. Blackmon referred that these programs are associated with many short-term outcome benefits, such as reduction in post-operative morbidity, reduction in pain, reduction in length of stay, and overall patient satisfaction (24,25). Regarding pain in particular, the shorter the duration of the air leak and the chest tube duration, the less pain is experienced by patients. As part of the pain control, the aim is to seal the lung and remove the chest tube as soon as possible, and use the smallest chest tube possible and minimal suction. ERAS<sup>®</sup> recommendations to minimize pain include the use of digital drainage systems, which only use suction as needed (as opposed to traditional wall suction systems which use constant suction), using a single chest tube (26), and early patient mobilization (1).

Digital drainage systems are sophisticated devices delivering a regulated form of negative pressure by adjusting the level of suction to the pre-set negative pressure. In case the pre-set intrapleural negative pressure is reached the device stop working and act as a monitoring device recording both the effusion and air leak. One of the main advantages of these devices is the fact they record objective information about air leak showing trends along with instantaneous measurements which improve and standardize clinical decision making. There is growing evidence regarding the benefits of digital drainage systems, which include balanced suction, easy to read displays, promotion of mobilization and communication, 24-hour registration of fluid and air, and the possibility of early removal of the chest tube, resulting in less pain for the patient. The benefits of lower suction have been demonstrated in a study by Holbek *et al.* (27), where the results show that drainage duration, time to air leak cessation, and time to drain removal were all significantly reduced by utilization of a lower suction on the chest tube, accomplished by the use of a digital drainage system (Thopaz+, Medela AG, Switzerland). One

study explored the possibility of omitting the chest tube altogether, and there is some indication that it may lead to shorter duration of stay and less pain, if applied in carefully selected patients (i.e., lung biopsy, uncomplicated wedge for peripheral nodules, excision of mediastinal tumours, in patients at low risk for air leak) (28). However, there is a higher risk of drain re-insertion or thoracocentesis in patients who do not have chest drains.

Dr. Blackmon ended her presentation by saying that there is a need to reduce pain though the use of more minimally invasive surgery, lower suction, digital drainage, and a combined approach to pain management, including regional blockade and ERAS<sup>®</sup> protocols.

#### **Presentation 4: the lung cancer surgical journey—patient perspectives and values**

*Speaker: Cecilia Pompili, MD PhD*

On the final presentation of the symposium, Dr. Pompili shared her knowledge about incorporating patient-reported outcomes and experiences in clinical practice, including the difference between outcomes and experiences, the challenges in the implementation of these measures, and the future directions of patient-reported outcomes.

The success of patient-centered care can be assessed by exploring the patient experiences, which capture the patient's view of what happened while they received their care. The patient experiences are, therefore, an indirect indicator of the quality of patient care, and this is why the investigation of patient-reported experience measures (PREMs) are an emerging area of research. Patient-reported outcome measures (PROMs) are used to capture the impact of an illness or health condition directly from the patient, without interpretation by a clinician or caregiver. When used together, PREMs and PROMs can support patient-centered care and inform about the quality of care and services.

Another indicator that can help to understand the patient's perspectives is the health-related quality of life (HRQoL), a subjective and multidimensional concept that assesses the functional effect of a medical condition and/or its treatment on the patient's quality of life. According to recent research, the regular compilation of PROMs and HRQoL can help detect, manage and monitor problems, while also facilitating patient-doctor communication (29,30). However, an essential requirement for their correct implementation is training, for both patients and clinicians (31), as well as the use of a standardized and

validated tool.

Regarding thoracic surgery, despite the recognition that PROMs provide essential data in perioperative care which could help drive the treatment course for each individual patient, influence continuous improvement in health system, and impact patient's long-term satisfaction and wellbeing, a recent ESTS survey (32) revealed that more than half the respondents were not collecting any quality of life data in daily practice. It is worth to note that while it is crucial to identify predictors of potential decline of quality of life after surgery, it has been demonstrated that for patients the major concern may not be perioperative morbidity and mortality, but rather to not be able to resume an acceptable daily lifestyle. So, again, the use of both PROMs and PREMs (and their impact on HRQoL measures) can have a positive influence in the pre-surgical decision-making process. Namely, it has been shown that pre-operative quality of life can help predict survival outcomes following pulmonary resection (33).

An important aspect of patient experience of care is patient satisfaction, Dr. Pompili says. Patient satisfaction can be used to compare different technologies, with several studies pointing to an association between satisfaction and outcomes after a surgery. For example, a recent study assessing the impact of digital versus traditional drainage devices on patient satisfaction showed that patients managed with digital drainage systems had higher satisfaction scores compared with those managed with traditional devices, in particular regarding comfort, portability, and convenience of use (34).

As for the future of PROMs in thoracic surgery, Dr. Pompili observed that the implementation of electronic means of capturing and reporting them will empower patients and give surgeons the opportunity to use these measures in real-life, effectively placing the patient at the center of care.

## Conclusions

The contributions made at the symposium support the view that teamwork and ERAS<sup>®</sup> protocols are essential pillars of patient-centered care in thoracic surgery. Among the key learnings that emerged from the presentations are the importance of taking the patient's experiences into account, including what they value the most after surgery, and how technology can enable better care, especially regarding chest drainage systems. There were two main ideas that were considered pivotal to achieve optimal care: (I) the use

of simple, easily implementable perioperative protocols and practices to improve compliance from both patients and the healthcare team, and (II) promote a better recovery with early mobilization and reducing the patient's levels of pain.

In conclusion, the presentations in this symposium allowed for a better understanding of the many components involved in patient-centered care in thoracic surgery, along with the future directions for ERAS<sup>®</sup>. Among the several topics addressed, the relevance of chest drainage and its impact on patient recovery was highlighted as one that can affect several indicators, from outcomes to satisfaction.

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*Ethical Statement:* The authors are accountable for all



aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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