Association of Chartered Physiotherapists in Respiratory Care scoping review: Post-operative physiotherapy management in upper gastrointestinal (GI) surgery

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Keywords | Abdominal surgery, mobilisation, physiotherapy, post-surgical rehabilitation, upper gastrointestinal surgery.

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Abstract

Objective

This scoping review will identify and synthesise the available evidence for post-operative physiotherapy following upper GI surgery, in order to identify gaps in the literature, inform evidence-based practice and contribute towards guidelines and/or policy development.

Introduction

Physiotherapy management following thoracic, cardiac and upper gastrointestinal surgery has been identified as one of the five key priorities for review by the Association of Chartered Physiotherapists in Respiratory Care (ACPRC) editorial board. Previously, systematic reviews have been published with a focus on one type of physiotherapy treatment. The aim of this scoping review was to identify all types of post-operative physiotherapy following upper GI surgery research to provide a comprehensive review of available evidence.

Inclusion criteria

Studies with adult patients undergoing upper GI surgery and published between 2015 and 2020 were included. The surgical procedure included required post-operative physiotherapy intervention as part of the recovery process. The context was in-patient, hospital-based surgery. Physiotherapy intervention prior to admission (such as pre-habilitation), and intervention after hospital discharge, for example, out-patient follow up were excluded. Research from any country of origin and any type of healthcare system was included.

Methods

The search strategy was agreed by the scoping team and searches were undertaken of PEDro, CINAHL, EMBASE, MEDLINE, PubMed, Google Scholar and the Clinical Trials Registry. Exclusion criteria included any articles not written in English.

All identified citations were uploaded into web-based Endnote. Articles were screened against title and abstract by one reviewer, and full text articles were appraised by two reviewers.

Data extraction included the aim of the study, design/methodology, sample details (number of participants, mean age, gender ratio), comparison group details, outcome measures, and key findings relevant to the scoping review questions. Quality was assessed using the relevant Critical Appraisal Skills Programme (CASP) or Joanna Briggs Institute (JBI) tools dependent on study methodology.

Results

Eleven studies were identified for inclusion of which there were three randomised control trials (RCT), four cohort studies, one systematic review, one cross sectional study, one narrative review and one survey. No qualitative studies were found.

Four studies considered the role of adjuncts (incentive spirometry and inspiratory muscle training). Five studies investigated ambulation or early mobilisation post-surgery, one study looked at the role of pre-operative education and one study looked at current practise. 57 physiotherapists were surveyed, 1,384 participants were included in studies and 37 papers were included in reviews.

The studies found that early and intensive mobilisation as part of an ERAS programme showed a statistically significant reduction in length of stay (LOS) and post-operative pulmonary complications (PPCs). Reported physiotherapy interventions are in line with current best practice guidelines. IMT and IS continue to show positive results in the literature in particular in the older and high-risk patient. Pre-operative assessment and education should be considered in patients undergoing upper abdominal GI surgery however screening tools for prioritisation are not yet established. The quality of the research was generally good; however, sample sizes were small and often underpowered.

Conclusions

This scoping review has demonstrated that current evidence supports post-operative physiotherapy intervention in people who undergo upper GI surgery. Future research should aim to determine the role of pre-operative physiotherapy, clarify the impact of breathing exercise protocols and expand the diversity of methodologies to include more qualitative research.

Introduction

The Association of Chartered Physiotherapists in Respiratory Care (ACPRC) editorial board is comprised of respiratory physiotherapy clinicians and academics who lead scoping of latest evidence, commissioning, co-ordination and delivery of all new ACPRC guidance documents and resources. The aim of this work is to facilitate knowledge sharing and drive improvements in the quality of care for respiratory patients.

The editorial board discussed potential areas for investigation and agreed that the area of physiotherapy and surgery should be prioritised. This was subsequently divided into cardiac, thoracic and upper gastrointestinal (GI) surgery. Members of the editorial board were nominated to be the scoping review leads and other respiratory physiotherapists were approached to be part of each team to conduct the literature searches and reviews. The editorial board aimed to provide an overview of all types of post-operative physiotherapy research.

A scoping review was decided upon by the research team to focus on any new evidence for physiotherapy intervention across the *POST-OPERATIVE UPPER GI SURGERY* population. The last large-scale review of the literature in this field was undertaken by Reeves and Boden (2016), this was a narrative review. It recommended that patients should be screened for risk of developing post pulmonary complications (PPCs); high-risk patients should have prophylactic physiotherapy; patients should have some form of preoperative education; post operative ambulation should be commenced as early as possible and that oscillatory PEP may assist in preventing PPCs. No recommendations were made about the inclusion of post-operative rehabilitation programmes. An exploratory search identified new literature and therefore an updated review is required.

Key terms

Physiotherapy intervention – treatment that is prescribed or carried out by a registered physiotherapist or a member of the physiotherapy team (for example, a rehabilitation or therapies assistant).

Surgical intervention – invasive surgery that requires admission to hospital, not performed as a day case.

Objectives

1 To assess the extent and type of evidence associated with post-operative physiotherapy following upper GI surgery.
2 To review the research to inform appropriate future guidance documents, whilst also highlighting gaps in the research field.

Review questions

- What types and number of studies have been carried out with adults undergoing upper GI surgery and post-operative physiotherapy treatment?
- What is the quality of the research? What are the results of the research?
- Is there sufficient evidence to develop new ACPRC guidance documents and resources, if so, what is the best resource to develop?

Methods

Participant eligibility criteria

Inclusion criteria

- Adult patients undergoing invasive upper GI surgery that requires admission to hospital and routinely receives post-operative physiotherapy.
- Human studies.

Exclusion criteria

- Paediatrics – defined as less than 18 years of age.
- Day case surgery.
- Animal studies.
- Pre-habilitation, and interventions after hospital discharge, for example, out-patient follow up.

Concept

Inclusion

- Procedures that require post-operative physiotherapy intervention as part of the recovery process.

Context

Inclusion

- In-patient, hospital-based surgery.
- Any country, state or privately funded.

Types of sources

Included studies were published in English from March 2015 to December 2020. This scoping review considered both experimental and quasi-experimental study designs including randomised controlled trials, non-randomised controlled trials, before and after studies and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control studies and analytical

cross-sectional studies were considered for inclusion. This review also considered descriptive observational study designs including case series, individual case reports and descriptive cross-sectional studies for inclusion. In addition, qualitative studies were included for consideration in this review. Finally, systematic reviews and opinion papers that met inclusion criteria were included.

Review methods

Search strategy

The search strategy was agreed by each scoping team, with input from local hospital and university library services (Appendix 1) Once developed, a full search was undertaken of PEDro, CINAHL, EMBASE, MEDLINE, PubMed, and Google Scholar. The Clinical Trials Registry was also searched for any unpublished literature. A hand search of reference lists and grey literature was also completed to ensure a comprehensive search was undertaken. All articles with search strategy terms contained in the titles and abstracts were shortlisted by the lead researcher and final inclusion was agreed by the search team. The search strategy, including all identified keywords and index terms, was adapted for each included database. The shortlisted references were uploaded to Endnote. Included studies were published over a five-year period, post 2015, this period was chosen as being after the date of the last significant review of relevant literature to capture any new published data.

Study/source of evidence selection

Titles and abstracts were further screened by one reviewer and assessed against the inclusion criteria for the review. Potentially relevant sources were then retrieved in full and reviewed by two reviewers. The full text articles were divided amongst the review team and assessed for quality using the CASP tool. Disputes were discussed and consensus for inclusion reached between reviewers.

Reasons for exclusion of sources of evidence at full text stage that do not meet the inclusion criteria are recorded and reported in the scoping review. Any ambiguity to the relevance of title, abstract or full text was discussed with the topic lead.

Data extraction

Data was extracted and analysed by one reviewer (KG). A data extraction tool was created by the topic leads to collect data from each study based on the JBI extraction tool (2020). Extracted data included: author(s), year of publication, setting, aim/purpose of study, sample size, design/methodology, outcome measures, comparisons and key findings (Table 1).

Table 1: Summary of findings for GI surgery.

Author(s)/year	Setting	Aim/purpose	Sample size	Design/methodology	Outcome measures	Comparison	Key findings
Adjuncts							
Kamble and Vardhan (2019)	India	Effect of threshold IMT Vs IS	*n* = 30	Prospective, cross-sectional comparison	MIP (Pimax)	IMT/IS	MIP increased in both groups. Threshold IMT has more effect than IS over a two week period
Kumar et al. (2016)	India	Comparison of flow and volume IS on pulmonary function and exercise tolerance	*n* = 50	RCT	FVC, FEV_1, PEF, 6MWT	Flow/volume IS	Flow and Volume IS showed significant statistical impvmt in 6MWT. FVC, FEV_1 and PEFR improved by day 4/5 post op in both flow and volume IS groups
Khyati et al. (2020)	India	Effect of IMT on pulmonary function (smoker/non smoker)	N/a	Observational cohort (IMT and conventional PT)	MIP/MEP, FVC, FEV_1, 6MWT, Borg Scale	IMT/conventional PT	N/a
Kendall et al. (2017)	Portugal	Meta-analysis of the effectiveness of IMT to reduce postoperative pulmonary complications (PPC) and length of hospital stay (LOS)	*n* = 853	SR	PPC LOS	N/a	IMT significantly reduces the risk of PPC and reduces LOS. IMT prescription should target at least a two week period

Ambulation/mobility

Asada et al. (2019)	Japan	Associated factors with delayed ambulation after abdominal surgery	*n* = 217	Retrospective cohort study	ASA-PS, patient characteristics, NLR PNI, intraoperative data, surgery duration, POD1 mobility	N/a	31.8% patient unable to ambulate without assistance POD1. Inability to mobilise on POD1 associated with longer LOS
de Almeida et al. (2017)	Brazil	Efficacy, feasibility and safety of supervised post op exercise and mobility programme	*n* = 108	RCT	Independent ambulation, 6MWT, Piper fatigue scale, HRQOL	Standard care v's exercise programme	Early, supervised mobilisation is safe. At POD5 early mobility intervention group had greater 6MWT than standard rehabilitation group
Carmichael (2017)	U.S.A.	Clinical practice guidelines for enhanced recovery after colon and rectal surgery	N/a	Clinical practice guidelines	N/a	N/a	Early and progressive patient mobilisation is associated with shorter length of stay. Grade of recommendation: strong recommendation based on low-quality evidence
Castelino et al. (2016)	Canada	Effect of early mobilisation protocols on post-op outcomes	*n* = 508	SR	Duration of stay, GI function, PPC's, spirometry, 6MWT, PRO's	N/a	Variation in mobility protocols between studies. No difference in post-op complications, functional testing, or PROs Reduced hospital LOS in IG

Hussey et al. (2019)	Ireland	Quantification post op mobility and barriers to mobility in oesophagectomy	*n* = 30	Prospective observational	Actigraph GT3X+, medical status, pain scores, physiotherapy comments	N/a	Haemodynamic instability most common reason for non-mobilisation. 96% of time during POD1–5 is sedentary. Light intensity activity = positive increase in daily step count
Education							
Boden (2018)	Australia	Pre-op physiotherapy for prevention of respiratory complications post UAS	*n* = 441	RCT	PPCs (Melbourne group score) LOS, hospital acquired pneumonia, HRQOL, physical function, post D/C complications	Information booklet v's pre-op physiotherapy	PPC halved in in intervention group. No significant differences in secondary outcomes
Current practice							
Patman et al. (2017)	Australia	Physiotherapy in upper abdominal surgery – what is current practice in Australia?	*n* = 57	Survey	Questions on: treatment milestones, prescribed and used interventions, components of breathing exercises, outcomes measures, perceived barriers to treatment	N/a	Intervention choice is reflective of guidelines. Early mobilisation and respiratory interventions are used despite conflicting literature

Reeve and Boden (2016)	New Zealand	Physiotherapy Management of patients undergoing abdominal surgery	Not stated	Narrative review	PPC's, current physiotherapy interventions	N/a	Limited and equivocal research. Cost analysis studies and good quality research needed

6MWD = 6 minute walk distance, 6MWT = 6 minute walk test, BMI = body mass index, CG = control group, CPAP = continue positive airway pressure, ERAS = enhanced recovery after surgery' FEV_1 = forced expiratory volume in 1 second, HFNO = high flow nasal oxygen, HRQOL = health related quality of life, IG = intervention group, IMT = inspiratory muscle training, IS = incentive spirometry, LOS = length of stay, METs = metabolic equivalent of task, PE_{max} = maximal expiratory mouth pressure, PI_{max} = maximal inspiratory mouth pressure, NLR = Neutrophil to lymphocyte ratio, PEF = Peak Expiratory Flow, PFTs: = pulmonary function testing, PNI = prognostic nutritional index, Post-op = post-operative, POD = post-operative day, PPCs = post-operative pulmonary complications, PROs = patient reported outcomes, PT = physiotherapy, (HR) QOL = quality of life, RCT = randomised control trial, RMT = respiratory muscle training, SR = systematic review, VAS = visual analogue scale.

Results

Types of study

Twelve studies were identified for inclusion of which three were randomised control trials (RCT) three cohort studies, two systematic reviews, one cross sectional, one narrative review, one survey and one guideline. One study was a protocol so limited methodological information could be elicited and was therefore excluded. No qualitative papers were found from either physiotherapist or patient perspectives. The results of the search and the study inclusion process can be seen in 'preferred reporting items for systematic reviews and meta-analyses extension for scoping review' (PRISMA-ScR) flow diagram (Figure 1).

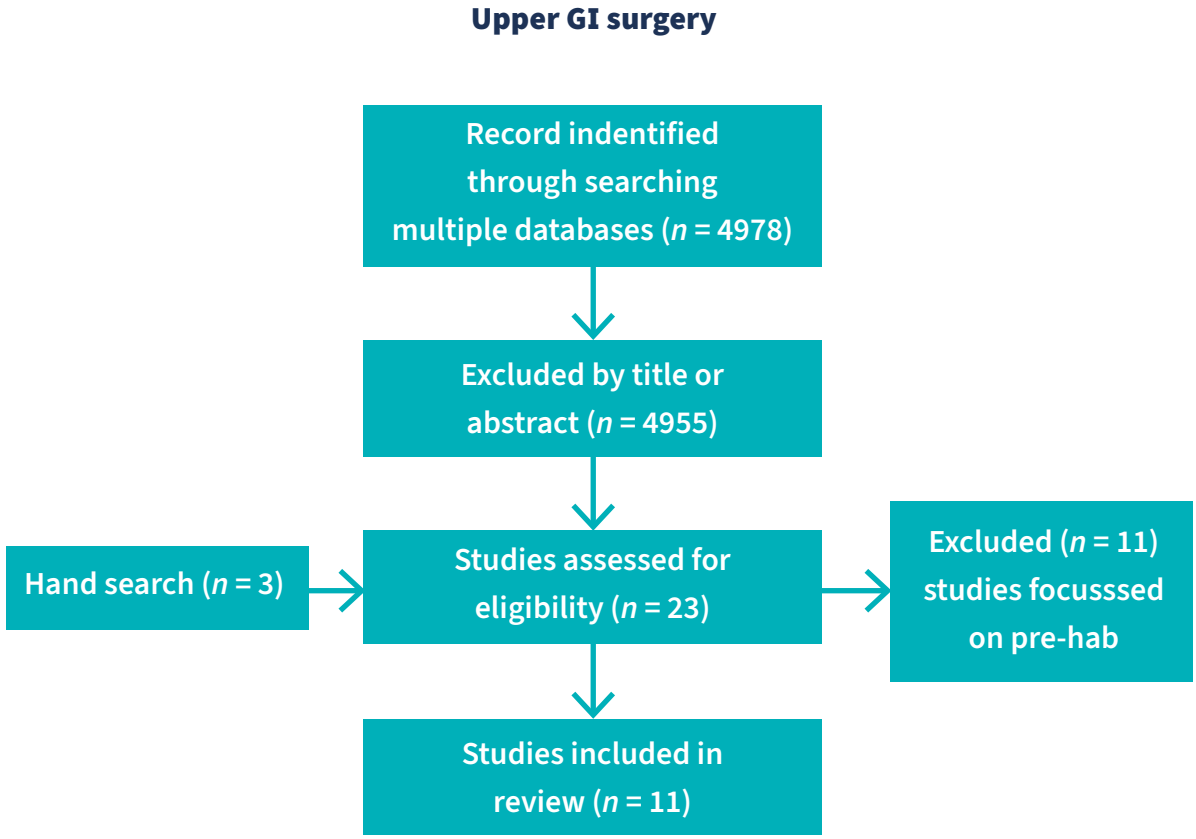

Figure 1: Flow diagram of scoping review process.

Participants

Across the eleven papers 57 physiotherapists were surveyed, 1,384 participants were included in studies and 37 papers were included in reviews. Authors came from a wide variety of countries and of the lead authors eight were listed as physiotherapists and 34 different types of upper abdominal surgical procedures were documented throughout the studies.

Intervention

Four studies explored the use of postoperative physiotherapy adjuncts: One RCT considered the role of incentive spirometry (IS), flow versus volume. One systematic review considered the evidence base for the use of inspiratory muscle training (IMT). One study compared IS

to IMT and one study proposed a protocol specifically considering IMT in the abdominal surgical patient group comparing this intervention to conventional physiotherapy. All studies described the intervention in detail and were conducted by physiotherapists. A wide variety of outcome measures were reported across the adjunct studies the most common being 6MWT, PPC, HRQol measures, MIP and spirometry.

Two studies (RCT and systematic review) reported that IMT should be undertaken for a period of 15–20 minutes to be most effective and ideally for two weeks post procedure (Kamble & Vardhan 2019; Kendall et al. 2018). All studies found IMT has the most impact on reducing post pulmonary complications and length of stay however there is variation across the studies in their definition of PPC's and their chosen measurements of this outcome. Kendall et al. (2018) also goes on to suggest that IMT should be started at the pre-op stage to be optimally effective.

In terms of incentive spirometry Kemble and Vardhan (2019) found that incentive spirometry showed an extremely significant improvement in maximal inspiratory pressure (p <0.0001). Kumar et al. (2016) found that IS better preserved pulmonary function (FVC, FEV_1 and PEFR) and that six minute walk test showed a statistically significant improvement in distance covered (p <0.05).

Five studies considered the effect of ambulation/early mobilisation in the post-operative stage. Three studies undertook exercise or mobilising interventions. One systematic review considered the effect of early mobilisation protocols and there was one, a clinical practice guideline considering enhanced recovery post-operatively.

Most studies were physiotherapy led ambulation/rehabilitation interventions apart from Asada (2019) which was nurse led. All five studies reported common barriers to early mobilising: wound infection, bleeding, anaemia, ileus, cardiovascular instability, and patient reported barriers include catheters and IV drip stand limitations and post- operative pain. Hussey (2019) suggests that specific strategies need to be put in place for those patients with CVS instability in terms of achieving early mobilisation.

All studies state the inclusion of physiotherapy as part of their intervention however the detail of the actual exercise programme or protocol varied significantly. Sit to stand, walking, stretches, balance exercises and ambulation were all described. In terms of outcome measures, use of pain scores, pedometer steps achieved, 6MWT, BORG scales and length of mobilisation achieved were all utilised across the studies. The clinical practice guidelines (Carmichael 2017) state that early and progressive mobilisation is associated with a shorter length of stay and that mobilisation goals should be discussed with the patient, but they also accept that their recommendations are based on low quality evidence.

One study investigated pre-operative education on post- operative pulmonary complications (Boden 2018) this paper was clear in stating that this intervention was not pre-habilitation but education. This was the only study that builds on the previously

suggested priorities by Reeves and Boden (2016). The study found that pre-operative education should be considered as the primary step in PPC prophylaxis (15% absolute risk reduction) and that qualitatively, education that was found to be engaging was most likely to be memorable and impactful.

One study reviewed current practice in post-operative physiotherapy, Patman et al. (2017) surveyed 57 physiotherapists in Australia. Interventions reported by clinicians were in line with current practice guidelines however some practices were still undertaken despite conflicting and limiting literature. Further research is needed around understanding the barriers to accessing physiotherapy, determining valid and appropriate pre-operative screening tools to aid prioritisation and that cost analysis studies were needed to be undertaken.

Quality assessment

The majority of studies have a small sample size and at times studies were underpowered. In terms of the RCT's, although there was blinding of some participants there was an absence of blinding of researchers and assessors. It is clear to see that studies mainly used established and valid outcome measures and assessment tools however some were country or hospital specific tools that may be difficult to replicate in the U.K. NHS health sector. The majority of studies had clear study protocols, and in most studies all participants were accounted for. In most studies the participants in each group had comparable baselines. The reviewers felt that cost-effective analysis would have improved many of the RCTs.

An agreed exclusion by all the leads of the surgical scoping reviews were studies that focussed on pre-habilitation as this was felt to merit a separate review in itself. Eleven studies were found in the time period of this review that related to pre-habilitation and upper abdominal surgery – the reviewers feel that this could be the focus of any further research in this speciality.

Limitations

Papers in other languages were excluded from this review so this may have added bias to the selection process. The lead reviewer had final say on all included papers, any two reviewers out of the review team undertook the quality assessment so this may have led to inconsistencies in approach as both CASP and JBI tools were used.

Conclusion

In conclusion, this scoping review was undertaken as an area of priority for the ACPRC editorial board. The objective was to report the extent and methodological type of evidence associated with post-operative physiotherapy in people who undergo upper abdominal surgery. From an initial search return of 4978 articles and following screening, 11 studies were included in the scoping review. A variety of different research methodologies were included in the review which demonstrates diversity of evidence available.

The literature showed positive outcomes for physiotherapy intervention. Studies reported that early and intensive mobilisation were linked to a reduction in PPCs and LOS. Reported physiotherapy interventions are in line with current best practice guidelines. IMT and IS continue to show positive results in the literature. Pre-operative assessment and education should be considered in patients undergoing upper abdominal GI surgery however screening tools for prioritisation are not yet established. The quality of the research was generally good with consistent positives across methodology types however sample sizes remain small and often underpowered.

The clinical relevance for this scoping review is that physiotherapy as part of an ERAS is beneficial, and intensive mobilisation is linked to improved recovery and reduced length of stay. Cost effectiveness analysis studies need to be undertaken. However, there was also a lack of qualitative studies, so a focus on patient experience and patient reported outcomes should also be prioritised.

In addition to this upper GI scoping review, the editorial board are undertaking independent cardiac and thoracic reviews. Each of these will be published separately, followed by a combined ACPRC surgical position statement on all three surgeries.

Funding

There was no funding provided in this scoping review. All participants gave their time voluntarily.

Conflicts of interest

There are no conflicts of interest with the authors listed on this manuscript.

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Appendix 1

Search strategy – upper GI

Search 1

Abdominal.

OR gastrointestinal.

OR upper gi (note: upper gi must be written in lower case or it thinks it's a boolean operator!).

OR upper gastrointestinal.

OR colorectal.

Results = 138,174 studies.

Search 2

operat#.

OR surg#.

OR (preoperative or pre-operative or pre-op or perioperative or peri operative).

OR (postoperative or post operative or post-surgery or post-surgical).

OR (prehabilitation or prehab or pre-operative rehabilitation or peri-operative rehabilitation).

Results = 217,824 studies.

Search 3

(physiotherap# or physical therap#).

OR (mobilisation or mobilisation or mobilise or mobilise).

OR (exercise or physical activity or fitness).

OR ambulat# OR walk#.

Results = 283,080 studies.