

Incentive spirometry can help to prevent pulmonary complications after abdominal surgery. Nurses have an essential role in helping patients to use it correctly

Incentive spirometry after abdominal surgery

In this article...

- Possible pulmonary complications after abdominal surgery
- The benefits of incentive spirometry
- How to instruct patients in using an incentive spirometer

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Patients face various possible complications after abdominal surgery. This article examines best practice in guiding and teaching them how to use an incentive spirometer to facilitate recovery and prevent respiratory complications.

Patients are at risk of various complications after abdominal surgery; common ones include pulmonary dysfunction, deep vein thrombosis and wound infections.

Pulmonary complications can have serious consequences including prolonged hospital stay, higher healthcare costs and negative health outcomes (Westwood et al, 2007). Over a quarter of complications are related to the pulmonary system in surgical patients (Kulaylat and Dayton, 2012). The risks and severity of such complications after abdominal surgery can be reduced by the judicious use of therapeutic manoeuvres that increase lung volume. Incentive spirometry is one of the prophylactic breathing therapies used to reduce this risk.

Nurses working in surgical units care for many patients recovering after abdominal surgery. Although there is limited information in the literature about best practice in using incentive spirometry, nurses must understand best practice to be able to teach and guide patients correctly.

This article examines the role of incentive spirometry in patients' recovery after abdominal surgery and its applications to nursing practice.

Changes in pulmonary physiology after abdominal surgery

Each alveolus is 0.3mm in diameter. Due to their small size the alveoli have a natural tendency to collapse. Some special cells on the alveolar surface secrete surfactant – a lipoprotein that reduces the surface tension of the alveoli and keeps them open. A healthy person can take deep breaths that expand the alveoli, which can lead to the production of surfactant. The alveoli collapse if insufficient surfactant is present, a condition known as atelectasis (Kaufman, 2007).

Pulmonary complications have a significant impact on morbidity and mortality after major abdominal surgery. The causes of pulmonary dysfunction after such surgery are multifactorial and include the following:

- » Effects of anaesthesia;
- » Abdominal distension;
- » Restricted breathing due to pain and diaphragmatic dysfunction;
- » Obesity;

5 key points

1 Patients are at risk of various complications after abdominal surgery

2 Pulmonary complications have a significant impact on morbidity and mortality following major abdominal surgery

3 Research strongly supports incentive spirometry as an effective tool to prevent pulmonary complications

4 An incentive spirometer is a medical instrument used to promote deep breathing

5 Nurses need to explain to patients how to use incentive spirometry

FIG 1. CAUSES OF ATELECTASIS

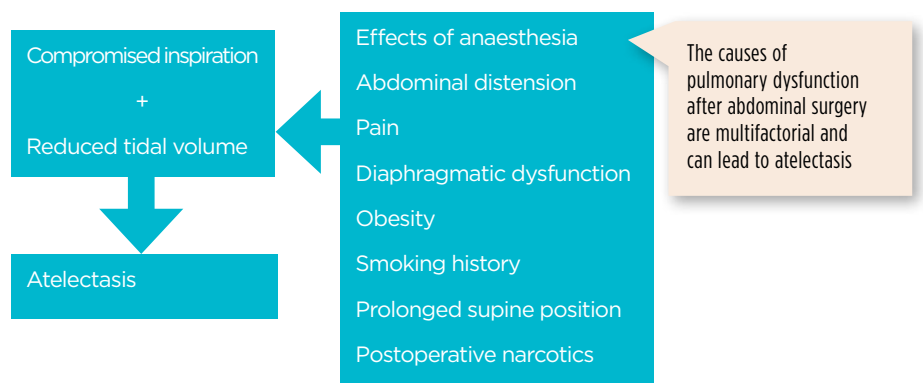


FIG 2. AN INCENTIVE SPIROMETER



- » Smoking history;
- » Prolonged supine position;
- » Postoperative narcotic analgesia (Kulaylat and Dayton, 2012; Westwood et al, 2007).

These factors lead to reduced effective inspiration and diminished tidal volume (volume of air inhaled and exhaled with each breath). The decreased tidal volume lowers the distending forces within the lung and depletes surfactant, leading to atelectasis. This creates a restrictive lung defect causing reduced lung compliance, compromised mucociliary clearance and predisposition to pneumonia (Westwood et al, 2007). Fig 1 summarises factors leading to atelectasis.

The most common postoperative respiratory complication, atelectasis (Kulaylat and Dayton, 2012), manifests with low-grade fever (first 48 hours after the procedure), malaise and diminished breath sounds in the lower lobes. If appropriate measures are not taken, it can lead to pneumonia (Kulaylat and Dayton, 2012). Patients with pneumonia can:

- » Have high fever;
- » Produce thick sputum with coughing;
- » Have leukocytosis;
- » Show the presence of infiltrates on chest X-ray;
- » Experience occasional mental confusion (Kulaylat and Dayton, 2012).

Breathing exercises aimed at maximising inspiratory effort are the most beneficial to prevent respiratory complications such as atelectasis and pneumonia (Westwood et al, 2007).

The role of incentive spirometry

Incentive spirometers, also known as sustained maximal inspiration devices, are used to promote deep breathing (Fig 2). They measure the flow of air inhaled through the mouthpiece and enhance pulmonary ventilation, overcome the effects

of anaesthesia or hypoventilation, loosen respiratory secretions, assist respiratory gaseous exchange, and help with re-expansion of collapsed alveoli (Berman et al, 2012). In this way they help to avoid compromised inspiration and reduced tidal volume, which helps to prevent pneumonia. They are also valuable in providing patients with visual feedback of their respiratory effort (Berman et al, 2012).

Lawrence et al (2006) reviewed the literature on lung-expansion interventions to prevent postoperative pulmonary complications after non-cardiothoracic surgery; the findings confirmed that incentive spirometry was effective in reducing pulmonary risk.

Another study found that surgical incisions close to the diaphragm placed some patients at high risk of pulmonary complications, such as those having abdominal surgery (Pelus and Kaplan, 2006). This study also highlighted that incentive spirometry was an effective pulmonary risk-reduction strategy.

Westwood et al (2007) examined the effects of incentive spirometry in reducing respiratory complications following major abdominal surgery, and confirmed it was useful for patients to achieve effective inspiration and reduced length of hospital stay. They also acknowledged that by maximising inspiratory effort, incentive spirometry plays a significant role in preventing atelectasis and its complications.

Advantages and disadvantages

Incentive spirometers are easy to use; give visual feedback to patients, which promotes concordance; can be used independently by any patient once trained; provide effective inspiratory effort; and are inexpensive (Westwood et al, 2007). Patients must understand and follow verbal instructions on how to use them effectively, so any condition that impairs their ability to understand them is a disadvantage.

Instructions for using incentive spirometry

Having gained an understanding of pulmonary complications and the usefulness of incentive spirometry, nurses need to explain to patients how to use the device. The following outlines best practice:

- » Correctly position the patient; this is critical to effective use of incentive spirometry. Help the patient into an upright sitting position in bed or on a chair to promote optimal lung expansion while using the spirometer;
- » Instruct the patient to exhale, letting all the breath out;

- » Ask the patient to close the lips around the mouthpiece of the spirometer;
- » Instruct the patient to inhale slowly, breathing in until unable to do so any more (slow breathing prevents or minimises pain from sudden pressure changes in the chest);
- » Ask the patient to hold the breath for 2-3 seconds then exhale slowly. This is considered a key step while using an incentive spirometer as holding breath and slowing exhalation helps to maintain maximal inspiration and reduces the risk of progressive collapse of individual alveoli. Nurses need to stress the importance of this step to patients and ensure they follow it correctly; if not, patients may assume breathing in through the spirometer is enough to prevent complications (Potter and Perry, 2001).

This process should be repeated 10 times each hour while the patient is awake (Potter and Perry, 2001). Patients can schedule this activity according to their own pace and time, for example, using the spirometer during advertisement breaks while watching television, or looking at the wall clock and using it every 5-10 minutes.

Conclusion

Deep breathing is vital for general well-being. After abdominal surgery, the breathing pattern can change and result in various pulmonary complications. Incentive spirometry is beneficial for patients affected in this way as it promotes deep breaths, which will aid their recovery. Nurses play an important role in teaching patients how to use an incentive spirometer and the underlying principles. **NT**

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