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## The Benefits of Early Mobilization on Post-Abdominal Surgery: A Review of Literature

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### Abstract

**Background:** post-abdominal surgery and postponed physical recovery are significant problems. Thus, early mobilization is important to treat the post-surgical procedure, facilitate recovery, and prevent further complications.

**Objectives:** this literature review was to find the benefits of early mobilization on post-abdominal surgery.

**Methods:** the researchers took the data from PubMed, EBSCOhost, ProQuest, Science Direct, and Scopus, published from 2017-2022 with the predetermined keywords. The searching method applied the Preferred Reporting Items for Systematic Review and Meta-Analysis, PRISMA guideline. The researchers conducted the research in November 2022. Articles selected with criteria for publication in International Journals within the last five years, in English, using experimental research designs, randomized controlled trials (RCTs), quasi-experiments, and cohort studies.

**Results:** the researchers found 57.990 articles from various data sources. They were Pubmed (n = 43), EBSCOHost (n = 1.223), Science Direct (n = 325.800), ProQuest (n=30.279), and Scopus (n=645). After promoting the first screening step, the researchers eliminated some obtained journal articles. The only articles published within five recent years with full-text conditions were 162 articles. Then, the researchers screened the articles based on the second and third criteria: having open access and writing in English. The results were 10 articles. Then, the researchers checked the duplications and screened the titles and the abstract, resulting in six articles. The results showed that the analyses of six articles stated that early mobilization, from the post of day 0 or 24 hours after the abdominal surgery could improve the respiratory function with SpO<sub>2</sub> and SaO<sub>2</sub> increase. The mobilization could also reduce the length of stay and make the cost more efficient.

**Conclusion:** The mobilization provided many advantages to reducing post-abdominal surgery complications, morbidity, and mortality.

**Keywords:** abdominal surgery, mobilization, and postoperative pulmonary complications (PPC).

## Introduction

Every year, Indonesian people require abdominal surgery. This surgery rate increases continuously. A report pointed out 230 million people took this abdominal surgery. In English, a report showed 2.414 abdominal surgery procedures per 100.000 population every year.<sup>1,2,3</sup> In 2019, approximately 760.000 surgical procedures for adult people were observable in Sweden. A percentage of 30% of surgical procedures were abdominal surgery due to malignant and benign tumors effectively.<sup>4</sup> A study of surgical case total in the United States of America showed a percentage of 11% contributed proportionally, half to mortality and a third to post-surgical complication<sup>1</sup>. In English, the government reported for each 100.000 population annually and the reported complication in a test with Randomized Control Trials (RCT). The results showed percentages of 30-60% dealt with abdominal surgery. Then, from 100.000 individuals, 300 to 500 individuals received large abdominal surgery.<sup>5</sup>

The surgery requires the main body cavity to respond to the inflammation and puts significant physiological stress on the patients. Thus, the procedure may lead to post-surgical mortality with an estimated percentage of 4%, and post-surgical complication with an estimated percentage between 15% and 40% of the patients.<sup>3</sup> Abdominal surgery is a procedure in which the surgery opens a patient's abdomen. The patient, in this case, sprawls on a bed. This position makes the abdomen relaxed because of the pressured diaphragm. The pressure on the diaphragm influences the contraction and produces lower inspiration volume with a reduced functional residual capacity (FRC of the lung volume at the end of normal expiration) and closes the small air tract and atelectasis.<sup>4</sup>

The most common complications in this abdominal surgery are Post-operative Pulmonary Complication, PPC; and Surgical Site Infection, SSI. These complications occur due to atelectasis or severe pneumonia that may lead to respiratory failure or death.<sup>6,7</sup> PPC is a common term for pulmonary complications after a surgical operation. The reported incidence of this complication ranged from 1 to 40%, depending on the definitions of PPC and the types of surgery.<sup>4</sup> Abdominal surgery is a procedure with Acute High-Risk Abdominal (AHA). This procedure is mostly correlated with a high mortality rate, postoperative complications, and longer stays at hospitals.<sup>8,9</sup> Therefore, advanced strategy development is important to improve recovery and relieve the complication of post-abdominal surgery. Mobilization and physiotherapy could facilitate the recovery process of the surgical operation, cure the postoperative complication, recover the physical function, and relieve the morbidity due to medication of the patients with post-abdominal surgery.<sup>10,11</sup> Physiotherapy before the surgery could show beneficial potency for post-surgical patient mobility.<sup>12</sup>

Therefore, the researchers would review and summarize various literature and previous studies. The researchers reviewed by promoting literature review to obtain the benefits of early mobilization on post-abdominal surgery and the effects of the accelerated recovery process of the patients.

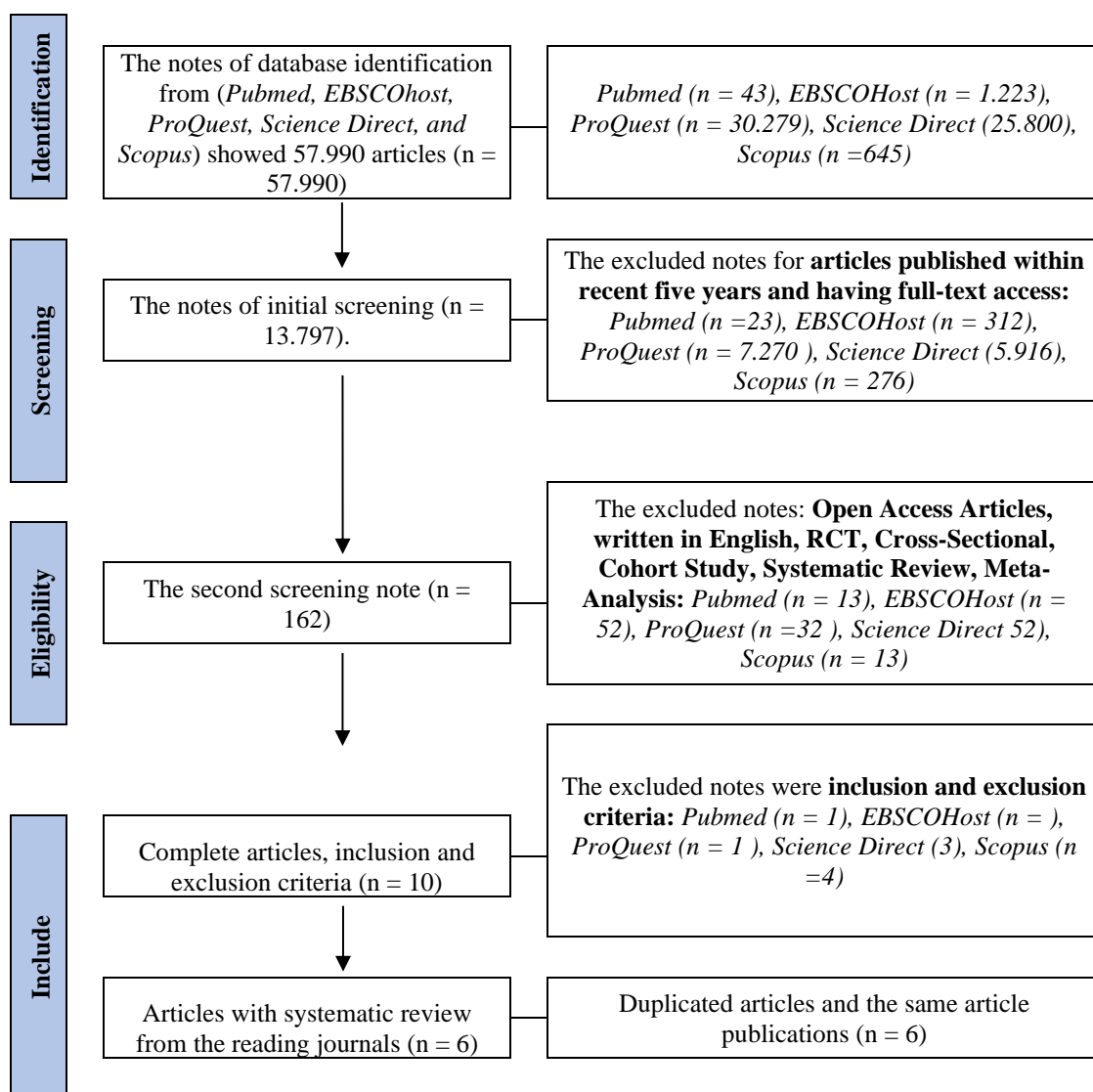
## Methods

The applied method was a literature review with Preferred Reporting Items for Systematic Reviews and Meta-Analyses, PRISMA. The selected journal articles were from some databases, such as PubMed, ProQuest, EBSCOhost, *Science Direct*, and Scopus. Then, the researchers applied some keywords, such as “(abdominal surgery) AND (mobilization) AND (Postoperative Pulmonary Complications)”. The researchers selected the articles based on the article contents and the objectives of this research. The researchers also applied some **inclusion criteria**. They were 1) full-text articles, 2) English-written articles, 3) explaining the objectives and the methods, 4) having relevance to the implementation of mobilization and post-abdominal surgery, and 5) being published between 2017 and 2022. **Exclusion criteria included:** 1) abstract and title of the review

only, 2) not related to the scope of the mobilization in abdominal surgery patients.

After searching the articles from six databases, the researchers found 57.990 articles. They were from Pubmed (n = 43), EBSCOHost (n = 1.223), Science Direct (n = 25.800), ProQuest (n=30.279), and Scopus (n=645). Then, the researchers screened the articles by searching only five-recent year article publications and full-text-written articles, n = 162. After that, the researchers screened the articles based on the two adherences: having open access and being written in English. The results were 10 articles. Then, the researchers excluded the duplicated articles and screened the titles and abstracts based on the inclusion and exclusion criteria. The results were six articles.

Chart 1. PRISMA Flowchart



From the six analyzed articles, the articles applied Randomized Controlled trials as the prospective study to measure the effectiveness of early mobilization on post-abdominal surgery to receive the benefits. In this research, the researchers applied Non-Randomized Controlled Trials as the reference to support the discussion. Thus, the researchers could

have clear literature review results about the early mobilization of post-abdominal surgery as shown in the PRISMA chart in [Chart 1](#).

## Results

### The implementation of early mobilization on post-abdominal surgery

#### The respiratory function

After promoting the mobilization from the bed within 2 hours of post-abdominal surgery, the results showed the pressures and the oxygen saturations, SpO<sub>2</sub> and PaO<sub>2</sub>, were better than the patients with bed rest treatment. The early mobilization was important to improve the SpO<sub>2</sub> and PaO<sub>2</sub> after experiencing the surgery. The mobilization, within the first hour after the surgery, had the same urgency as the second-hour mobilization. Prolonged mobilization duration, for more than 90 minutes, did not surpass the shorter period (30 until 90 minutes or less than 30 minutes) because the increased SpO<sub>2</sub> and PaO<sub>2</sub> were the same for all patients.<sup>4</sup>

Early mobilization is applicable after the Post-Operative Day, POD 0, or within 24 hours after the surgery. Mobile activity may begin from a bed with or without breathing exercises within 2 hours after the abdominal surgery. Then, the patients continued this activity after six hours with the further mobilization step. This condition improves the values of SpO<sub>2</sub> and PaO<sub>2</sub> by providing the same secure, monitored, and reliable exercises to improve functional capacity after having abdominal surgery.<sup>13,14,15</sup> The findings supported the prescribed progressive mobilization for patients with pancreas surgery as long the mobilization was stable and titrated into each response and security consideration. On the same surgery day, the mobilization should provide more oxygenation to increase the potential of relieving complications and accelerating the recovery process.

#### Postoperative Pulmonary Complications (PPC)

Postoperative Pulmonary Complications (PPC) are the most common complication with incident rates of 20 to 50%.<sup>16</sup> The levels of post-surgical complication could be lower by utilizing the multi-modal pre-habilitation program, such as pre-observed surgery for distant ambulation, and nutritional supplements for patients suffering from malnutrition or smoking. Thus, the results would be varied, between 16 and 100%.<sup>17,18</sup>

This matter becomes an important matter to prevent further complications. The postponed mobilization could be correlated with the increased risk of inpatient and short-term mortality rates, especially for older and weaker patients receiving the operation.<sup>19</sup> Mobilization of post-abdominal surgery physiotherapy could accelerate the recovery process and prevent PPC.<sup>20</sup> The protocol of Incidence of Complications Following Emergency Abdominal Surgery Gets Exercising (ICEAGE) with mobilization could lower the PPC incidents.<sup>16</sup> The prescribed progressive mobilization for the patients after having pancreatic surgery, when the patients are stable, should provide more oxygen, relieve complications, and accelerate the functional recovery process.<sup>21</sup>

#### Length of Stay (LOS) and Cost

Mobilization or physiotherapy could decrease the incidents of prolonged post-ileus surgery. Thus, the patients could go home soon which means their length of stay at hospitals gets shorter. A short length of stay could provide benefits on the expenses cost by decreasing the cost to pay the hospital services.<sup>5,16,22</sup> Besides that, a slow early mobilization after abdominal surgery or delayed initial ambulation could lead to higher infection complications and prolonged inpatient that could make the longer length of stay. Therefore, early mobilization of post-surgery becomes a key component for clinical medication after post-abdominal surgery.<sup>23</sup> The multi-intervention of the mobilization n pre-operation, pre-nutritional care, and post-operation could improve the recovery from post-abdominal surgery. Thus, the length of stay will be shorter.<sup>24</sup>

### **The physical and mental wellbeing**

Patients will value mobilization because it will have positive effects on their well-being completely both mentally and physically. Thus, mobilization becomes an encouraging factor and an important part of post-surgical care. Patients will experience that they have everything to win and recover by implementing early mobilization. Thus, they can go home soon. Many parties find the post-surgical recovery unit as the safe and strategic place to promote the first mobilization after surgery for the patients and the health care professionals. The professionals work as a team to facilitate immediate mobilization.<sup>4</sup>

### **Post-Surgical Morbidity**

Mobilization could be a new strategy to decrease morbidity incidents after having abdominal surgery.<sup>11</sup> Therefore, the mobilization requires some assessment to determine the complications after the surgery, to provide benefits, and to determine the morbidity incidents of post-surgery. The morbidity of post-abdominal surgery is measurable with Comprehensive Complication Index, CCI, within 30 days after the surgery. CCI is assessed and calculated based on the assessments of all complications as proposed by Dindo-Clavien's classification. Fitness trackers (FTs) could be the tool to improve the mobilization of post-surgery. The tool is installed on the dominant hand of a patient with post-surgery until the time the patient leaves the hospital or maximally 30 days.<sup>25</sup>

**Table 1.** The summary of the research articles

No	Author	Title	Objective	Method and design	Population and sample	Procedure	Outcome	Finding
1.	Svensson-Raskh et all (2021) <sup>4</sup>	Early mobilization of post-abdominal surgery was effective.	The investigation of respiratory effects from the applied early mobilization on post-surgery: abdominal laparoscopy, the opened abdominal dissection, or robot-assisted surgery procedure	<ul style="list-style-type: none"> <li>• Research with a single RCT consists of three clinical studies, resulting in four research articles.</li> </ul>	<ul style="list-style-type: none"> <li>• Patients would have surgical operations. Two weeks before the operation,</li> <li>• The patients received pre-operative outpatient at the University of Karolinska in Solna.</li> <li>• Adults (<math>\geq 18</math> years old) would have the opened abdominal surgery.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Paper I</b> consists of a research protocol enlisted in the Clinical Trials. Patients with post-operation were randomly grouped into three groups. They were               <ol style="list-style-type: none"> <li>1. Mobilization from resting on a bed to sitting on a chair</li> <li>2. Mobilization from resting on a bed to sitting on a chair with a standardized breathing exercise.</li> <li>3. For the control group, having no mobilization or breathing</li> </ol> </li> </ul>	The patients with post-abdominal surgery could effectively move from the bed within 2 hours and had some respiratory improvements, SpO2 and PaO2.	<ul style="list-style-type: none"> <li>• Early mobilization was important to improve SpO2 and PaO2 after abdominal surgery.</li> <li>• Patients valued the mobilization because they experienced positive effects on their well-being completely both mentally and physically</li> </ul>

						<p>exercise during the study</p> <ul style="list-style-type: none"> <li>• <b>Paper II</b> consists of secondary analyses of partial RCT data</li> <li>• <b>Papers III and IV</b> apply interview study with qualitative approaches.</li> <li>• All studies occurred at the hospital of Stockholm Country University, Sweden.</li> </ul>		
2.	Boden et al (2018) <a href="#">16</a>	ICEAGE (Incidence of Complications following Emergency Abdominal surgery: Get Exercising for the prevention of complications and improved physical recovery after emergency abdominal surgery	Testing the physiotherapy to prevent complications and improve the physical recovery after abdominal surgery	Protocol study, multi-center, RCT	288 patients would receive EMG abdominal operation.	<ul style="list-style-type: none"> <li>• ICEAGE compared the standard physiotherapy care with the refined physiotherapy care package for 288 patients that would receive emergency abdominal surgery at three hospitals in Australia.</li> </ul>	<ul style="list-style-type: none"> <li>• From the analyses, 214 patients with mobilization and respiratory training had significant improvements in SpO2 (mean difference [MD] = 2,5%; 95% CI = 0,4-4,6) and PaO2 (MD = 1,40 kPa; 95% CI =</li> </ul>	<ul style="list-style-type: none"> <li>• The researchers found the oxygen saturation differences (SpO2 in a percentage) and the arterial oxygen pressure (PaO2, in kilopascal measurement) from the groups.</li> <li>• The secondary results were</li> </ul>



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						<ul style="list-style-type: none"> <li>• The researchers randomly took the participants with hidden allocation to receive standard physiotherapy care (education, a single training session, and early ambulation for every day within 15 minutes each).</li> <li>• The improved physiotherapy (education, training twice a day for minimally two days, 30-minute rehabilitation with routine monitoring every day for at least five days after the surgery).</li> </ul>	<p>0,64 until 2,17) compared to the control group.</p> <ul style="list-style-type: none"> <li>• Group with only mobilization had an improved PaO<sub>2</sub> (MD = 0,97 kPa; 95% CI = 0,20 until 1,74) compared to the control group.</li> <li>• in The pre-protocol analysis, 201 patients had significant SpO<sub>2</sub> and PaO<sub>2</sub> improvements for both groups with mobilization compared to the control group. 1.</li> </ul>	<p>arterial carbon dioxide pressure, spirometry, respiratory insufficiency, pneumonia, and length of stay.</p>
3.	Svensson-Raskh et al (2021) <sup>13</sup>	Mobilization began two hours after the abdominal surgery to improve the peripheral and	The researchers investigated the mobilization from the bed, after two hours of the abdominal surgery. The	a single-center randomized controlled trial	<ul style="list-style-type: none"> <li>• The sample consisted of 214 patients, recruited in order from those with opened</li> </ul>	<ul style="list-style-type: none"> <li>• After the patients received the surgery, the researchers randomized the patients and put them to receive mobilization, by</li> </ul>	<ul style="list-style-type: none"> <li>• From the analyses, 214 patients with mobilization and respiratory training had significant improvements</li> </ul>	The researchers found the oxygen saturation differences (SpO <sub>2</sub> in a percentage) and the arterial oxygen pressure (PaO <sub>2</sub> , in



		arterial oxygenation.	results showed that mobilization could improve respiratory function and have positive effects on respiration.		abdominal operations or laparoscopy with gynecology, urology, or endocrinology robots for an anesthesia duration of more than 2 hours. <ul style="list-style-type: none"> <li>• The researchers recruited the patients randomly.</li> </ul>	sitting on a chair, having respiratory exercise (n = 73), mobilization by only sitting on a chair (n = 75), and control group with n = 65. <ul style="list-style-type: none"> <li>• The intervention began after two hours arriving at the post-surgical care unit and continued until maximally six hours.</li> </ul>	in SpO2 (mean difference [MD] = 2,5%; 95% CI = 0,4-4,6) and PaO2 (MD = 1,40 kPa; 95% CI = 0,64 until 2,17) compared to the control group. <ul style="list-style-type: none"> <li>• Group with only mobilization had an improved PaO2 (MD = 0,97 kPa; 95% CI = 0,20 until 1,74) compared to the control group.</li> <li>• In The pre-protocol analysis, 201 patients had significant SpO2 and PaO2 improvements for both groups with mobilization compared to</li> </ul>	kilopascal measurement) from the groups. <ul style="list-style-type: none"> <li>• The secondary results were arterial carbon dioxide pressure, spirometry, respiratory insufficiency, pneumonia, and length of stay.</li> </ul>
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							the control group. 1.	
4.	Schwab et al (2020) <a href="#">25</a>	Post-operative complication and mobilization on post-major abdominal surgery compared to treatment without Fitness Track (EXPELLARMUS).	The researchers investigated whether the modest mobilization protocol implementation with the combination of FT-based feedback could lower the morbidity after having major abdominal surgery.	Multicentre: RCT with two parallel studies	<ul style="list-style-type: none"> <li>• The researchers recruited 348 patients from 15 German centers.</li> <li>• The researchers assigned the participants randomly (1:1) into an experiment group. This group received daily step suggestions and FT based on feedback about the daily steps.</li> <li>• The control group received a standardized mobilization and FT with a black screen.</li> </ul>	<ul style="list-style-type: none"> <li>• The experiment group: the patients had FT devices installed or worn (ActiGraph GT9X Link, ActiGraph, ProCare, Groningen, Dutch) on their dominant wrists after the surgery as long as they stayed after the surgery until they went home or maximally after 30 days. The patients received visual feedback of the live time via the tract display. Thus, they could know their daily steps and were encouraged to meet the pre-determined daily step target. The inter-</li> </ul>	<ul style="list-style-type: none"> <li>• The final point of the research dealt with post-operative morbidity within 30 days. This morbidity was measured by Comprehensive Complication Index.</li> <li>• The secondary final point covered all stages and functional parameter sets, morbidity, and security.</li> </ul>	EXPELLIARMUS provided high-quality data about the effectiveness of fitness track-based feedback after the major abdominal surgery.

					<p>Thus, they had no FT-based feedback.</p>	<p>professional health care teams encouraged the ambulation to meet the predetermined objective steps.</p> <ul style="list-style-type: none"> <li>• The control group: the patients had FT devices installed or worn (ActiGraph GT9X Link, ActiGraph, ProCare, Groningen, Dutch) on their dominant wrists after the surgery as long as they stayed after the surgery until they went home or maximally after 30 days. The device display was back-screened and had no feedback. The patients could move arbitrarily</li> </ul>		
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						based on their tolerance.		
5.	Steffens et al (2022) <a href="#">22</a>	Pre-habilitation with pre-operative exercise and education for the patients with large abdominal cancer surgery.	<ul style="list-style-type: none"> <li>The effectiveness of pre-habilitation with the exercise program and education of progressive and individual pre-operations in comparison to the common care to reduce the patients' proportions with the post-operation complication at hospitals.</li> <li>investigating the effectiveness of a pre-</li> </ul>	Multicentre: RCT	172 patients with abdominal surgery	<ul style="list-style-type: none"> <li>The researchers took the sample randomly by training and educating the intervention group with pre-operation. The training and education lasted for 4 until 8 weeks before the operation by the nurses and the common nurses for the control group.</li> <li>the intervention lasted from 12 to 24 sessions of individual progressive training, including aerobic, anaerobic, resistance, and breathing exercises. The intervention recommended training at home</li> </ul>	<ul style="list-style-type: none"> <li>The primary results showed decreased complications after the surgery while being at the hospitals.</li> <li>The secondary results consisted of intensive care unit and length of stay, life quality, morbidity, and post-operative cost.</li> </ul>	Mobilization or pre-operative exercises, exercising at home, and education was important for the patients with major abdominal surgery, such as major gastrointestinal surgery.

			operation intervention to reduce the length of stay in intensive unit care at hospitals and improve life quality and morbidity, and decrease the cost.			for 16 to 32 sessions and suggested daily physical activities.		
6.	Boden et all (2020) <sup>5</sup>	Pre-surgery physiotherapy saves the cost to prevent pulmonary complications. Post-large abdominal surgery	The analyses of pre-surgery physiotherapy and cost efficiency to decrease the post-pulmonary complication (PPC) and the improved life quality adjustment after large-abdominal surgery, QALYs	An experiment with controlled randomization; multi-center	<ul style="list-style-type: none"> <li>• 400 adults waiting for the upper-abdominal surgery schedule at pre-anesthesia clinics Hospitals in Australia and New Zealand</li> </ul>	<ul style="list-style-type: none"> <li>• The experimental group received the information booklet and a face-to-face session of 30 minutes, involving educators to train the patients' breathing and breathing exercise with physiotherapy.</li> <li>• The control group only</li> </ul>	<ul style="list-style-type: none"> <li>• The effectiveness probability of the cost and the benefits on the cost-effectiveness and probability curve based on the willingness to pay.</li> <li>• The cost-effectiveness model applied the data audit of hospital service costs after twenty days of surgery</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-operative physiotherapy has a probability percentage of 95% to save the cost with benefits for the hospitals, \$4.958 (95%CI10 until 9.197) for each prevented PPC. The hospitals were willing to pay \$45.000 to provide the service.</li> </ul>

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						received an information booklet	and QALYs, estimated from the health utility and Short Form-Six Domain mortality until 12 months.	<ul style="list-style-type: none"> <li>• The cost of the utility for QALY was uncertain. The analysis of sensitivity strengthens cost-effectiveness.</li> <li>• The improved cost-effectiveness and QALY were detected while the physiotherapists provided the interventions.</li> </ul>
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## Discussion

The abdominal surgery involves the primary abdominal cavity that causes various inflammation responses. Abdominal surgery could also provide significant physiological stress. This situation increased the mortality incidents after having abdominal surgery, estimated to be 4%; and post-surgical complications of the patients, 15 to 40%.<sup>3</sup> A high percentage of post-abdominal surgery complications influenced the recovery process of the patients. The positions of the surgery, with a lacerated abdomen, may also lead to a complication during the surgery or after the abdominal laceration. This situation is correlated with the diaphragm pressure that influences the contraction capability. This situation leads to lower inspiratory volume from the reduced functional capacity of the final-normal pulmonary expiration and the disclosures on the small air tracts and atelectasis.

The most common complications in this abdominal surgery are Post-operative Pulmonary Complication, PPC; and Surgical Site Infection, SSI. These complications occur due to atelectasis or severe pneumonia that may lead to respiratory failure or death.<sup>6,7</sup> The PPC complication makes prolonged treatment of the patients from the recovery room and the post-surgical room to fully recover. PPC is a common term for pulmonary complications after a surgical operation. The reported incidence of this complication ranged from 1 to 40%, depending on the definitions of PPC and the types of surgery.<sup>4</sup> Abdominal surgery is a procedure with Acute High-Risk AHA This procedure is mostly correlated with a high mortality rate, postoperative complications, and longer stay at hospitals.<sup>8,9</sup> Therefore, further strategy development is important to recover and decrease post-abdominal surgery complications. The doctors and nurses managing the patients with post-abdominal surgery had to provide early mobilization treatment to accelerate the recovery process.

Early mobilization after the surgery could facilitate the recovery and treatment processes. Early mobilization is applicable after the Post-Operative Day, POD 0, or within 24 hours after the surgery. Mobilization, by getting off the bed within 2 hours after the surgery, or by having respiratory exercise after two hours of the abdominal surgery, with the follow-up of mobilization steps after six hours, would make the pressures and saturation of oxygen, SpO<sub>2</sub>, and PaO<sub>2</sub>, better than only by having bed rest treatment. The early mobilization was important to improve the SpO<sub>2</sub> and PaO<sub>2</sub> after experiencing the surgery. The mobilization, within the first hour after the surgery, had the same urgency as the second-hour mobilization. Prolonged mobilization duration, for more than 90 minutes, did not surpass the shorter period (30 until 90 minutes or less than 30 minutes) because the increased SpO<sub>2</sub> and PaO<sub>2</sub> were the same for all patients.<sup>4</sup> With the duration based on the reference and the stages of promoting early mobilization, the health workers could help the patients to provide early mobilization treatment for post-abdominal surgery.

The levels of post-surgical complication could be lower by utilizing the multi-modal pre-habilitation program, such as pre-observed surgery for distant ambulation, and nutritional supplements for patients suffering from malnutrition, or smoking. Thus, the results would be varied, between 16 and 100%.<sup>17,18</sup> This matter becomes an important matter to prevent further complications. Mobilization or physiotherapy after abdominal surgery could accelerate the recovery process and prevent PPC.<sup>20</sup> The early mobilization influenced the diaphragm muscles to promote the respiratory function and minimize the complication during the post-abdominal surgery. A protocol is important to measure the complication incidence about the urgency of post-abdominal surgery. The protocol of *Incidence of Complications Following Emergency Abdominal Surgery Gets Exercising (ICEAGE)* with mobilization could lower the PPC incidents.

Mobilization could also decrease ileus incidents of prolonged post-surgery. Thus, the patients could obtain more benefits, such as a short length of stay or going home immediately from the hospital. A short length of stay, LOS, would also decrease the costs of hospital services to pay the patients. The patients could also leave the hospitals



sooner.<sup>5,16,22</sup> Therefore, early mobilization of post-surgery becomes a key component for clinical medication after post-abdominal surgery.<sup>23</sup> The multi-intervention of the mobilization pre-operation, pre-nutritional care, and post-operation could improve the recovery from post-abdominal surgery. Thus, the length of stay will be shorter.<sup>24</sup> Mobilization could also improve the physical and mental well-being of the patients because they found themselves acknowledged during the recovery process and post-surgical care.

Morbidity incidents of post-abdominal surgery could be decreased by promoting early mobilization as the new strategy.<sup>11</sup> The numbers of morbidity incidents after surgery are important to assess and determine the post-surgical complication rates. In this case, the Comprehensive complication Index, CCI, can measure the post-surgical morbidity incidents within 30 days after the surgery. The assessment of all complications could assess and calculate the CCI based on Dindo-Clavien's classification. Fitness trackers (FTs) could be the tool to improve the mobilization of post-surgery. The tool is installed on the dominant hand of a patient with post-surgery until the time the patient leaves the hospital or maximally 30 days.<sup>25</sup> With the assistance of FTs instruments, the patients could be monitored from the first day of post-abdominal surgery until the full recovery condition of the patients.

### Conclusion

Mobilization provides many advantages to relieve post-abdominal surgery complications and becomes an assessment to determine the mobilization levels to apply. Thus, the morbidity and mortality of post-abdominal surgery could be minimized and prevented. Early mobilization of post-abdominal surgery is applicable on Post-Operative Day, POD 0, or within 24 hours after the surgery. This mobilization could improve respiratory function with increased SpO<sub>2</sub> and Sat O<sub>2</sub>, shorten LOS, lower the cost, and relieve post-surgical complications. The limitation of this literature review dealt with the analyses of the article results. Some articles did not provide clear advantages specifically from this post-abdominal surgery based on the surgery types. The researcher recommends the health care providers provide early mobilization for post-abdominal surgery patients. Thus, they could accelerate the recovery process.

### Conflict of Interest Declaration

The researcher stated that there was no conflict of interest in this research.

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