Postoperative Work and Activity Restrictions After Abdominal Surgery

A Systematic Review

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Objective: This systematic review aims to assess what is known about convalescence following abdominal surgery. Through a review of the basic science and clinical literature, we explored the effect of physical activity on the healing fascia and the optimal timing for postoperative activity.

Background: Abdominal surgery confers a 30% risk of incisional hernia development. To mitigate this, surgeons often impose postoperative activity restrictions. However, it is unclear whether this is effective or potentially harmful in preventing hernias.

Methods: We conducted 2 separate systematic reviews using Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The first assessed available basic science literature on fascial healing. The second assessed available clinical literature on activity after abdominal surgery.

Results: Seven articles met inclusion criteria for the basic science review and 22 for the clinical studies review. The basic science data demonstrated variability in maximal tensile strength and time for fascial healing, in part due to differences in layer of abdominal wall measured. Some animal studies indicated a positive effect of physical activity on the healing wound. Most clinical studies were qualitative, with only 3 randomized controlled trials on this topic. Variability was reported on clinician recommendations, time to return to activity, and factors that influence return to activity. Interventions designed to shorten convalescence demonstrated improvements only in patient-reported symptoms. None reported an association between activity and complications, such as incisional hernia.

Conclusions: This systematic review identified gaps in our understanding of what is best for patients recovering from abdominal surgery. Randomized controlled trials are crucial in safely optimizing the recovery period.

Keywords: abdominal surgery, convalescence, hernia, hernia prevention, physical activity

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Nearly 2 million abdominal or pelvic surgeries are performed each year in the United States,[1] and up to 30% of these patients will develop an incisional hernia within the first 2 years following surgery.[1–3] In the US, over 400,000 ventral hernias are repaired each year.[4] Following incisional hernia repair, recurrence rates are as high as 63% at 5–10 years.[5–7] The direct economic costs in the United States related to hernia care range from 7 to 36 billion dollars annually,[3] with even higher indirect costs due to associated disability and lost wages.

In an effort to prevent incisional hernia formation after abdominal or pelvic surgery, patients are often placed on activity restrictions in the postoperative period. Animal studies dating back to the 1920s have examined the tensile strength of the healing wound.[8] In the often-cited study by Levenson et al from 1965, for example, they found that tensile strength of healing skin continues to increase rapidly until week 6, reaching a maximum strength at 3 months, but never surpasses 80% of the strength of unwounded skin.[9] This study examined skin rather than fascial healing, and; therefore, may have limited applicability to abdominal wall hernia formation. Nevertheless, this, and other similar studies, likely contribute to concerns that early activity after surgery, which increases tension on the healing abdominal wall, can lead to disruption of the fascial closure and subsequent hernia development.

Surgeons often advise patients to refrain from heavy lifting or strenuous activity for a designated period of time following abdominal or pelvic surgery. These restrictions potentially have socioeconomic implications for patients, their families, their employers, and their insurers. In addition, they have an impact on patient quality of life, as patients may be prevented from participating in activities they find enjoyable or rewarding. Although returning to activity too early or too rigorously may lead to hernia formation, delaying the return to routine activities may also lead to significant physical deconditioning and may be detrimental for physical, psychosocial, and economic reasons. Whether activity restriction following abdominal surgery is effective or potentially harmful in preventing hernias is an important question for both patients and surgeons.

The aim of this systematic review is to assess what is known about postoperative convalescence following abdominal or pelvic surgery. We sought to answer the questions: (1) when is the optimal timing for patients to return to activity that is both safe and maintains quality of life, and (2) what is the effect of activity on the healing fascia. To this end, we performed a systematic review of the literature for studies that attempted to answer these questions from the patient perspective, from the clinician perspective, and also from basic science experiments.

METHODS

Protocol and Registration

We conducted a systematic review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses. We performed 2 separate systematic literature searches. The first was performed to assess the available basic science literature on

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timing and strength of fascial healing. The second review was performed to assess the available clinical literature related to post-operative activity following abdominal surgery. The protocols were registered on the PROSPERO international prospective register of systematic reviews under registration numbers CRD42020203982 on September 12, 2020.

Search Methods and Study Selection: Basic Science

Electronic databases including PubMed, Scopus, and Embase were searched for relevant studies through June 6, 2019. Articles published between 1971 and 2019 were reviewed. Articles before 1971 were excluded as they had already been comprehensively reviewed by Carlson et al in 2011, and those findings are included in our study. The following search terms were utilized: *("abdominal surgery" OR "fascia") AND ("wound healing" OR "physical activity").* The search was further limited to animal studies or tissue studies, excluding all clinical studies or trials. The reference lists of selected manuscripts were reviewed to identify additional articles. Full articles were reviewed by 2 independent reviewers (MML and PS).

Studies were included if they were written in the English language and provided data on the strength of fascial healing over time or on the effect of activity or stress on healing fascia. Articles were excluded based on titles and abstracts. Studies were excluded if they: (1) were not about abdominal or pelvic surgery, or (2) focused on the effect of mesh or suture materials on wound healing.

The following variables were extracted from each article: author and year of publication, animal model used, study groups and methods, results, and conclusions of the study.

Search Methods and Study Selection: Clinical Evidence

The second systematic review was performed by a search of electronic databases including PubMed, Embase, Scopus, Cochrane Central Register of Controlled Trials, and Clinicaltrials.gov for relevant studies through June 6, 2019. Articles published from 2000 to 2019 were reviewed. These dates were chosen to include only the modern era of surgical practice following the adoption of minimally invasive surgery (MIS) and the onset of the obesity epidemic (https://www.cdc.gov/media/pressrel/r991026.htm).

The following search terms were utilized: *("abdominal surgery" OR laparotomy OR laparoscopy) AND (convalescence OR lifting OR "return to work" OR activity OR time-off OR "time off" OR restrictions) AND (hernia OR "quality of life").* The reference lists of selected manuscripts were reviewed to identify additional articles. Titles and abstracts were reviewed by 2 independent reviewers (PS and MML). Each of the full articles were reviewed by the same 2 independent reviewers (PS and MML). Discrepancies were resolved by the senior author (MKL). Studies were included if they were focused on adult patients (18 years or older) undergoing either abdominal or pelvic surgery, including laparotomy or laparoscopic procedures, were written in the English language, and included an evaluation of the activity levels of patients following surgery. Given the small number of randomized controlled or prospective trials on this topic, all available articles, including retrospective and observational studies, were included in the analysis.

Articles were excluded based on titles and abstracts. Studies were excluded if they were: (1) studies on surgical procedures that did not include abdominal or pelvic surgery, (2) studies that did not address postoperative activity or return to work, (3) studies on Enhanced Recovery After Surgery (ERAS) protocols that did not address activity post-discharge from the hospital, or (4) studies on anastomotic healing rather than fascial healing. Each paper was evaluated for relevance and guidelines following surgery.

Using STROBE guidelines (https://www.strobe-statement.org/index.php?id=available-checklists, Accessed June, 29, 2020), the following variables were extracted from each article: authors and year of publication, study type, study setting, surgery type, number of subjects, study outcomes of interest, subject follow up and compliance, results, study weaknesses, and conclusions.

Outcome Measures

The primary outcome of the basic science review was time to fascial healing after abdominal incision. Secondary outcomes included the identification of which factors related to activity affect wound healing. For the review of the clinical studies, primary outcome was to determine which factors influence length of convalescence after abdominal or pelvic surgery for patients and for surgeons. Secondary outcomes included how length of convalescence correlates with surgical complications and patient-reported outcomes.

Methodological Appraisal and Statistical Analyses

The Cochrane Collaboration's tool for assessing risk of bias in randomized controlled trials (RCTs) was utilized to appraise the quality of evidence of the included RCTs (https://methods.cochrane.org/bias/sites/methods.cochrane.org.bias/files/public/uploads/6.%20Assessing%20risk%20of%20bias%20in%20included%20studies%20v1.0%20Standard%20author%20slides.pdf). Risk of bias was considered high for all non-controlled studies. A meta-analysis was not performed as the evidence level of the collected articles was low with extensive variability in reported outcomes.

RESULTS

For the basic science review, 1240 de-duplicated manuscripts were identified from the search of databases: 1172 manuscripts were excluded based on review of the titles or abstracts (Fig. 1). We reviewed 68 full text manuscripts, including 28 manuscripts which were identified from the references. Ultimately, 7 articles met the criteria for inclusion in the systematic review Supplementary Table 1, http://links.lww.com/SLA/D240.

For the clinical studies portion of the systematic review, 2119 manuscripts were identified from the initial database search. After duplicates were removed, 1118 manuscripts remained, including 35 additional records identified through a review of the primary article references. Then 1058 manuscripts were excluded based on review of their titles and 60 remained for full text review (Fig. 2). Twenty-two articles were included in the systematic review. These manuscripts were divided into (1) those that reported on findings regarding clinician opinions and practices (4 articles, Supplementary Table 2, http://links.lww.com/SLA/D240) and (2) those that focused on clinical outcomes, patient centered outcomes, and patient opinions (17 articles, Supplementary Table 3, http://links.lww.com/SLA/D240). One additional article included perspectives from both clinicians and patients[10] and is included in both Supplementary Tables 2 and 3, http://links.lww.com/SLA/D240. Given the heterogeneity of data, a meta-analysis was not performed.

Quality Assessment and Description of Included Studies

Five of the basic science manuscripts reported on experiments on animals (4 rat, 1 mice), 1 reported on fibroblasts in tissue culture, and 1 reported on human cadaver tissue. Studies centered on the clinician perspective included 4 survey studies and 1 expert panel study (Delphi method). One manuscript reported on the qualitative results of both clinician and patient focus groups. There were 17 studies centered on the patient perspective, including 3 RCTs, 1 cluster-controlled trial, 1 retrospective cohort, and 1 protocol for an

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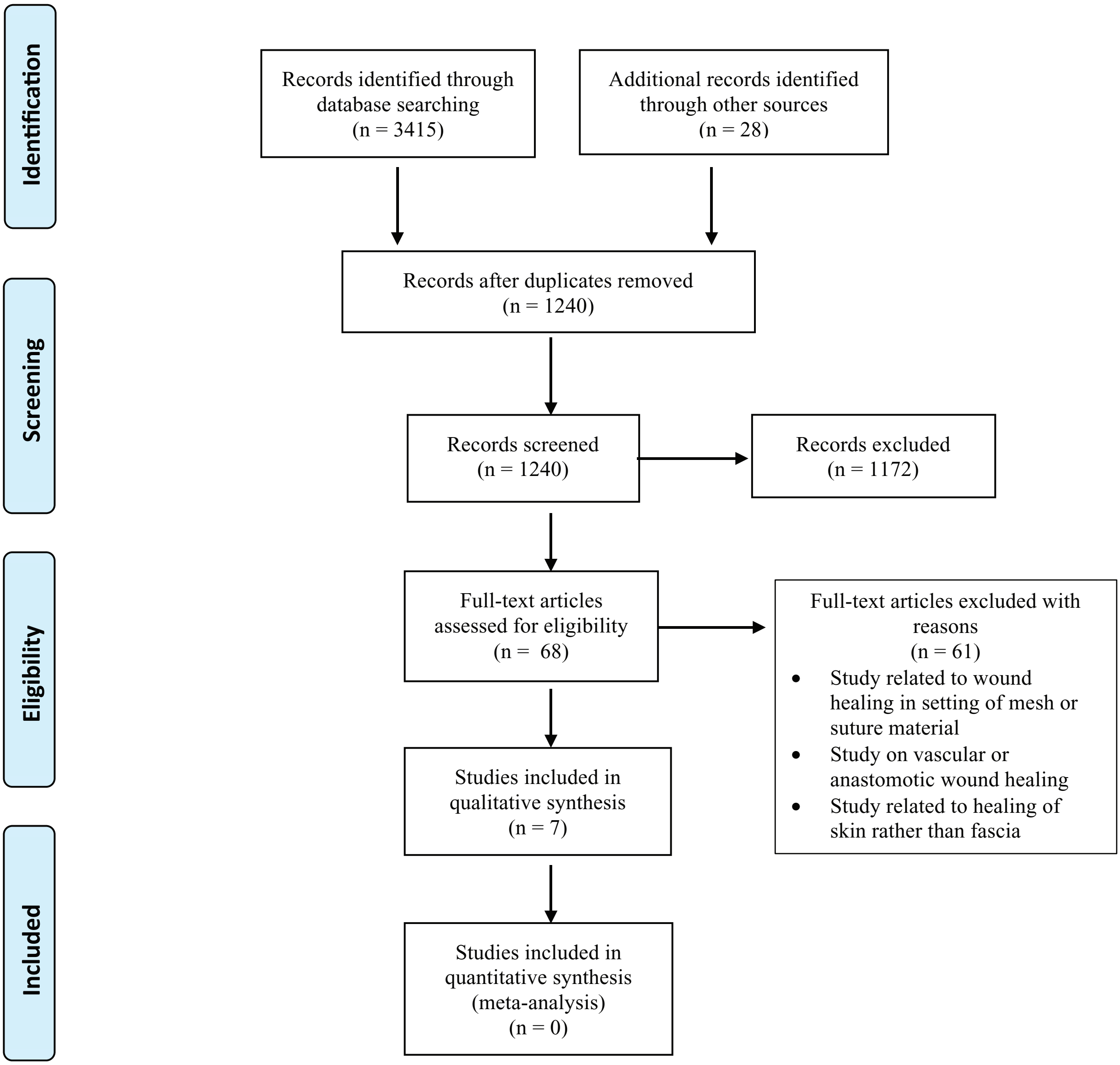

FIGURE 1. PRISMA flow diagram of included studies for the basic science review. PRISMA indicates Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

RCT. Eleven of the studies involved patient questionnaires or surveys. Of these, 4 included a preoperative patient evaluation and 7 did not (Fig. 3).

Basic Science of Abdominal Wall Healing

This body of literature mainly reported on the tensile strength of the healing abdominal wall. Time to achieve 50% tensile strength and final tensile strength as a percentage of unwounded abdominal wall were frequently reported. There was substantial heterogeneity among the studies with regards to layer of the abdominal wall studied, type of animal model, methods for measuring tensile strength, and duration of time to determine ''final strength.''

Carlson et al (2011)[8] had performed a systematic review of this topic that included articles before our search dates. Twelve articles are included in Carlson review, only 4 of which investigate healing of rectus sheath fascia while the remainder assessed skin or dermis. For healing of the rectus sheath, the time to reach 50% strength occurred at day 3 (rabbit study, sutures in place), day 6 (dog), day 7 (guinea pig), and day 13 (rabbit study). The final strength of the wounds was measured in 3 of the fascial studies and was reported as 21% to 80% at 28 days. This review is notable for the variation in both time to healing and final strength of the healing fascial layer.

In the same article, Carlson et al presents original research that examines the tensile strength of the entire abdominal wall, including all layers, which was measured in mice at several time points following ventral midline incision with standard suture repair. Time to 50% strength occurred at 40 days, maximal tension was similar between wounded and unwounded abdominal wall at 60 days, and there was no difference at 120 days. The authors cited several possible explanations for the variability in their findings compared to the previous studies, including species-specific differences and changes in methodology over the 40+ year time span during which

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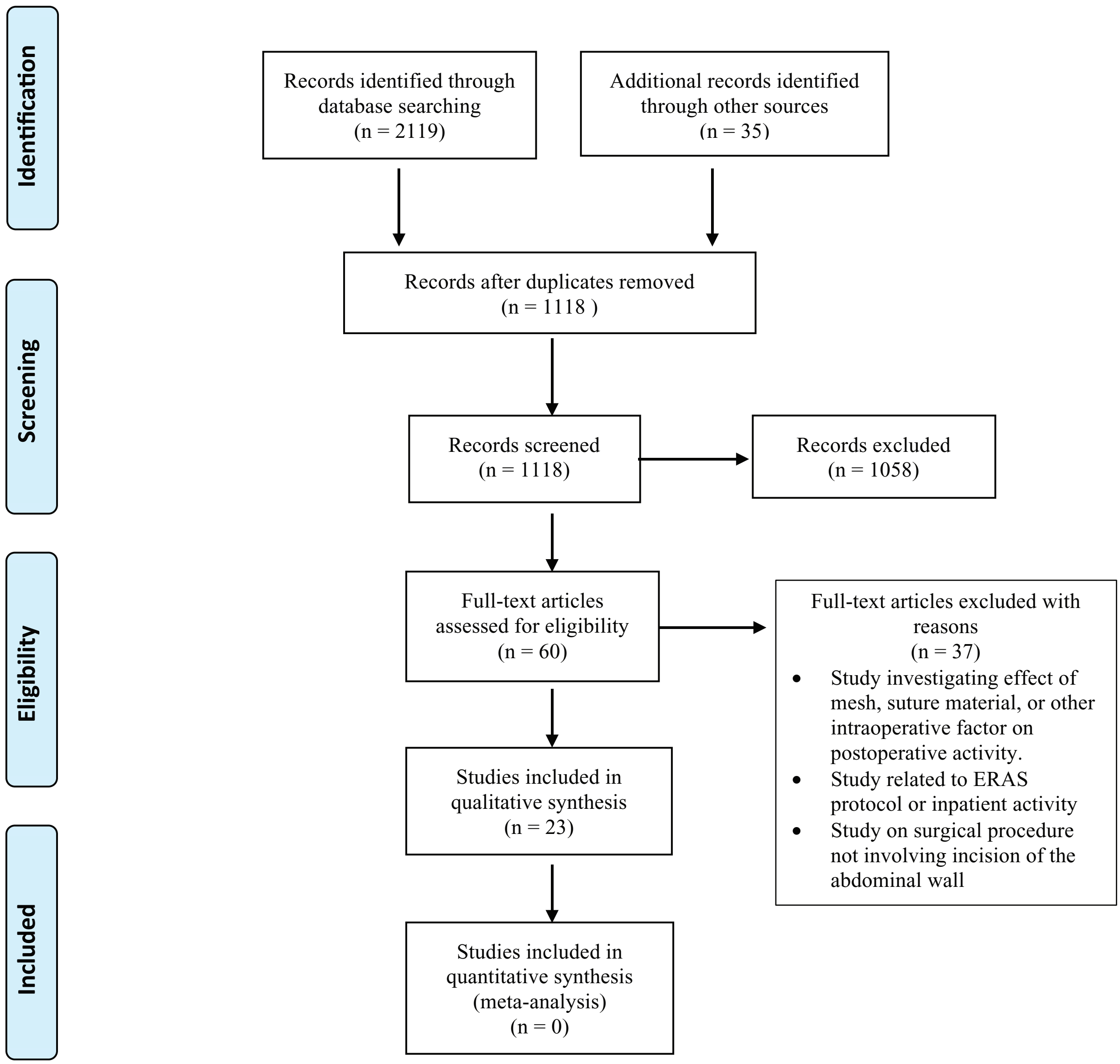

FIGURE 2. PRISMA flow diagram of included studies for the clinical studies review. PRISMA indicates Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

these studies were conducted. The use of the mouse model itself explains some of the differences found in this study, in that its anatomical size may limit study of abdominal wall biomechanics, separation of the dermis from fascia cannot be reliably accomplished, and the effect of aging in the mouse may not be applicable to humans or similar to what is seen in other animal models. In contrast to these findings, in a human cadaver study comparing tensile strength of fascia in those with previous laparotomy and those without prior abdominal surgery, tensile load bearing capacity of scar reached 70% by 1 year after surgery; however, this capacity remained at 30% less than native midline fascia, even decades after surgery.[11]

Incisional hernia development is typically attributed to failure of fascial healing. However, the relevance of skin healing in the development of hernias was not explicitly explored in any of the included basic science studies. Based on the available studies, healing of the individual layers of the abdominal wall occurs on different timelines and results in differences in ultimate tensile strengths. The study by Franz et al (2001)[12] noted faster wound healing for fascia in comparison to dermis with greater breaking strength than skin at days 7 and 14. By day 21, dermis and fascia had similar breaking strength. The authors believe that these findings are due to the simple, parallel orientation of collagen bundles in fascia, in contrast to the more complex 3-dimensional collagen structures that occur in dermal healing. In an animal model of hernia development, in which fascia was closed loosely after midline incision with the intention of creating an incisional hernia, it was noted that the fascia healed within the first week but then gradually weakened leading to hernia development by week 4.[13] In this study, however, the role of skin healing in hernia development was not explored.

Several of the studies point towards strengthening of healing fascia by application of tension. Franz et al (2001)[12] postulated that the increased fibroblast and collagen deposition seen in fascia in

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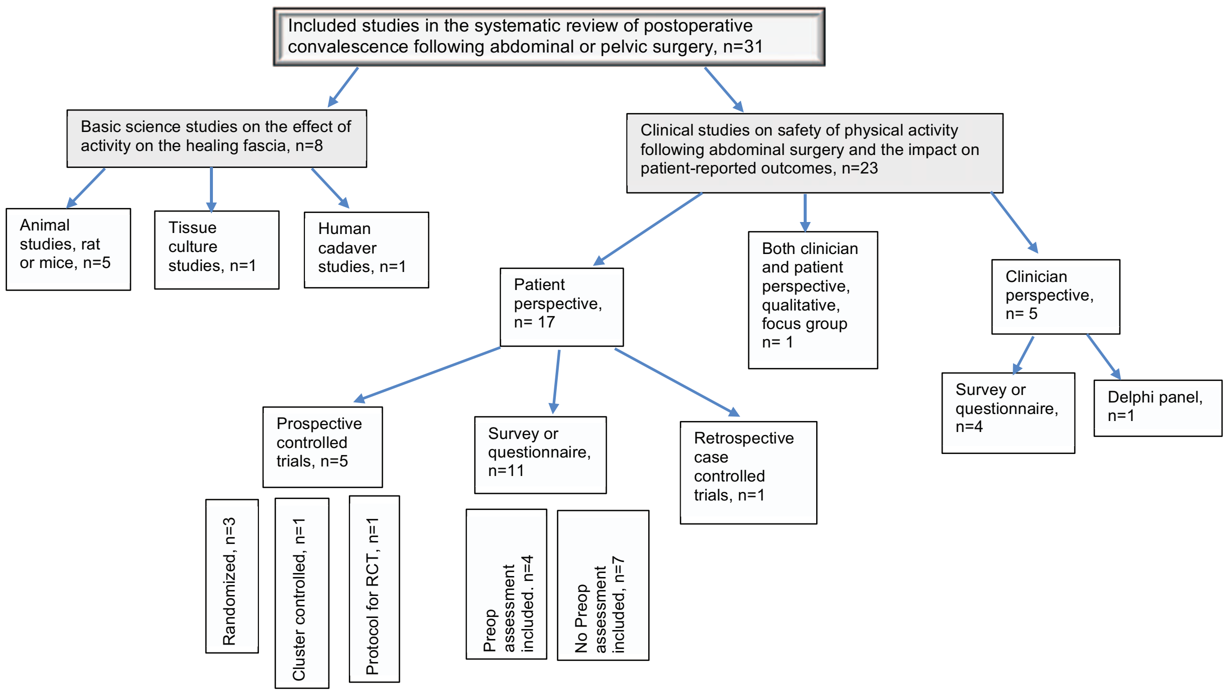

FIGURE 3. Diagram of included study types for included basic and clinical studies.

comparison to skin may be related to early tension applied to the abdominal wall as it resumes its structural support function. Similarly, in cell culture of rat linea alba fibroblasts, mechanical strain induced a proliferative, morphologic, and functional response, and the authors concluded that loss of wound edge tension during laparotomy may contribute to impaired wound healing.[14] In an animal model of hernia formation due to intentionally unstable wound closure, the wound failure was due to abnormal collagen deposition and attributed by the authors to a loss of abdominal wall load force signaling to fibroblasts.[15] Using a rat model, Dubay et al (2007)[16] demonstrated shortening and reduced mechanical compliance of the lateral abdominal wall (ie, the internal oblique muscles) after both laparotomy and creation of an abdominal wall defect (hernia model). The increased abdominal wall stiffness and dysfunction of the lateral abdominal wall was observed in the hernia model, and to a lesser extent, after laparotomy. The authors attributed the lateral abdominal wall shortening to unloading of these muscles as a result of mechanical failure of the laparotomy wound (as occurs with a ruptured Achilles tendon), postoperative pain and immobility. Because of this abnormal (stiff) lateral abdominal wall musculature, increased load forces are transmitted to the weakest point following subsequent hernia repair, which is the healing midline fascia, thereby contributing to wound failure.

Clinician-centered Studies

The majority of included studies from the clinician perspective were survey- or interview-based studies. The types of procedures studied included hysterectomies, colorectal procedures, and general surgical procedures (cholecystectomy, incisional hernias, and laparotomy). The time to return to work or activity was examined in 5 of these studies. After open surgical procedures, most studies reported recommendations by practitioners for at least 6 weeks of convalescence.[17–19] One study reported a recommendation for 4 weeks of physical rest after incisional hernia repair.[20] Recommendations for return to activity were more variable for MIS abdominal surgical procedures, with most recommending between 2 and 6 weeks of reduced physical activity.[18,19] When recommendations for MIS versus open procedures were analyzed, fewer restrictions were advised for MIS procedures.[18] An earlier return to work by 2.3 weeks on average was recommended for MIS versus open procedures ($P < .001$) by the surgeons participating in the study by Loor et al.[19]

Similar findings for open and MIS procedures were reported in the study by Van Vliet et al in 2016, which used a Delphi method and an expert panel of 13 practitioners to explore convalescence recommendations following uncomplicated abdominal surgery.[21] In this study, several different physical activities were assessed, including sustained sitting, walking, climbing, sustained standing, lifting weights (5 and 15 kg), and sexual intercourse. Resumption of these activities was deemed safe by the expert panel between 1 and 6 weeks. For most procedures, resumption of an average job was advised at 2 weeks; however, longer convalescence from physical activity was recommended for colectomy (6 weeks for MIS, 8 weeks for open).

In general, many of these studies noted the large variation in the advice being given to patients.[17,19,20] In addition, most studies noted that when advice is given, it tends to be conservative with clinicians often recommending longer periods of convalescence than what is likely needed.[17,20,21] Particularly before 6 weeks postoperative, there is disagreement on activity restrictions.[18] In a study that included both the patient and physician perspective, which was obtained through focus group interviews, discordance was noted between patients and physicians on this topic.[10] In addition, physicians noted that their advice given to patients was the most important factor in guiding return to activity after surgery; yet, they also noted that the lack of communication between providers and the lack of guidelines on this topic were both major barriers to providing guidance.[10] Indeed, only 23% of surgeons said that their recommendations on postoperative activity are based on scientific evidence.[19] In the Delphi study, lack of consensus was noted even on round 3 out of 4 for 17 out of 35 of the activities assessed.

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Patient-centered Studies

Studies on Time to Return to Work

Many studies assessed time to return to work or activity as reported by patients.[22–34] For MIS procedures, the time period to work or normal activity ranged from 4 to 18 days.[22,23,28,31] For lighter activity, patients reported an earlier return to activity of 5–6 days, whereas for more strenuous activity, patients reported 10–18 days of recovery.[23,25] For open procedures, patients reported longer times needed for recovery, with convalescent periods that ranged from 42–94 days.[24,28–31,34]

Recovery of function following surgery was also reported by patients, and these results demonstrated high rates of inability to return to work and previous levels of activity. In 1 study, recovery of autonomy was noted by only half of patients and occurred at 79 +/− 48 days.[33] At 8 weeks following benign gynecologic surgery, 30% of women had only returned to work part time, and 20% were not working.[27] Dahl et al (2014) reported that after prostatectomy only 51% of men had returned to work at 6 weeks and 27% had deterioration of work status at 3 months postoperative.[32]

Studies on Job Characteristics and Related Factors That Influence Return to Work

Several of these studies assessed patient factors that affect return to work and activity after surgery.[10,22–25,31,34,35] Pain and fatigue were reported as factors that contributed to longer convalescence periods.[10,22,23,25] In addition, jobs that required moderate to demanding physical activity were associated with longer periods of leave.[22,32,34] Other factors which were associated with longer recovery periods included low job satisfaction and younger age.[22,32] Higher monthly income and freelance work were associated with shorter recovery periods.[34] In addition, many of these studies noted that patient work status and decision to return to work were highly influenced by sick leave policies and instructions given by providers, rather than the patient level of comfort and physical ability following surgery.[10,31,32,34]

Patients who did not receive advice from their physician about when to return to work, returned later than those who did receive advice.[24] Some patients also reported wanting to return to work sooner than what they were permitted by their physician.[10] This study also found significant discordance between the patient and physician perspectives.[10] Baseline expectations about return to work was found to be an important predictor of delayed return to work.[31] Another factor which was cited in several of the studies is the role of regional differences in sick leave policies.[32,34] For example, the Norwegian sick leave compensation policy allows for 52 weeks of paid time off after surgery, which affects patient expectations and practices regarding return to work.[32]

Studies on Early Return to Activity and Possible Interventions to Improve the Recovery Period

None of the included studies addressed the effect of physical activity after abdominal surgery on the development of incisional hernias. These studies did not follow patients for a long enough period of time to detect incisional hernia rates, nor did they include hernia development as an outcome to be measured on physical exam, symptoms, or radiographically. These studies reported primarily on patient-reported outcomes, which are similar or slightly better in patients under liberal postoperative activity restrictions. In 2 RCTs included in this review,[35,36] patients were randomized into liberal versus restrictive postoperative activity groups after pelvic reconstructive surgery. Patients in both groups reported similar Activities Assessment Scale (AAS) scores, similar satisfaction with surgery scores, similar return to baseline level of function, and similar quality of life. Patients in the liberal activity restriction groups in both studies reported to be less bothered by their symptoms.

Three studies reported on possible interventions to improve the convalescence period and potentially shorten time to return to work.[27,30,37] Van der Meij reported on a RCT of an interactive e-Health program to provide customized advice and feedback during the recovery period after general surgical procedures. This program was effective in reducing time to return to normal activities (26 vs 21 days) with no difference in satisfaction with care.[37] Brolman et al (2009) suggested the use of a subjective recovery score at 2 weeks to help identify individuals in need of intervention or rehabilitation to achieve return to work.[27] In a cluster controlled trial on the implementation of an internet-based postoperative care plan developed by an expert panel, patients had a reduction in the median time to full return to work in the intervention group. In addition, quality of life and pain scores were improved with this intervention.[30] Finally, 1 included study describes the protocol for a planned national multicenter prospective trial (3N6, Germany) comparing 3 versus 6 weeks of activity restrictions after incisional hernia repair.[38] Of note, this study will not be using hernia recurrence as an endpoint, but will focus instead on duration of sick leave and 30-day postoperative complications.

DISCUSSION

In this systematic review, we explored what is known about how physical activity after abdominal surgery affects fascial healing and the development of incisional hernias. To achieve this, we reviewed the basic science literature on fascial healing and the clinical literature on important factors regarding return to work and activity after abdominal surgery, from the perspective of the clinician and of the patient. The majority of the clinical literature on this topic was observational, with only 5 prospective studies. None of the studies included incisional hernia as an endpoint, but rather focused more on patient reported outcomes, such as quality of life. Nevertheless, this systematic review highlights several essential themes.

From the basic science studies relevant to this topic, there is wide variation in the time to achieve 50% tensile strength and the maximal strength achieved in healing wounds. This is likely due to differences in technique and species. Another source of variability is the layer of the abdominal wall in which tensile strength is measured, as some studies measured fascia only and some full-thickness abdominal wall. In the case of incisional hernias, it is fascial healing which seems to be most pertinent, as this is the layer of the abdominal wall which fails. However, the role of skin healing in this process is unclear. In addition, because of differences in the amount and arrangement of collagen fibers, different tissues heal at different rates.[39] Regardless of type of tissue, however, little strength is present in tissues during the lag phase of wound healing (first week) making all layers susceptible to mechanical failure even with unavoidable physiologic loading, such as coughing and sneezing, in the early postoperative period.[39]

The basic science literature included in this review also points to the possibility that physical activity improves fascial healing. Abdominal wall loading and mechanical stress, which occur through physical activity, seem to be important factors in the stimulation of fibroblasts to produce collagen.[39,40] In the field of orthopedic surgery, early resumption of activity after surgery or musculoskeletal injury has been found to be an important factor in the restoration of function, while prolonged rest has adverse effects on healing tissue.[41–43] Although this has been studied extensively as it pertains to healing of bone and joints, the role of physical activity in fascial healing has not been fully elucidated. Healing of abdominal wall fascia is particularly challenging because, regardless of the activity restrictions imposed by physicians, physiologic activities, such as Valsalva maneuvers, coughing, and sneezing,

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which are repetitive and impossible to avoid, place enough load on the abdominal wall to potentially disrupt a healing wound.

For the clinical studies included in this review, physical activity after abdominal surgery was associated with improvements in symptom distress, and participation in a postoperative activity program improved quality of life and pain scores. Patients reported returning to work at 1–3 weeks after MIS abdominal surgery and 6–8 weeks after open abdominal surgery. Similarly, most practitioners recommend 2–6 weeks of convalescence for MIS cases and at least 6 weeks for open cases. However, there is wide variation in these practices, and wide variation in what defines convalescence. Weight limits for lifting and which specific activities should be avoided in this time period are not agreed upon. As a result, the instructions which are given to patients are inconsistent. Patients report that advice from their physicians is an important factor in their decision to return to work or activity. Achieving evidence-based consensus on this topic would, therefore, be an important step in the postoperative care of patients.

The decision to return to activity following abdominal surgery is multifactorial. Patient pain level, quality of life, and motivation are important factors. Surgeon level of comfort with a return to activity is also important, and, moreover, the effective communication of these instructions is essential. In addition, sick leave policies implemented by the government, the employer, or the insurer also play a role. The studies reported here were mainly conducted in Europe (14 out of 18 patient-centered studies and 4 out of 5 clinician-centered studies). The sick leave policies in these countries are different than in the United States and other countries, and therefore, the findings of this systematic review are not widely applicable to all patient populations. In constructing a postoperative activity program following abdominal surgery, many factors will need to be taken into account. Additional studies on the effect of physical activity on hernia formation should form the basis for these recommendations. Patient comorbidities, intraoperative findings, and preoperative level of activity will need to be considered for risk stratification. In addition, surgeons will need to buy into this data, be comfortable with this risk stratification, and possibly be willing to change practice. Additionally, patients will need to have adequate levels of pain control, functional capacity, motivation, and psychosocial support to comply with activity recommendations. Social frameworks for sick leave may also require modification, such that employers and insurers align with the recommendations of clinicians.

The main limitations in this systematic review is the sparsity of data on the safety of physical activity in the postoperative period. Through this systematic review we learn about some of the factors involved in the decision-making regarding return to activity and about when patients and clinicians may feel comfortable with a return to activity. However, this review does not answer the question as to whether early return to activity may increase risk of incisional hernia or other complications. Studies on convalescence after inguinal hernia repair have demonstrated no increased risk of hernia recurrence or reoperation with short duration of activity restrictions.[44–47] However, most of the published data on physical activity after abdominal surgery is survey-based or retrospective, relying on opinions of clinicians and patients, with little data on clinical outcomes.

One of the questions which remains is: in the absence of restrictive recommendations or a sick leave policy, what would patients choose as an appropriate duration for convalescence? In planning for upcoming surgery, patients and family members often ask about when they can expect to return to full activity. This often informs timing for surgery, amount of help needed at home, accommodations needed at work, and the potential economic impact on home finances. Surgeons play a strong role in setting expectations for the recovery period. However, without clinical guidelines, these recommendations are based upon personal experience or training, rather than evidence in literature.[19] Furthermore, rather than being protective, activity restrictions may have a negative impact on quality of life and, in fact, impair healing and functional status. In the absence of evidence, these restrictions should be given with caution.

CONCLUSIONS

This systematic review has helped to identify gaps in our understanding of what is best for patients as they recover from abdominal surgery. As of now, we do not have the evidence from either basic or clinical studies to form the basis for activity restrictions. Whether physical activity in the postoperative period increases or decreases the risk of incisional hernias remains unanswered. Furthermore, the extent and type of activities which are safe will need to be further explored. In addition, patient quality of life and surgeon acceptance will be important factors in the implementation of any postoperative activity program. High quality RCTs are urgently needed on this crucial subject that impacts all patients undergoing abdominal/pelvic surgery.

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