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THE IMPACT OF IMPROVING TEAMWORK ON PATIENT OUTCOMES IN SURGERY: A SYSTEMATIC REVIEW

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THE IMPACT OF IMPROVING TEAMWORK ON PATIENT OUTCOMES IN SURGERY: A SYSTEMATIC REVIEW

ABSTRACT

Background

The aviation industry pioneered formalised crew training in order to improve safety and reduce consequences of non-technical error. This formalised training has been successfully adapted and used to in the field of surgery to improve post-operative patient outcomes. The need to implement teamwork training as an integral part of a surgical programme is increasingly being recognised. We aim to systematically review the impact of surgical teamwork training on post-operative outcomes.

Methods

Two independent researchers systematically searched MEDLINE and Embase in accordance with PRISMA guidelines. Studies were screened and subjected to inclusion/exclusion criteria. Study characteristics and outcomes were reported and analysed.

Results

Our initial search identified 2720 articles. Following duplicate removal, title and abstract screening, 107 titles full text articles were analysed. Eight articles met our inclusion criteria. Overall, three articles supported a positive effect of good teamwork on post-operative patient outcomes. We identified key areas in study methodology that can be improved upon, including small cohort size, lack of unified training programme, and short training duration, should future studies be designed and implemented in this field.

Conclusion

At present, there is insufficient evidence to support the hypothesis that teamwork training interventions improve patient outcomes. We believe that non-significant and conflicting results can be attributed to flaws in methodology and non-uniform training methods. With increasing amounts of evidence in this field, we predict a positive association between teamwork training and patient outcomes will come to light.

KEYWORDS: teamwork, surgery, outcome, training, intervention, post-operative

INTRODUCTION

In recent years, there have been increasing efforts to achieve better surgical performance. There is a demand for greater transparency of results [1], better patient satisfaction, and error reduction. Operating theatres are challenging environments, where human errors have been shown to cause the greatest amount of unintentional harm in a hospital [2,3]. These unintentional errors often have significant consequences, and have been reported to be as high as 11% across British hospitals [4]. Furthermore, these errors are often non-technical and may be preventable, thus opening up a new field of research targeting the reduction of human errors in surgery.

Parallels have been drawn between aviation and surgical disciplines. Both are high-stress, performance-demanding environments with little margin for human error. In the 1980s, the aviation industry developed the concept of Crew Resource Management (CRM) to reduce avoidable errors [5]. The focus on the quality of interpersonal coordination can be adapted to the field of surgery [6]. One of the first specialties to adopt this concept in medicine was anaesthetics, in the form of Anaesthesia Crew Resource Management [7].

Meanwhile, the use of checklists to improve outcomes and reduce error in medicine has dramatically increased in recent years [8]. The implementation of the World Health Organisation (WHO) Surgical Safety Checklist is now widespread, one of its aims being to improve team cooperation in surgery [9]. A recent systematic review concluded that safety checklists have improved communication and teamwork [8]. A summary of the effectiveness of other teamworking interventions, however, has not previously been reported.

In this article, teamwork is defined by characteristics of interpersonal interactions that allow for effective cooperation in the surgical environment. Teamwork interventions are training programmes which are targeted at improving these teamwork characteristics.

Currently there is little consensus as to how surgical teamwork training should be conducted, and thus far no review to our knowledge has explored the association between teamwork training and patient outcomes. Intuitively, teamwork is beneficial for many aspects of surgery, such as staff morale and effectiveness in communication. Our aim is to systematically review the existing literature to see if training interventions leads to significant improvements in post-operative patient outcomes.

METHODS

2.1 Search strategy

The search strategy was completed in accordance with Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines [10]. Our most recent search was completed on 09/05/2017 and we have screened all abstracts meeting our criteria published prior to this date. The Ovid search engine was used to interrogate the MEDLINE and Embase databases using the following individual search strategies:

2.1.1 MEDLINE

(*patient care team/ or teamwork.mp. or cumulative experience.mp.) and (surg*.mp. or operation op * operating rooms/ma) and (quality indicators, health care/ or complications.mp. or outcomes.mp. or safety.mp. or performance.mp. or mortality.mp.)

2.1.2. Embase

(teamwork/ or cumulative experience.mp.) and (surg*.mp. or operating room/ or surgery/ or operation.mp.) and (health care quality/ or complications.mp. or safety.mp. or outcomes.mp. or performance.mp. or mortality.mp.)

The reference lists of included articles were manually searched for additional studies. Two independent reviewers (M.C.S. and D.C.M.) assessed the titles and abstracts of all identified articles to determine eligibility. Articles were assessed in full if information retrieved from the titles and abstracts was insufficient to determine inclusion. A third independent reviewer (M.M.) was responsible for resolving dispute in initial study inclusion or exclusion.

2.2 Study selection

Studies were selected based on the following inclusion criteria: original research, teamwork intervention, post-operative data from surgical patients available, assessing the effect of teamwork on patients’ outcomes. Publications must also demonstrate a change or intervention specifically in relation to teamwork quality or quantity, and use statistical methods to assess outcome. Exclusion criteria were: not original research, outcomes not focused on patients (e.g. costs, efficiency), intervention not focused on improving teamwork (e.g. focused on surgical training), the use of qualitative approaches, and using debriefs or checklists as means to measure teamwork. The choice of our inclusion and exclusion criteria were for two main reasons: clarity of topic, i.e. to establish cause and effect between intervention programmes and surgical patient outcomes; and to only include studies of sufficient research quality. The use of patient outcomes establishes a higher threshold for interventional success than measures such as questionnaires, or self-reports. There were no limitations placed on year of publication. Only publications in english were included in our search. Studies produced in the same centre but at different times were included in our synthesis as separate studies.

2.3 Data of interest

Data that were extracted and synthesized for analysis included: article reference, aim of the study, study design, country of origin, setting and specialty, use of crew resource management, number of teams, size of teams, number of surgical procedures, teamwork intervention used, duration/frequency of intervention, number of surgeons, experience of surgical team, outcome measures (mortality, morbidity, team efficiency, operation time, never events, teamwork quality), and feedback provision.

2.4 Statistical analysis

Study characteristics and outcomes were summarized and contrasted using descriptive methods. Study design heterogeneity, and variations in outcome, population and setting prevented meaningful quantitative analysis. We therefore present our findings and discussion in a qualitative manner. A MERSQI (Medical Education Research Study Quality Instrument) analysis of each of the included studies was carried out and included in the summary of results (Table 1).

RESULTS

3.1Study identification and selection

After the removal of duplicates, our search strategy returned 2784 articles. Screening of titles and abstracts identified 114 results. After applying exclusion and inclusion criteria, eight articles were included in the systematic review (Figure 1).

3.2 Study characteristics

Data was included from hospitals in the US, France and UK, with a total of 222 162 surgical procedures. The majority of these procedures derive from work by Neily et al (n=182 409) [13]. Sample sizes ranging from 72 to 182 409 procedures. Of the eight studies, two were multi-centre studies [13,14]. Six studies were prospective studies, two were retrospective. A summary of study characteristics of included papers can be found in the Appendix. All eight studies were of sufficient research quality, as assessed by MERSQI scoring (Table 1).

3.3 Training intervention

A summary of effects of training intervention on post-operative outcomes is shown in Table 1, along side p values and confidence intervals where available. MERSQI scores are also included in Table 1 for each study, to demonstrate quality of included study. All included studies [11,12,13,14,15,16,17,18] assessed whether training programmes, or the implementation of a strategy to increase communication, had a positive effect on post-operative outcome.

Eight studies involved teamwork training courses, two of which employed TeamSTEPPS programmes (a government-funded teamwork training programme in the US). In Forse et al [16], all members of the theatre staff were trained over a two-month period by attending a TeamSTEPPs course. An alternative setting was investigated by Capella et al [15], who focused on trauma resuscitation teams and used TeamSTEPPS and simulation sessions to improve teamwork by training surgeons and surgical nurses. TeamSTEPPS is an evidence based programme delivered to health care professionals in modules covering key elements of teamwork performance, such as communication, situation monitoring, leading a team etc. The programme is delivered using a combination of tutorials, videos, and group practices.

As an alternative strategy to TeamSTEPPS, Neily et al [13] utilized CRM principles to train teams over a two-month period with a further one-day conference and quarterly coaching interviews. Duclos et al [14] used two CRM trainers: one aviation CRM consultant and one surgeon experienced in surgical quality. They found no difference between the two arms, and concluded that there is a need to adapt aviation CRM training further for surgery. McCulloch et al [18] also utilized CRM principles to train operating room team members during a nine-hour course and biweekly coaching for three months. Morgan et al conducted two studies [11,12] based on CRM principles, each with a one-day intervention. One study measured performance and outcomes over a three-month period, their other study included the use of weekly coaching for six weeks following the initial intervention.

The intensities of interventions in these eight studies (length of training and number of staff trained) were variable. These ranged from a short programme of a few hours to day-long training session followed by biweekly coachings.

3.4 Patient outcomes

Of the included studies, three demonstrated statistically significant improvements in patient outcomes after teamwork intervention [13,16,17]. Main outcomes measured include patient mortality, morbidity, length of stay, and operating time. These outcomes were measured alongside a range of metrics (such as infection rates, re-operation rates, prophylactic antibiotic use, to name a few) for assessing the quality of the teamwork.

Of these three papers with significant improvements:

1) Friedman et al [17] found the initiation of a pro-teamwork routine (specific allocated responsibilities, frequent communication, orientation of new team members) increased efficiency and decreased length of hospital stay (risk adjusted, $p<0.01$). They report an average reduction in length of hospital stay of 1.18 and 0.89 days, for private patients and ward patients, respectively.

2) Neily et al [13] retrospectively analysed outcomes from 182 409 procedures from 74 centres that had undergone teamwork training based on CRM principles, compared to 34 that had not. Their findings identified a significant reduction in mortality rates ($p<0.01$) following implementation of training. Ratios for rate of mortality in the 'trained facilities' compared to the 'non-trained facilities' was 0.82 (CI 0.76-0.91). Selection of facilities for training were made with consideration for training

needs of different facilities, and so were not randomised. Furthermore, adjusting for severity of illness, there was a non-significant 50% reduction in mortality in the trained facilities.

3) Forse et al [16] report that using TeamSTEPPS for nine months improved parameters such as antibiotic administration and discontinuation, beta-blocker administration, VTE assessment, mortality, and surgical complications ($p<0.05$).

Capella's study [15] also used TeamSTEPPS, like Forse et al [16], but only for a maximum of two months, and with varying lengths depending on participants' job role, yielding no significant improvement. Their cohort numbers were similar (73 and 75, respectively).

McCullogh et al [18] used CRM principles, like Neily's study [13], and compared outcomes from 55 procedures after training with 48 prior to training. They report no significant benefit in patient outcomes (length of hospital stay and complication rates) post-training. However, non-technical errors and subjective measurements of teamwork all improved ($p<0.01$).

Morgan et al [11] used CRM principles and assessed complications in two orthopaedic theatres. There was no significant decrease in length of stay or readmission compared with avascular theatre that was not trained. The authors report a significant ($p=0.05$) increase in complication rate compared with the control group. A further study by Morgan et al [12] also reported no difference in complication rates, length of hospital stay or readmission rates, with the intervention group being one orthopaedic theatre at one site and the control group being two other orthopaedic theatres at another site. NOTECHS II score in both studies showed an improvement in teamwork quality.

Duclos et al [14] conducted a multi-centre randomized controlled trial (RCT) using two trainers: one aviation CRM specialist and one surgeon for their CRM-adapted intervention. They found no significant reduction in risk of major adverse events between intervention and non-intervention groups ($p=0.47$). Major adverse events that were recorded included 12 intra-operative complications, 20 post-operative complications and death.

DISCUSSION

We identified eight studies which involved an intervention aimed at improving teamwork and measured patient outcomes; three of these showed significant improvements in patient outcomes. All studies were assessed as “sufficient” or “good” quality using the MERSQI scoring tool.

Main key factors we have identified as contributing to non-significant results include: a small cohort size, lack of a unified approach to training, and a short training period.

Similar to teamwork training, various other methods of non-technical surgical training are also in their infancy. Individual feedback programmes generally enhance surgical performance, however the effect is often sub-threshold or mixed [8,19,20]. Total transparency of individual surgeons’ mortality rates has generally not shown an effect on clinical outcomes in fields outside cardiac surgery [21,22].

There have been systematic reviews evaluating the role of teamwork training in the hospital setting, not specific to surgery. Schmutz et al [23] reviewed seven studies which addressed teamwork interventions in the context of clinical performance. Only two of their included papers assessed patient outcomes: one of these evaluated a non-surgical cohort (maternity) and the other (McCulloch et al) was included in our study. Schmutz’s team reached a mixed conclusion; some of their papers demonstrating a positive correlation between teamwork behaviours and performance, whilst others did not. Fung et al [24] conducted a systematic review of CRM and its impact on teamwork behaviours and patient outcomes in medicine. Of 12 studies, only two studies assessed patient outcomes, both of these studies showed a single intervention improved patient outcomes, as measured by patient outcome scores (WAOS and AOI); neither of these studies were in the field of surgery.

4.1 Strengths and limitations of the included studies

Cohort size was a limitation for the following studies: Capella et al, Forse et al, McCullogh et al, both studies by Morgan et al. Neily et al had the largest cohort of 182 409 procedures and yielded significant results. Duclos et al, Friedman et al had the second and third largest cohorts (22 779 and 14 359, respectively). Duclos et al found no difference between control and experimental arms, whilst Friedman et al found a significant improvement in hospital length of stay and patient satisfaction. Due to the difference in cohort sizes of all eight studies, their contribution to our overall conclusion is not equal. Of the three largest studies, two found significant results and one found no difference.

Several studies had comparatively short training times. The national TeamSTEPPS programme constitutes a 2-day training of representatives, but does not offer further advice on how long training should be carried out for in hospital [25].

Variation can also be seen in the amount of follow-up training. Forse et al [16] found an increase in complications and mortality rates when the training stopped. Neily et al [13] found that the longer the training was implemented, the larger the positive effect on outcomes; they postulated this was due to the follow-up period providing clinicians with enough time to change their behaviour. These findings support the implementation of follow up training in training programmes. However, it's precise role and required duration is unknown. Morgan's study [11] included weekly coaching to enhance the initial training intervention, they found a significant improvement in teamwork quality (as measured by NOTECHS II) but a sub-threshold effect on patient outcomes.

There are discrepancies in how many staff members are trained. Capella et al [15] had varied training for different staff and were unclear about who underwent training, returning non-significant results. Neily's group only documented training of their clinicians, but found significant improvements. All other studies trained all operating room staff. Overall, it appears likely that training surgeons alone is enough.

Outcome parameters that were included varied greatly; the choice of included parameters is likely to be a factor contributing to overall results. Some parameters, by their nature, are likely to have a more direct correlation with the quality of teamwork. For example, efficiency of transportation from admission to the operating theatre would correlate more with communication skills, whereas other parameters may be heavily influenced by surgical technicalities or the nature of the surgery itself.

CRM seems to be the most likely basis for future design of intervention, due its popularity and already established field of research. Duclos et al [14] recommended better adaptation of CRM to the field of surgery and considered the potential use of simulation training. A uniform surgical CRM training curriculum has wide potential to improve patient outcomes in the future.

There are a number of confounding factors in the interpretation of outcome results. For example, the nature of procedures carried out at night, fatigue of surgeons, and the loss of information during handover.

The majority of our eight studies included adjustments for patient demographics (e.g. age, gender, morbidity, social status, etc). Additionally, we identified some covariates which were not accounted for: technical skills, difficulty of the procedures, baseline quality of teamwork, equipment and resource differences, staffing levels, case load, and staff morale.

Many included studies are limited by observer bias due to non-blinding. This is also true for the ‘Hawthorne effect’; the notion that the assessment of performance will lead to better performance. The results could thereby be an overestimation of the true effect of improved teamwork. Publication bias may also have occurred; studies with negative results may not be favourably selected for publication.

This review excluded studies which adopted the use of checklists, assessment of familiarity of teams and teamwork scores. The implementation of checklists has a well-established role in reducing morbidity and mortality, and is integral to team performance. However, the literature for teamwork familiarity assessment [26,27,28] and quality scoring [29,30] of teamwork performance found inconclusive results. We excluded these studies for sake of clarity of association between teamwork training and outcome.

We included studies with objectively measured patient outcomes as an indicator of performance. Papers with only technical improvements were not included unless they translated into clinical improvements. However, improvements in many outcome parameters suggest a positive impact of teamwork training on quality of care, even if it did not reach significance in improving clinical outcomes. Indicators of performance such as the reduction in technical errors [17], better patient satisfaction [16,17] and better staff satisfaction [17] were observed. Translation of these improvements into reaching clinical significance may be limited by underpowered studies, insufficient training times and lack of follow-up training.

Meta-analysis was precluded due to heterogeneity of the study designs. We call for more evidence on teamwork interventions, with standardised measurements of quality of teamwork using standardised training programmes. Based on methodological discrepancies we observed of our papers, and encouraging evidence for positive correlation between teamwork and technical performance, we postulate there will be increasing evidence in literature to support a significant effect of teamwork training.

Due to our search terms, studies we screened were limited to the english language. This may bias the interpretation of teamwork within surgery in an international context, as the culture of interpersonal and resource management will differ in non-english speaking countries.

We find there is yet insufficient evidence to recommend teamwork training as a method for improving patient outcomes without further research. However, we predict such evidence to come to light in the future, as more results are published from up and coming trials. Neily et al [13] indicated a “dose-response” for teamwork training after propensity matching. This study also contributes a significant portion of our total number of procedures, and found positive results. This is currently our most convincing evidence that teamwork training is a worthy intervention. The surgical environment is a complex system and teamwork behaviours may be only one link necessary for surgical success. Nonetheless, further developments in the field of surgery will eliminate limiting factors for clinical improvement, and we can then expect teamwork interventions to demonstrate a supra-threshold effect. Currently, however, with a stronger evidence base for surgical checklists, these present a more proven cost-effective intervention for improving outcomes at this time.

CONCLUSION

Our review shows there is limited positive evidence to suggest teamwork interventions improve patient outcomes. We discussed how certain elements of methodology (non-randomization, choice of outcome parameters) and study design (cohort size, training and follow-up times, training programme and subjects) may be the cause for non-significance. In order to justify future investment in teamwork training interventions, we call for more research using objective and standardised methodology.

Although cost-effectiveness of training interventions cannot be fully proven at present, a positive outcome should appear with the emergence of further high quality research. Promotion of teamwork training and teamwork mentality will also help to positively influence the culture within surgical training. Further reviews and meta-analyses should include quality studies, which can be assessed via scoring systems such as MERSQI or Newcastle-Ottawa Scale Education (NOS-E). We suggest that clinical outcome measures be used as endpoints, as they provide high threshold, objective and reproducible measures of effectiveness of interventional training, better than that of questionnaires or self-report scores. A unified, evidence-based training programme with consensus over training methodologies should then be established and adopted for widespread use. In particular, we suggest training time should be a minimum of two full days with a follow-up period of more than six months. There should be additional support and renewal of training material during this period.

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APPENDIX

Study Characteristics

Table A.1

Study	Operation type	improved post-operative outcomes	p value and C.I values	MERSQI score (max 18)
Capella et al [15]	Trauma resuscitation by surgical staff	Teamwork parameters ratings (leadership, situation monitoring, mutual support, communication, overall)	p<0.001 - p=0.004 no C.I reported	15.5
		Time to CT scanner	p=0.005 no C.I reported	
		Time to intubation	insignificant no C.I reported	
		Time to operating theatre	p=0.021 no C.I reported	
Duclos et al [14]	OR staff in orthopaedics, general surgery, urology, gynaecology, cardiovascular and neurosurgery	12 inter-operative complications, 20 post-operative complications, death	(ratio of odds ratio) P=0.474 C.I=0.67 -1.21	18
Forse et al [16]	All operations, trained all OR staff	After nine months: first cases starts, Surgical Quality Improvement Programme measures, VTE, b-blocker administration, patient satisfaction, mortality, overall surgical morbidity	p<0.05 no C.I reported	13.5

Study	Operation type	improved post-operative outcomes	p value and C.I values	MERSQI score (max 18)
		After one year compared with after nine months: Surgical Quatliy Improvement Programme measures	p<0.05 no C.I reported	
		After one year compared with after nine months: first cases starts, patient satisfaction, mortality, overall surgical morbidity	worsened, p<0.05 no C.I reported	
Friedman et al [17]	General surgery	Patient satisfaction	p<0.001 no C.I reported	15.5
		Hospital stay length (sum of all inpatient days for general surgical floor)	p<0.001 no C.I reported	
McCulloch et al [18]	Laparoscopic cholecystectomies and carotid endarterectomies	NOTECHS score (Oxford Non-technical Skills)	p=.0.021 no C.I reported	15.5
		Technical errors, non-procedural errors	p=0.009, p<0.001 no C.I reported	
		Operating time, length of hospital stay, complications	insignificant no C.I reported	
Morgan et al [11]	Orthopaedics	Non-technical skills, WHO compliance	p=0.047, 0.006	15.5

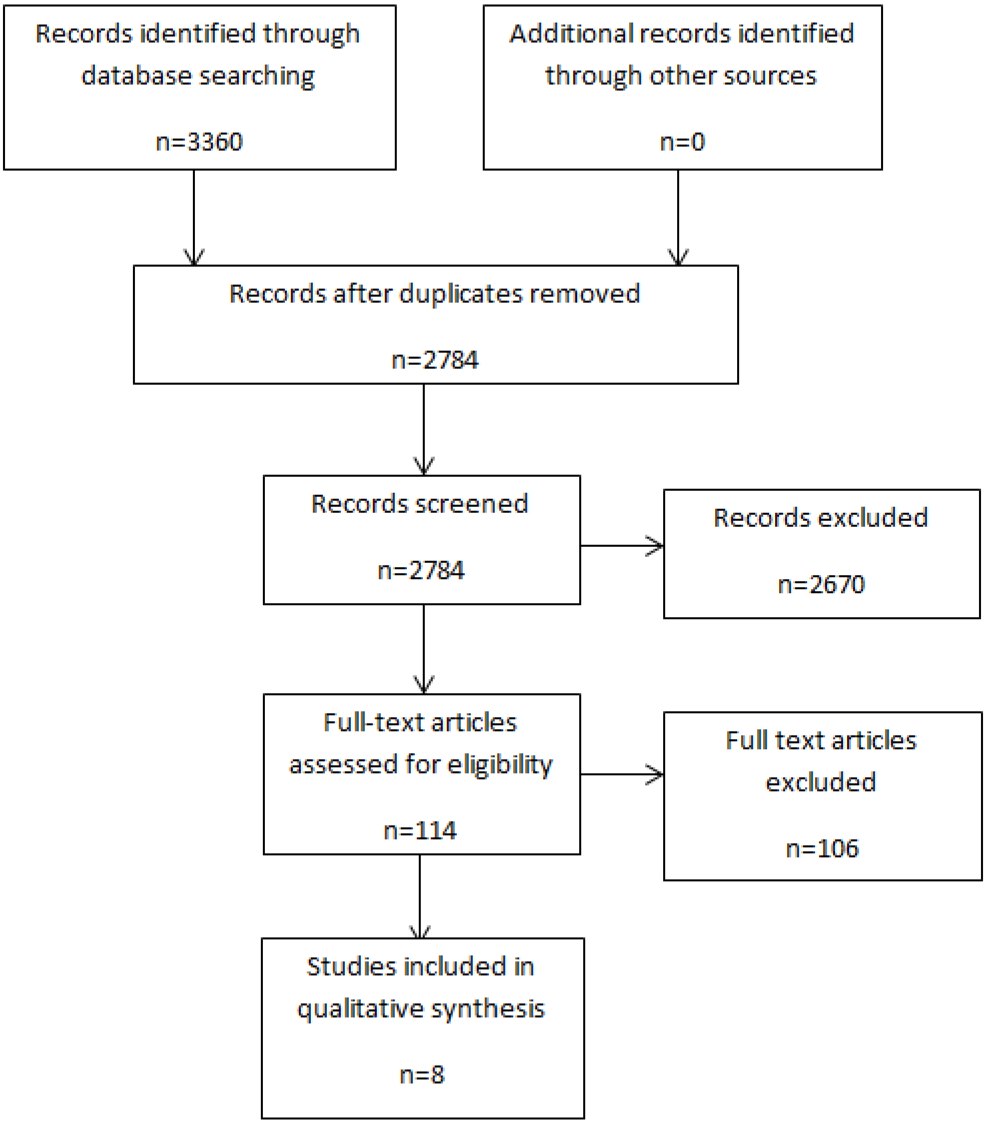
Study	Operation type	improved post-operative outcomes	p value and C.I values	MERSQI score (max 18)
		Glitch count, complication rate	worsened p=0.002 (C.I 1.16 -4.82 glitches per hour), worsened p=0.05 (no C.I reported)	
		Length of hospital stay, operating time, readmission within 90 days	insignificant no C.I reported	
Morgan et al [12]	Orthopaedics	Non-technical skills, WHO compliance	p=0.002 (C.I -8.2, -0.18 NOTECHS II score), p<0.001 (C.I 43% - 84%)	15.5
		Glitch count, clinical outcomes (length of hospital stay, operating time, complications, readmission within 90 days)	insignificant C.I -3.01, 0.49 glitches per hour	
Neily et al (12)	All specialties	Mortality rates	p=0.01 C.I 1.10-2.07 relative risk	17
		Per quarter training and reduction in 0.5 deaths per 1000 procedures	p=0.001 C.I 0.2-1.0 reduction of 0.5 deaths per 1000 procedures	

Table 1. Summary of post-operative outcomes. Some parameters such as teamwork scores or technical improvements are included in this table for reference purposes, studies were only included if they also assessed post-op patient outcomes.

Authors/Year published	Study design	Setting	Speciality	No. of procedures	Intervention	Outcome measures*	Teamwork measures
Capella et al 2010	Prospective	Level 1 Trauma centre	Trauma	73	Two hour didactic sessions and 2-hour simulation sessions, no. dependent on seniority: TeamSTEPPS programme	Mortality, complications, hospital stay, ICU stay length, arrival to examination time, arrival to CT time, arrival to intubation time, arrival to surgery time, arrival to ED departure	Pre-training and post-training
Duclos et al 2016	Prospective	Multi-centre study	Orthopaedics, gynaecology, urology, general surgery, cardiovascular, neurosurgery	22 779	Two half-day training sessions separated by six months	12 inter-operative complications, 20 post-operative complications, death	Trial and experimental arms, pre-training and post-training
Forse 2011	Retrospective	Teaching hospital	All	75	TeamSTEPPS programme	No. of delayed cases, pin control, antibiotic administration time, antibiotic discontinuation, check-up for VTE, beta-blocked administration time, mortality, complications	Pre-training and post-training

Authors/Year published	Study design	Setting	Speciality	No. of procedures	Intervention	Outcome measures*	Teamwork measures
Friedman et al 2004	Prospective	Tertiary care centre	General	14359	Enforce handover of information at certain times, schedule same group of people at same meeting times, additional monthly meetings targeting issues of communication	Adjusted length of hospital stay	Pre-training and post-training
McCulloch et al 2009	Prospective	Teaching hospital	General / vascular	103	9 hr course and biweekly coaching for 3 months	Complications, length of hospital stay	Pre-training and post-training
Morgan et al 2016	Prospective	Teaching hospital	Orthopaedics	37 before, 35 after	1 day of training with 6 weeks of weekly in-service coaching	length of hospital stay, readmission under 90 days, complications, operation time	Pre-training and post-training
Morgan et al 2016	Prospective	Teaching hospital	Orthopaedics	1121 before, 1100 after	3 month intervention using CRM methods with follow-up support	length of hospital stay, readmission under 90 days, complications, operation time	Pre-training and post-training
Neily et al 2010	Retrospective	Veterans Health Administrations	All non-cardiac	182409	1 day learning session using crew resource management theory, 4 quarterly follow-up telephone interviews	Mortality	Pre-training and post-training

Table 2. Summary of study characteristics of studies included


Records identified through database searching
n=3360
Additional records identified through other sources
n=0
Records after duplicates removed
n=2784
Records screened
n=2784
Records excluded
n=2670
Full-text articles assessed for eligibility
n=114
Full text articles excluded
n=106
Studies included in qualitative synthesis
n=8

Highlights

- We systematically reviewed existing evidence for the effectiveness of surgical teamwork training interventions on improving post-op patient outcomes.
- We found good evidence to suggest a positive correlation between teamwork training and patient outcomes, although the current evidence alone cannot justify investment into its implementation.
- Methodological flaws of included studies are discussed and we recommend strategies for future research in this field.