Chapter 7

Physiotherapy Following Emergency Abdominal Surgery

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Additional information is available at the end of the chapter

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Abstract

Physiotherapy following elective abdominal surgery has been well documented, but following emergency abdominal surgery, despite poorer outcomes and increased complication rates, physiotherapy interventions for this patient group remain largely uninvestigated. The most common complication following upper abdominal surgery is the development of a post-operative pulmonary complication (PPC). Risk factors for the development of PPCs include duration of anaesthesia, emergency upper abdominal surgery, current smoker status, respiratory comorbidities, obesity, increased age and multiple surgeries. Physiotherapy interventions aim to prevent or remediate PPCs and post-operative complications associated with the sequelae of immobility such as venothrombotic events and to facilitate recovery from surgery and a return to normal activities of daily living and function. Physiotherapy interventions after major surgery include early mobilisation and respiratory physiotherapy techniques. Respiratory therapies include deep breathing and coughing exercises, positive expiratory pressure devices, incentive spirometry and non-invasive ventilation. Early mobilisation has been demonstrated to be safe and efficacious following elective abdominal surgery and for patients who are critically ill. This chapter reviews the evidence in these populations and propose that, until further studies are available to direct care, this evidence is extrapolated to patients following emergency abdominal surgery. As abdominal surgery impacts on physical recovery and health-related quality of life, post-discharge rehabilitation programmes may improve long-term outcomes; however, rehabilitation following major cavity surgery is in its infancy. This chapter investigates post-operative rehabilitation research to date in this population in an attempt to determine the effectiveness of such programmes and make recommendations for future practice.

Keywords: physiotherapy, post-operative complications, emergency surgery, abdominal surgery, rehabilitation

1. Introduction

Recovery after abdominal surgery is multifaceted and requires input from a variety of health professionals. Recovery is not a concept that is well defined for healthcare professionals or for patients. Recovery has been previously described as a return to normality and wholeness through an energy requiring process and involves multiple domains, namely physical, physiological, psychological, social and economic [1, 2]. Physiotherapy aims to facilitate recovery from surgery by preventing or remediating post-operative complications and providing physical rehabilitation to assist a return to premorbid physical function, and whilst primarily focussing on physical rehabilitation, physiotherapy may impact on a number of the other domains. Rehabilitation commences, where possible, preoperatively and continues throughout the acute and sub-acute post-operative period and may extend beyond hospital discharge into community-based or ambulatory care to assist with a return to normal activities of daily living and function.

The effectiveness of physiotherapy to prevent complications and improve recovery for patients undergoing elective abdominal surgery has been well documented over the past 20 years [3]. However, despite data showing a higher incidence of complications and poorer physical recovery for patients undergoing emergency abdominal surgery [4, 5], the benefits of physiotherapy for this patient group are yet to be reported in detail.

This chapter will provide an overview of the common complications that occur following abdominal surgery including emergency surgery, specifically focussing on those that may be remediated by physiotherapy interventions. Evidence for physiotherapy interventions will be extrapolated based on both elective abdominal surgery studies and those combining elective and emergency surgical cohorts and recommendations for physiotherapy practice following emergency abdominal surgery will be presented.

2. Complications associated with emergency abdominal surgery

Physiotherapists have been involved in the routine provision of care to patients undergoing abdominal surgery since the 1950s [6, 7]. Post-operative complications are common following major upper abdominal surgery (UAS) with up to 50% of all patients having some type of complication following their surgery [8, 9]. Complications include post-operative pulmonary complications (PPCs), prolonged post-operative ileus, wound infection, haemorrhage and venothrombotic events [4]. Complications following emergency UAS are two to three times more common compared with similar elective procedures [4] with patients more susceptible

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to cardiopulmonary complications and sepsis [10]. These types of complications are shown to be the most frequent cause of early post-operative death and correspondingly the 30-day mortality rate is five times higher following emergency surgery compared with elective abdominal surgery [10].

2.1. Post-operative pulmonary complications

Post-operative pulmonary complications (PPCs) are described as '…a pulmonary abnormality that produces identifiable disease or dysfunction, that is clinically significant and adversely affects the clinical course' [11]. PPCs may include pneumonia, respiratory failure, atelectasis, sputum retention, pneumothorax, pleural effusion and pleural oedema [12] (see **Figure 1**).

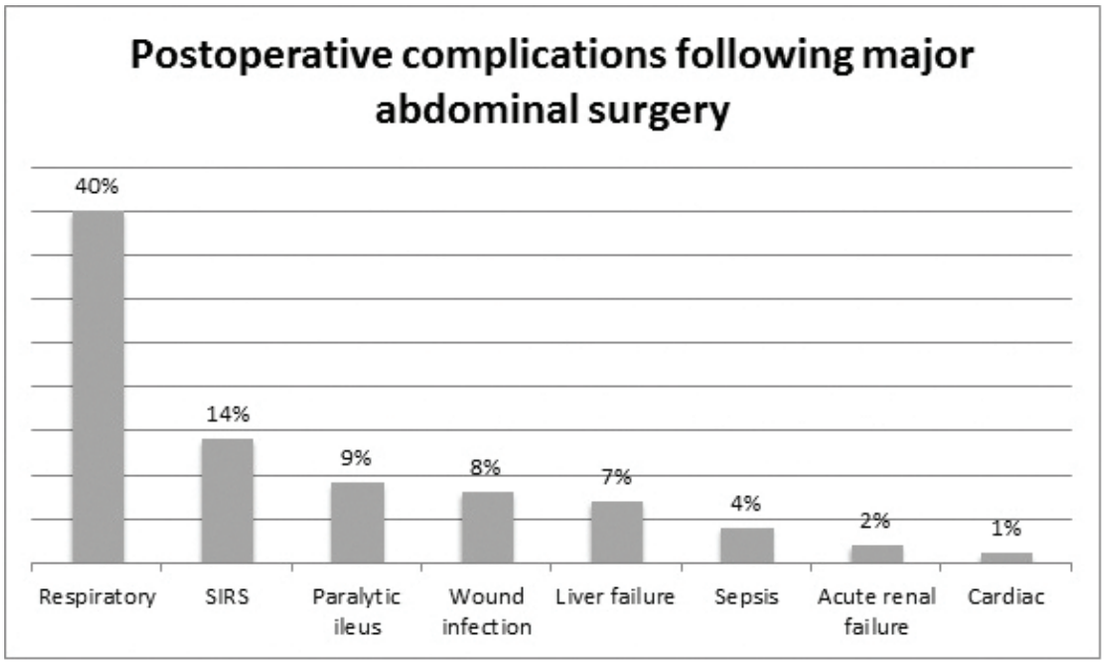

Figure 1. Post-operative complications following major elective abdominal surgery [12].

PPCs are a major cause of morbidity and mortality and the most common complication following elective UAS with a reported incidence of up to 40% [12]. Similar incidences of PPCs have been reported following emergency UAS [5, 10, 13, 14] although variability in the definition and diagnosis of PPC affects the reliability of this data [15]. Despite the true incidence being unclear, emergency surgery is seen as an independent risk factor for PPC across all surgery types [16].

PPCs have significant consequences for both the patient and healthcare services. Patients have poorer outcomes and a slower recovery if they develop a PPC following abdominal surgery. Hospital costs are doubled [17], length of stay is longer by a minimum of four days [18, 19], and mortality is higher [20, 21] in those patients who are diagnosed with a PPC following elective UAS. Considering the consequences of respiratory complications, much focus has been placed on their prevention. By identifying the factors that predispose to the development of

PPCs and the populations most at risk, prophylactic therapeutic interventions can be more appropriately targeted.

2.1.1. Risks factors associated with the development of PPCs

The pathophysiological effects of abdominal surgery on the respiratory system are well known. Atelectasis [22], alterations in mucociliary transport [23], respiratory muscle dysfunction and altered chest wall mechanics [5, 22], reduced lung volumes and decreased cough strength [22] are thought to contribute to an increased risk of PPC through the combined impact of general anaesthesia, post-operative pain and immobilisation, and handling of the viscera [22].

Factors most highly associated with the development of PPCs for patients undergoing elective abdominal surgery include duration of anaesthesia greater than 3 hours, upper gastrointestinal surgery, a current or recently ceased smoking history, estimated VO_2max below 19.37 ml/kg/min and respiratory co-morbidity [24]. Risk analysis from a recent study focussing on emergency upper and lower abdominal surgery identified age, abnormal body mass index, upper abdominal incision and multiple surgeries as predictors of PPC [5].

2.1.2. Identifying PPCs

Rates of PPC vary greatly depending on the diagnostic criteria used to define them, and such inconsistencies make identifying clinically significant PPCs, comparison of PPC rates and interpretation of research findings problematic. Additionally, not all clinically significant PPCs are amenable to physiotherapy interventions, for example, a pneumothorax. One diagnostic

Melbourne Group Score PPC diagnostic criteria

Diagnosis confirmed when 4 or more of the following are present in a 24 hr period:

CLINICAL FACTORS

- New abnormal breath sounds on auscultation different to preoperative assessment
- Production of yellow or green sputum different to preoperative assessmen
- Pulse oximetry oxygen saturation (SpO_2) <90% on room air on more than one consecutive postoperative day
- Raised maximum oral temperature >38°C on more than one consecutive postoperative day

DIAGNOSTIC FACTORS

- Chest radiograph report of collapse/consolidation
- An unexplained WCC greater than 11 x 10^9/L
- Presence of infection on sputum culture report

OTHER

- Physician's diagnosis of pneumonia, respiratory tract infection, undefined respiratory problem.
- Prescription of an antibiotic for a respiratory infection

Figure 2. The Melbourne Group Score PPC diagnostic criteria.

tool, the Melbourne Group Score (MGS), has recently been used to identify those PPCs considered potentially responsive to physiotherapy interventions, for example severe atelectasis and pneumonia. Whilst the measurement properties of the MGS have not yet been fully demonstrated, the tool has been shown to have excellent inter- and intrarater reliability and good clinical utility when compared to other similar diagnostic tools [25].

The MGS tool is an eight-item checklist, identifying patients as having a PPC if they are positive for four of the eight criteria in a 24-hour period (see **Figure 2**).

To date, the MGS has been used following abdominal [18, 26–28] and thoracic surgery [25, 29], and whilst further studies investigating its clinimetric properties are warranted, it currently remains the best tool for physiotherapists to determine the presence of a PPC amenable to their care.

2.2. Complications associated with prolonged immobility

Prolonged bed rest is associated with an increased risk of post-operative complications after surgery. Prolonged immobility has been shown to increase the risk of venous thromboembolism [30], result in loss of muscle bulk and strength [31], increase insulin resistance [32], reduce pulmonary function and tissue oxygenation and increase levels of hospital associated depression [33]. All of these complications increase patient length of hospital stay (LOS) and, in some cases such as venous thromboembolisation and decreased pulmonary function, can threaten life. More recently, literature has clearly demonstrated an increase in the risk of severe acute weakness syndromes such as intensive care unit-acquired weakness (ICUAW) in the context of sepsis and critical illness [34]. These weakness syndromes impact patients both during their acute recovery and following discharge, with some patients experiencing ongoing weakness and functional difficulties up to two years after their ICU discharge [34].

Delayed ambulation has also been associated with PPCs, with an observational cohort study finding patients were three times more likely to have a PPC diagnosis for each day they did not mobilise away from the bedside [27], although it is possible that the presence of a PPC caused the delay in ambulation rather than vice versa, as a majority of PPCs are diagnosed on the first post-operative day and before to the opportunity for early ambulation. Whilst no conclusive evidence has demonstrated that delayed ambulation increases the likelihood of a PPC, it does contribute to functional decline. A randomised controlled trial found that in patients following elective abdominal surgery where mobilisation was delayed by three days, more physiotherapy input was required, and length of hospital stay was increased by 4.4 days (95%CI 0.3–8.8) compared with those who ambulated on the first post-operative day [35].

2.3. Prolonged post-operative ileus

Post-operative ileus (POI) is a normal, transient impairment of bowel motility and is considered an inevitable consequence of abdominal surgery [36–38]. A clinically significant ileus, or prolonged ileus, is defined as lasting longer than three days [37, 39] and involves symptoms such as nausea and vomiting, inability to tolerate an oral diet, abdominal distension and delayed passage of flatus or stool [37, 38]. Prolonged ileus occurs in up to 25% of patients

following major abdominal surgery, is associated with a higher risk of developing other post-operative complications and increases hospital length of stay [39]. Early ambulation is included as part of standard care guidelines and has been suggested to be influential on the timely resolution of ileus although there is currently little evidence for this [38]. Further studies are needed to test the hypothesis that early and frequent ambulation reduces ileus rates.

3. Physiotherapy following emergency abdominal surgery

To date, there have been limited data regarding physiotherapy interventions following emergency abdominal surgery. Physiotherapists caring for patients following emergency surgery can only base their interventions on evidence extrapolated from elective abdominal surgery and literature for critically ill patients.

Whilst preoperative education, inspiratory muscle training, and exercise training have been shown to significantly impact on PPCs in patients undergoing elective abdominal surgery [40–43], the nature of emergency surgery invariably renders this approach impossible in this patient group. Consequently, such patients are assumed at increased risk of post-operative complications.

3.1. Physiotherapy in the immediate post-operative period

Physiotherapists have been involved in the routine provision of care to patients undergoing abdominal surgery under the assumption that complications can be prevented by assisted early ambulation and respiratory physiotherapy techniques such as deep breathing and coughing (DB&C) exercises [44–46]. Whilst there is little evidence demonstrating effective physiotherapy techniques specifically for the emergency UAS population, there is good quality evidence to demonstrate that physiotherapy focusing on early rehabilitation in the immediate post-operative period is both safe and effective following elective UAS, and for patients with a critical illness (including following emergency surgery) in intensive care. As such, until further evidence becomes available, evidence from both the critical illness literature and the elective abdominal surgical literature should be applied to determine appropriate and effective interventions for these patients. Therapy usually comprises of early assisted mobilisation, respiratory physiotherapy, strength and conditioning rehabilitation and education.

3.1.1. Physiotherapy assessment

Physiotherapy assessment occurs in the context of the patient condition, the nature and type of the surgery, the ongoing medical plan, the patient's premorbid status and any comorbidities impacting upon post-operative rehabilitation. Level of alertness, ability to follow instructions and haemodynamic and respiratory stability will be carefully assessed before any therapeutic intervention is considered. Consensus guidelines for physiotherapy assessment and treatment have been recently published and, where higher quality evidence is absent, should be used as the primary resource for recommendations for physiotherapy practice [46].

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3.1.2. Physiotherapy treatment

3.1.2.1. Early ambulation and rehabilitation

Early ambulation and rehabilitation have been extensively researched after both elective abdominal surgery and after critical illness. There is an increasingly compelling body of evidence that physical activity 1–2 times per day for up to 15–30 min is both safe and efficacious for critically ill patients [47]. Early mobilisation has been shown to decrease ICU and hospital length of stay, reduce the effect of ICUAW and improve quality of life [48]. Early mobilisation in the critically ill should be undertaken under highly controlled circumstances and such decisions are made according to individual patient status and haemodynamic stability. Evidence shows that adverse events occur in only a small number of patients (1–4%) [47, 49–52]. A recent systematic review reported no serious adverse medical consequences whilst mobilising critically ill patients in 14 of 15 trials [53].

Enhanced Recovery After Surgery (ERAS) protocols exist to inform peri-operative management of specific elective abdominal surgeries. Such protocols contain recommendations regarding, amongst other interventions, the importance of early ambulation after abdominal surgery, specifying the frequency and duration required to be undertaken. For example, for patients undergoing elective rectal or pelvic surgery the guidelines recommend they are nursed in an environment encouraging independence and mobilisation with two hours out of bed on the day of surgery and six hours out of bed each day thereafter [54]. A further example includes patients following elective pancreaticoduodenectomy and states such patients should be actively mobilised from the morning of the first post-operative day, with mobilisation targets to be met each day [55]. Regardless of specific protocols, there is general consensus that to counteract the deleterious effects of immobility following any abdominal surgery patients should be mobilised early and often [54–58].

3.1.2.2. Respiratory physiotherapy

Whilst DB&C exercises to clear secretions have previously been considered essential in physiotherapy programmes following abdominal surgery [46], there has been no convincing evidence showing them to be any more effective in reducing PPC incidence than providing frequent early intensive ambulation alone [59]. As a result, recent research has focussed on the effectiveness of providing early ambulation alone in preventing post-operative complications [46]. Following emergency UAS, some patients may be unable to ambulate due to, for example, haemodynamic instability or traumatic injury, and thus, the inclusion of DB&C should be considered to be of value after emergency UAS [46]. If sputum retention occurs post-operatively, DB&C can also be augmented using additional techniques such as positive expiratory pressure (PEP) therapies. Such devices have been purported to aid in improving lung volumes and secretion clearance although a systematic review concluded that PEP conveys no additional benefit over other respiratory techniques [60]. These findings were limited by the poor quality of studies and small samples sizes within the review. However, since this systematic review, a well-designed randomised controlled trial (RCT) has found that an oscillating PEP device reduced days of fever and LOS [61] following elective UAS and thoracic surgery.

Incentive spirometries (ISs) are respiratory devices, which aim to increase inspiratory volumes. Incentive spirometry has been researched extensively, but meta-analysis of the available data has found little benefit when administered prophylactically following elective surgery [62, 63]. The benefits of PEP and IS are currently unknown in emergency surgery populations; however, considering that emergency abdominal surgery patients are at high risk of PPC and that these devices are generally low cost, on the balance of risk versus benefit, such devices should be considered as a prophylactic respiratory physiotherapy treatment in patients considered high risk for the development of a PPC.

To date, the current research investigating the effectiveness of respiratory physiotherapy interventions in a population following emergency UAS is inconclusive due to limited low-quality research and poor sample sizes. In this high-risk population, it is possible that the benefit of a reduction in PPCs by the delivery of prophylactic low-cost, low-risk interventions may outweigh the high cost of PPCs to the healthcare system however further and better-quality research, including cost-benefit analyses, is required to determine this.

3.1.2.3. Non-invasive ventilation

Non-invasive ventilation (NIV) in the form of either continuous positive airway pressure (CPAP) or bi-level positive airway pressure (BiPAP) reverses the known reduction in functional residual capacity (FRC) following abdominal surgery. Mechanically driven air-flow (with or without additional oxygenation) is delivered during inspiration via a sealed facemask or nasal interface until a predetermined inspiratory positive airway pressure is obtained. On expiration, positive airway pressure is maintained with the use of a positive end expiratory pressure (PEEP) valve. This positive intrathoracic pressure throughout the breath cycle increases FRC, reverses atelectasis and improves gas exchange. NIV can be used either prophylactically aiming to prevent PPC, or as a therapy to address hypoxemia and respiratory failure.

Systematic reviews support the use of NIV to prevent respiratory complications following abdominal surgery despite methodological limitations of the clinical trials included. The majority of trials compared NIV to usual care of oxygen therapy alone and/or respiratory physiotherapy (DB&C ± incentive spirometry/PEP) in the post-operative period. These trials demonstrate NIV may reduce PPC risk by half, with a further significant sub-group effect specifically for the prevention of pneumonia [64, 65]. Systematic reviews and meta-analyses of NIV as a treatment for respiratory failure following abdominal surgery have not yet been performed due to the lack of clinical trials on this topic. However, a recent multicentre RCT has reported that NIV as a treatment for acute hypoxemic respiratory failure following abdominal surgery prevents tracheal intubation and reduces mortality when compared to using oxygen therapy alone [66].

Despite evidence supporting the use of NIV as an effective therapeutic intervention to prevent PPC, the uptake in hospitals is poor. Data from an observational study at a single large tertiary metropolitan hospital investigating PPC following high-risk abdominal surgery reported that NIV was utilised in just 3% of patients [13]. A reasonable question arises; if NIV has been shown to be superior to usual care in the prevention of PPC following abdominal surgery, why is it

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that this therapy is not widely provided as standard care? The answer to this question is likely to be multifactorial [67]. Clinical trials have not reported widely on the rates of negative effects of NIV. Potential risks and negative factors associated with the use of NIV are patient discomfort with the sealed interface leading to non-compliance, aspiration pneumonia secondary to emesis whilst wearing the mask, gastric gas insufflation, reduced venous return and cardiac filling, failure to provide consistent therapeutic pressure with air leaks around the interface occurring especially with the presence of nasogastric tubes, and the requirement for a dedicated skilled health professional to apply, titrate and to monitor the use of NIV making it problematic to manage outside the critical care environment. It may be that a combination of these negative factors prevents a hospital from providing this efficacious preventative therapy to all patients following abdominal surgery. Additionally, the paucity of cost-benefit and risk analysis evidence for NIV versus standard care may also be a factor. The hospital and patient costs of blanket NIV application may outweigh the benefit of preventing PPC, especially if the PPC incidence rate is low. Until detailed cost-benefit analysis and adverse event rates are reported in more detail, this remains unknown. It may not be necessary or cost-effective to treat all patients with prophylactic NIV. It may be more appropriate to stratify patients into high- and low-risk groups. Simple, low-cost prophylactic measures such as self-directed DB&C exercises, IS or PEP devices may be all that is required to prevent a PPC from occurring after low-risk abdominal surgery. Selective application of NIV to patients identified as being at high risk of developing a PPC may be more appropriate [68].

Other factors that need further investigation is the ideal frequency and duration of NIV therapy to prevent PPC, and, whether or not delivering high-flow humidified oxygen via specialised nasal prongs is as effective and/or more cost-effective as NIV in preventing PPC following abdominal surgery. Preliminary data have shown that high-flow nasal prongs (HFNP) are comparable to NIV in the treatment of hypoxemic respiratory failure yet with better patient compliance [69]. The use of HFNP following abdominal surgery to prevent PPC may be more a more feasible option compared with NIV and should be explored further.

Non-invasive ventilation is a proven prophylactic intervention in the reduction in PPC and pneumonia. Despite the evidence, application on a broad-scale is poor. On the balance of available evidence, prophylactic delivery of NIV should be targeted towards all patients at high risk of developing a PPC and this includes all patients having emergency open upper abdominal surgery.

3.1.2.4. Barriers to physiotherapy interventions

3.1.2.4.1. Cardiovascular and haemodynamic instability

In those undergoing emergency upper abdominal surgery, early mobilisation and other physiotherapy interventions may not be possible due to the increased likelihood of post-operative complications such as hypotension, post-operative bleeding and increased pain. It has been reported that following elective and emergency abdominal surgery, 52% of patients have some type of barrier to early ambulation with the most common being hypotension [13]

although, where required respiratory therapies, such as DB&C, can all be applied in patients unable to mobilise unless contraindicated.

3.1.2.4.2. Psychological preparedness

In patients awaiting elective UAS, education and planning allows for some manner of psychological preparedness for surgery and what it entails. ERAS guidelines have recommendations regarding preoperative preparation of patients undergoing elective UAS with preoperative counselling recommended in all guidelines [54–58]. Emergency surgery leaves little or no time to prepare patients psychologically for the surgery or for the process of recovery after surgery. Post-operative education, detailing the rationale for respiratory care and early ambulation, is important to ensure patients are engaged in their own recovery and understand the necessity for complication prevention.

3.1.3. Outcome measures

The use of standardised outcome measures throughout the period of care provides a means to quantify change from baseline status and evaluate the efficacy of care. Emergency UAS dictates that premorbid status is often unknown and the impact of the surgery and subsequent rehabilitation on physical function may be unclear. Utilising standardised and repeatable outcome measures early in the post-operative period will provide a means by which changes in condition may be measured. These may include, but not be limited to respiratory, cardiovascular, musculoskeletal and neurological status. Studies investigating physiotherapy rehabilitation practices in acute surgical care commonly report LOS and post-operative complications as proxy outcome measures, but these measures have limitations when demonstrating the functional changes associated with physiotherapy interventions [70]. Outcome measures designed for the measurement of physical function in the acute care environment include, amongst others, the Physical Function ICU Test (PFIT) [71], the Acute Care Index of Function [70], Activity Measure for Post-Acute Care (AM-PAC) '6-Clicks' tool [72], the Modified Iowa Level of Assistance scale (mILOA) [73] and the Functional Independence Measure (FIM) [74, 75]. No single physical therapy functional outcome measure has yet been found to be valid and reliable specifically in patients following elective or emergency UAS. However, the PFIT and Acute Care Index of Function were developed for measuring mobility in patients with critical illness and the mILOA has been shown to be reliable, valid and responsive in assessing the mobility status of acute hospital inpatients [73] and their use could be extrapolated to the emergency surgery population. Determining tools with satisfactory psychometric and clinimetric properties in patients undergoing both elective and emergency abdominal surgery warrants further investigation. Embedding outcome measures should be a matter of routine in clinical practice and research and until a specific outcome measure for physical function is tested for the emergency UAS population, the use of well-tested outcome measures from other clinical populations is required.

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3.1.4. Physiotherapy following discharge from hospital

Surgical and perioperative care should strive to improve both the quantity (life expectancy) and quality of life [76]. The development of even minor post-operative complications has been demonstrated to be a major determinant of hospital readmission, long-term adverse outcomes and death [77, 78]. Complications in the immediate post-operative period have been shown to be independent predictors of poorer recovery and poor Health Related Quality of Life (HRQoL) [79, 80] with delayed recovery and persistent disability following UAS demonstrated up to 6 months post-operatively [79]. Following major intestinal surgery in elderly patients, mortality, LOS, complication rate, discharge destination and discharge home with/without help were found to be significantly better in patients undergoing electively surgery compared with the same procedures performed as an emergency. Louis et al. [81] found 69% of patients were discharged directly home after elective procedures compared with only 6.5% if the same procedure was performed as an emergency. Less than half of older adults admitted to hospital for any cause return to their premorbid function within 1 year [82]. Despite these studies, little work has been done to investigate what ongoing rehabilitation support patients require or is available following emergency abdominal surgery. Indeed, it has been argued that after emergency surgery, future studies should reconsider their focus and consider utilising long-term functional outcomes alongside more traditional outcomes such as in-hospital or 30-day mortality and morbidity [81]. It is conceivable that following abdominal surgery post-operative exercise rehabilitation programmes (both in the inpatient and outpatient environment) might hasten recovery, alter discharge destination and improve long-term outcomes.

Whilst caution is warranted in extrapolating data from Louis et al. [81] to patients following emergency abdominal surgery, the feasibility of inpatient rehabilitation programmes has been determined in recent studies for patients recovering from critical illness [83, 84]. In this phase of recovery, the aim of improving physical function to promote safe and timely hospital discharge is similar across populations. Beyond hospital discharge, to date only a small number of studies exist which investigate the effect of post-discharge rehabilitation programmes and none of these are solely in patients undergoing abdominal surgery [85–89]. Recently, a Cochrane systematic review [90] has examined the effect of physical rehabilitation on HRQoL and physical recovery following critical illness and ICU stay. The review included six clinical trials (483 adult ICU participants) that compared an exercise intervention after ICU discharge with any other intervention or a control/usual care programme in adult survivors of critical illness. The overall quality of the evidence precluded meta-analysis. The exercise-based interventions were delivered as inpatient programmes in two studies, as both inpatient and outpatients in one study and as outpatients in three studies. Whilst the duration of the intervention varied according to length of hospital stay following ICU discharge, it was generally for a period of 12 weeks. Outcome measures were functional exercise capacity and HRQoL but these varied in both their measurement and the tool used for measurement. Overall, the quality of the evidence was low and study findings were inconsistent; some studies reported improvements in functional exercise capacity and others not. The review found no effect on HRQoL.

Given the absence of evidence investigating the effect of rehabilitation programmes on patients having undergone elective or emergency abdominal surgery, and the limitations in the evidence in a population following critical illness, further investigation of the value of post-discharge physical rehabilitation programmes is warranted.

4. Recommendations for physiotherapy practice in patients following emergency abdominal surgery

Patient education regarding the necessity for physiotherapy interventions should be implemented post-operatively as soon as feasible to ensure patients are engaged in their own recovery and understand complication prevention strategies such as respiratory physiotherapy and early mobilisation.

Mobilisation should be commenced as soon as possible to prevent complications associated with prolonged immobility.

Evidence for the prophylactic use of DB&C exercises, PEP or IS in patients following emergency abdominal surgery is generally of low quality and under-powered. Until further evidence is available to guide best practice, DB&C exercises should be instituted where ambulation is delayed in high-risk patients. Incentive spirometry and PEP devices can be provided prophylactically on a case-by-case basis where individual hospitals decide that the benefit of reducing PPC outweighs the cost of this service provision.

There is evidence to suggest prophylactic NIV is effective in preventing PPCs following abdominal surgery. The cost-effectiveness associated with providing prophylactic NIV to all patients undergoing abdominal surgery has not been established, and thus, it is recommended that the use of post-operative NIV is restricted to those at high risk of developing a PPC.

For audit, research and clinical purposes, the Melbourne Group Score should be used to diagnose PPCs that are amenable to physiotherapy intervention.

Evidence for post-discharge rehabilitation is lacking. In the absence of evidence, we recommend assessment of functional ability on discharge from hospital to highlight patients who may require ongoing rehabilitation.

5. Conclusion

Complications following emergency abdominal surgery include PPCs and the sequelae of prolonged immobility. Physiotherapy aims to remediate these problems, but to date, the effectiveness of these interventions in patients following emergency abdominal surgery has been poorly investigated. Due to paucity of published physiotherapy outcome data in this patient group, we have drawn on evidence from patients with critical illness or undergoing elective abdominal surgery to enable us to make recommendations for practice; however, we

recognise the limitations with adopting this approach. The chapter has attempted to highlight the areas for further research to help determine the effectiveness of physiotherapy interventions in this high-risk patient population.

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