The impact of Huddles on a multidisciplinary healthcare teams' work engagement, teamwork, and job satisfaction: a systematic review

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Abstract

Job satisfaction and retention of healthcare staff remains an ongoing issue in many health systems. Huddles have been endorsed as a mechanism to improve patient safety by improving teamwork, collaboration, and communication in teams. This study synthesizes the literature to investigate the impact of huddles on job satisfaction, teamwork, and work engagement in multidisciplinary healthcare teams. Five academic databases were searched to conduct a systematic review of peer-reviewed literature published from January 2000 – January 2020. Articles were included if they (1) featured a daily huddle, were conducted in a healthcare setting, and involved a multidisciplinary team and (2) measured variables including job satisfaction, work engagement, or teamwork. Results were reported in accordance with the Systematic Synthesis Without Meta-analysis (SWiM) and Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. We identified 445 articles of which 12 met the eligibility criteria and are included in this review. All 12 studies found a predominantly positive impact on teamwork and job satisfaction. None of the studies discussed or reported evidence of the impact of huddles on work engagement. This review highlights the value of a daily multidisciplinary healthcare team huddle in improving job satisfaction and teamwork for the healthcare staff involved. However, there is a dearth of high-quality, peer-reviewed evidence regarding the direct impact of huddles on job satisfaction, teamwork and in particular on work engagement. Further research – particularly controlled studies on adoption, implementation, and outcomes for healthcare team culture – is needed to further assess this intervention.

Title:

The impact of Huddles on a multidisciplinary healthcare teams' work engagement, teamwork and job satisfaction: a systematic review

Short Running Title:

Huddles: Do they lead to a happier workplace?

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Abstract & Keywords:

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This review highlights the value of a daily multidisciplinary healthcare team huddle in improving job satisfaction and teamwork for the healthcare staff involved. However, there is a dearth of high-quality, peer-reviewed evidence regarding the direct impact of huddles on job satisfaction, teamwork and in particular on work engagement. Further research – particularly controlled studies on adoption, implementation, and outcomes for healthcare team culture – is needed to further assess this intervention.

Keywords:

- Huddle
- Work engagement

- Teamwork
- Job satisfaction
- Collective leadership
- Health management

Main Text:

INTRODUCTION:

A huddle can be defined as a structured, brief (5-15 minutes), routine (daily or multiple times a day), face-to-face communication of a team's membership.[1] Daily healthcare huddles have been consistently shown to improve patient safety by enhancing teamwork, creating standardised communication processes, and providing a feeling of shared responsibility.[2-6] A recent systematic review on the impact of multidisciplinary team huddles on patient safety published in the BMJ concluded that "the present body of research related to such huddles demonstrates a generally positive impact on safety".[7] Despite the evidence on the impact of huddles on patient outcomes and patient satisfaction,[8-11] there is a dearth of literature on the impact of huddles on individual healthcare staff, particularly in relation to job satisfaction and work engagement.

The WHO Global Code of Practice on the International Recruitment of Health Personnel states that each country must 'educate, retain, and sustain' an appropriate health workforce.[12] However, in the context of increased pressures on services, organisations can struggle to attract and retain skilled staff. One of the primary reasons for this type of 'brain drain' is the lack of job satisfaction within the health care system, which has been attributed to poor working cultures in organisations and the strong hierarchical nature of healthcare systems.[13] Research has indicated that the feeling of not having a voice or influencing decisions decreases engagement, motivation, and wellbeing among medical staff[14] and such environments can result in greater reported intention to leave. A strong body of evidence has demonstrated that turnover intention is a reliable indicator of job dissatisfaction.[15,16]

Job satisfaction among healthcare professionals is also important because if their own needs are not met, they often have difficulties in meeting the needs of their patients.[17,18] Job satisfaction in healthcare workers has been reported to be related to a number of factors: having autonomy in decision-making, effective communication among staff and supervisors, and having the ability to express one's opinion freely,[19] all of which are potentially facilitated by the implementation of a daily team huddle.[20] Huddle implementation in a healthcare team has been perceived by staff to increase accountability, create a culture of collaboration, foster a heightened sense of community, and increase empowerment, by giving all team members a dedicated time and platform to discuss concerns.[20]

Improved communication between team members has been shown to be a specific intervention that improves interdisciplinary teamwork.[21] Programs such as TeamSTEPPS (Team Strategies and Tools to Enhance Performance and Patient Safety), the Aston Team Facilitation Programme, and ISBAR (identify, situation, background, assessment, recommendation) are widely used in multiple healthcare systems to improve team communication.[22] Thus, it is hypothesised that the implementation of a huddle would therefore promote teamwork by improving communication between team members.

We conducted a systematic review on the impact of daily, multi-disciplinary huddles on healthcare staff. The primary outcomes of interest were staff satisfaction, teamwork, and work engagement in a healthcare setting. We are not aware of any other reviews conducted on these potential outcomes of the huddle in a healthcare setting.

METHODOLOGY:

A systematic review was conducted to synthesise the available literature with the aim of informing clinical practice.[23,24] This review followed the Cochrane Collaboration guidelines[25] and results are reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) and the Synthesis Without Meta-analysis (SWiM) guidelines.[26-28] The protocol was published in the PROSPERO database in June 2020 (registration number CRD42020180283).

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Search Strategy and Data Sources:

Following the development of the review focus, keywords were selected that were determined pertinent to the topic. Five electronic databases (PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), PsycINFO, EMBASE, and Cochrane) were used as sources of relevant literature. These searches were conducted for articles published from January 6, 2000, to January 6, 2020 (searches were carried out on 6-8th January 2020).

Keywords and terms used in searching included 'huddle', 'team brief', 'preoperative brief', 'brief', 'multidisciplinary healthcare team', 'MDT', 'team', 'work engagement', 'job satisfaction', 'turnover intention', 'satisfaction', and 'teamwork'. Previous publications on team-based interventions helped to inform the search strategy.[7,29,30] Groups of keywords relevant to a specific category (e.g. Huddle) type were combined using the 'OR' Boolean term (e.g. 'huddle' OR 'brief' OR 'preoperative brief') and categories of keywords were combined using the 'AND' Boolean operand. Researchers also scanned the reference lists of included papers and of previously published systematic reviews. Copies of all database search strings can be obtained by contacting the corresponding author.

Eligibility Criteria:

We searched for peer-reviewed studies published in English over the last 20 years to capture the evolution in the use of huddles over time. Studies were included if they featured a daily huddle, were conducted in a healthcare setting, and involved a multidisciplinary team (>1 profession). No restrictions were placed on country of study origin.

Studies were excluded if they did not meet the inclusion criteria or were duplicates. Preoperative briefs/huddles that were based on the surgical safety checklist were also excluded as they did not meet our definition of a huddle. Non-empirical article types such as reviews, comments, or letters to the editor were not included.

Study Selection:

Searches of the databases were carried out by the primary researcher (BR). Titles and abstracts of retrieved records were screened for relevance independently by two researchers (BR and SA) and any disagreements were discussed and resolved between the two researchers.

Data Extraction:

Data from all included studies was extracted independently by two researchers (BR and SM) into a datasheet compiled for this review. Extracted data included information related to the setting, study sample size, the type of huddle specified, methods of evaluation, the intervention content and duration, main findings or emergent themes, general conclusions, and limitations of the studies. Reviewers also collected information such as first author, publication year, and study design. All reviewer conflicts were resolved by a third researcher (SA).

Risk of Bias and Quality Appraisal:

Two researchers (BR, SA) used the Cochrane Systematic Review Handbook to assess the risk of bias and the quality of the studies. Following this, the Mixed Method Appraisal Tool (MMAT)[31] was used to evaluate the quality of included studies. This provided a validated, systematic approach to assessing the methodological quality and the risk of bias in the included studies. The results of the MMAT quality appraisal can be found in Table 1. Disagreements between reviewers' judgements were resolved by consulting a third reviewer (SM). No studies were excluded following the quality appraisal.

Table 1: Mixed Methods Appraisal Tool

Data Synthesis:

Meta-analysis could not be performed due to lack of comparable data, heterogeneity of studies, and the different outcome measures across studies. Due to the inclusion of mixed methodology papers, a narrative synthesis approach was adopted to summarise and synthesise findings. The SWiM reporting guidelines were used in conjunction with the PRISMA guidelines.[26-28]

RESULTS:

Study Selection:

The database searches yielded a total of 436 articles. Authors (BR, SA) screened the abstracts and titles, and 411 articles were removed as they did not meet the inclusion criteria, despite containing keywords in their title or abstract. The reference lists of the remaining 25 articles were then scanned and nine additional records were identified through these sources. 14 duplicates were then removed, leaving 20 full-text articles to be assessed for eligibility. Following the independent full-text review by the researchers (BR, SA), 12 articles were included and analysed.[1,20,32-41] Two articles were removed following full-text review as the huddle was not daily, two were removed from this review as they did not involve a multidisciplinary team, and four were removed for not according to the PRISMA guidelines regarding methodology.[26,27] Figure 1 depicts the PRISMA flow diagram of selection of eligible studies.

Description of Studies:

Table 2 summarises the details of the articles included in the review. Study characteristics extracted include the year published, study design, setting, study sample size, methods of evaluation, and intervention. There were six quantitative studies,[32,35,36,38,39,41] three qualitative,[20,37,40] and three mixed method studies[1,33,34] included in the final review. All of the studies took place in the USA and UK, with three taking place in community-based care,[1,37,41] and nine taking place in university hospital-based inpatient care.[20,32-36,38-40] The results are discussed in terms of the three outcomes of interest: teamwork, job satisfaction, and work engagement.

Table 2: Summary of Findings

Intervention Methods:

Six of the studies included looked primarily at the implementation of daily huddles.[1,20,34,36,38,40] The other six studies looked at the effect of multiple interventions, one component of which was a huddle– the details of these interventions are included in Table 3. The qualitative or mixed methods approach of these studies were therefore useful in gathering results on the specific components (i.e., daily huddle) of each intervention that was introduced.

Table 3: Intervention Characteristics

Teamwork:

Six included studies looked at the impact of huddles and quality improvement interventions on teamwork.[33,35,36,38,39,41]

Of 12 studies, only two were controlled trials.[35,38]Monash *et al* measured attending and trainee physicians' perception of nursing involvement during morning rounds. The new structure of rounding introduced in the intervention arm incorporated a pre-round huddle. Level of agreement for a statement (e.g., I am satisfied with morning rounds) was measured on a continuous scale; 0 (far too little) to 100 (far too much), with 50 being 'about right'. This was carried out using an electronic survey adapted from previously published work,[42] however this is not a standardised, validated survey. They measured the standard mean of attending and trainee responses and found both groups in the intervention arm perceived a significantly higher level of nursing involvement during morning rounds than the control arm; (44.6 v 35.7 adjusted mean, p=0.032) and (45.2 v 37.7, p=0.006) respectively. It is likely that this extra involvement bolstered team dynamics and enhanced workflow and engagement, improving the teamwork of healthcare staff involved.[43]

Pannick *et al* measured the effect of introducing daily briefings with teams over a six-month period and found improvements in both teamwork attitudes and patient safety outcomes.[38] With sustained implementation, the estimated marginal mean 'teamwork score' significantly improved (81.7 v 70.0, p=0.004). The teamwork score measures the perceived quality of collaboration between personnel.

Communication between members of a healthcare team has previously been shown to be one of the most important factors to improve teamwork and work engagement.[44] Stapley *et al* conducted 76 semi-structured interviews with staff members on four wards four months after the intervention.[40] Thematic analysis showed that the huddle helped to *'increase their awareness of important issues ... communication, teamwork, and encourage a culture of increased efficiency'.* One nurse described that the daily huddle helped the team work better on the ward:

"I think it helps that boundary between medical staff and nursing staff, it sort of links them a little bit more."

Rodriguez *et al* reported that huddles were described as an important mechanism to ensure member awareness of what each team member's role is and improved communication between members.[1] When one registered nurse was asked what she felt was the most important change implemented she said:

"To be honest, the huddle, because you're communicating with each other, you know? And that's key to everything. To have success for any relationship whether it's with - for the patients' benefits, when we're getting it across and trying to solve problems, looking at it and tackling it."

Scotten *et al* also showed that the daily brief helped to improve teamwork across the hospital by looking at the results of the TeamSTEPPS Teamwork Perceptions Questionnaire.[39] This looked at the individuals' perception of teamwork with a five-point Likert scale. The mean for teamwork rating improved by 14.1% post-intervention, p <0.05.

Goldenhar *et al* conducted semi-structured interviews and focus groups to obtain a deeper understanding of the huddle system and its outcomes as implemented in a large academic tertiary care children's hospital.[20] One of their five key themes was 'sense of community'. Participants reported that they had a 'deeper understanding of what their colleagues across the hospital deal with on a daily basis' and that this makes them 'feel more connected to their peers'. Another key theme reported was a 'culture of collaboration/collegiality'. Since introduction of the huddle system, one participant commented that:

"Anti-competition, consideration, compassion -don't assume that the unit is saying no because they don't want to help, all have a better idea of what's going on on other units and know that everyone is busy!"

The Canadian Interprofessional Health Collaborative National Interprofessional competency Framework[45] was used by Hastings *et al* to develop staff surveys.[33] They introduced a number of new processes including regular care-hub huddles. Perceptions were measured with a Likert scale and completed at baseline and post-intervention. Similar to the previous studies mentioned, responses increased significantly for 'collaboration and communication' post-introduction of a huddle (4.4 v 3.4; p <0.001).

Job Satisfaction:

Monash *et al's* randomised controlled trial measured attending and trainees job satisfaction as a secondary outcome.[35] This was carried out using an electronic survey adapted from previously published work,[42] however this is not a standardised, validated survey. The efficiency of the new style of rounds incorporating a huddle was assessed against normal rounding practices and it found that trainees found the rounding less efficient (60.5 v 72.3, intervention v control; p=0.008). Trainees reported that it increased workload for the rest of the day and gave them less autonomy. The opposite was reported for attending physicians. Jain *et al* reported that the 'day's flow' improved dramatically after huddle implementation in a surgical environment (median rating increased from 5 to 9, with 10 being the best).[34] The average number of unexpected delays also decreased post-implementation (15 v 4). This was a much smaller study however, with only three surgeons surveyed.

Dingley *et al* analysed 495 discrete communication events pre and post-huddle implementation.[32] Trained data collectors were used to record communication processes within the health system by using a standard form and asking nurses their perception of communication events. Comparison of pre- and post-intervention positive resolution of communication/issue (nursing staff's perception of resolution of the patient's issue following an interaction/communication with medical staff) and satisfaction scores revealed a significant increase in positive resolution scores (p =0.04), and a difference in satisfaction scores approaching significance (p =0.08) in the Medical Intensive Care Unit and nonsignificant increases in resolution and satisfaction scores (p =0.13, p =0.53, respectively) in the Acute Care Unit. Positive responses to both the resolution and satisfaction questions in the post-intervention period increased.

Turnover intention has been shown to be a reliable indicator of job satisfaction.[15,16] Hastings *et al* examined intent to leave within the next twelve months. This was conducted using staff interviews (n=15) and staff surveys (n=25) and showed those that implemented team huddles were significantly less likely to plan to leave after implementation than they were before the new model was introduced (20% at final evaluation vs. 48% at baseline).[33]This included nursing staff, allied health professionals, managers, and physicians. Of note, there were multiple changes to the organisation including comfort rounds, bedside shift reports, patient whiteboards, rapid rounds, and team huddles.

Newman *et al* similarly found improved job satisfaction across all provider groups (cardiologist, resident, nursing staff).[36] Job satisfaction was measured using an electronic survey that was piloted to twelve senior staff members to establish validity. Pre-post intervention surveys asking if staff had a positive overall experience working in the unit resulted in (20 v 25 residents agree/strongly agree (n=26 pre) (n=25 post); p=0.001), (8 v 16 cardiologists agree/strongly agree (n=14 pre) (n=17 post); p=0.005), (3 v 13 nursing staff agree/strongly agree (n=14 pre) (n=15 post); p < 0.001).

The job satisfaction ratings post-huddle implementation were also higher in Rodriguez *et al's* study. They measured differences in 'huddlers' and 'non-huddlers' by using a survey that included the experiences of teamwork and practice climate.[1] Those who implemented daily huddles in their practice were found to have higher satisfaction with their teams (83.1% v 51.7% satisfied; p <0.001), higher psychological safety (61.7% v 46.0%; p <0.001), and better experiences of practice communication (60.9% v 48.1%; p <0.01). However, 42% (n=174) of those surveyed indicated they found huddles 'not very helpful' when asked. Psychological safety in the workplace has been strongly linked to improved job satisfaction in the literature.[46]

As previously mentioned communication between team members has been shown to be a specific intervention that improves interdisciplinary teamwork[21] O'Malley *et al* similarly reported that huddles played a role in improved communication among healthcare professionals and that this improved communication resulted in higher job satisfaction.[37] 23 out 27 practices mentioned that huddles were '*key to maintaining structured communication within teams*' . Participants who adopted new forms of delegations such as huddles reported improved provider satisfaction and productivity.

However, it was also found that not all teams found the huddle was required to improve work engagement, teamwork, or job satisfaction. Rodriguez *et al* reported that some teams that did not choose to partake in daily huddles "have positive experiences of teamwork and indicated daily huddling was not necessary once team norms were firmly established and roles and responsibilities were very clear".[1] It is noted however that a greater proportion of non-huddlers interviewed described "challenging interpersonal dynamics among team members".

Work Engagement:

There was an apparent lack of published research on the impact of multidisciplinary healthcare huddles on work engagement. Although themes linked to work engagement, such as collegiality, organizational commitment, and staffing perceptions were measured in some of the papers included, no paper explicitly mentioned the impact of the huddle on the work engagement of healthcare staff involved.

DISCUSSION:

This systematic review explored the impact that a daily huddle can have on staff job satisfaction, teamwork, and work engagement in healthcare settings. Most of the studies found that the huddle improved communication between team members and in turn increased overall job satisfaction and teamwork. Effective, respectful communication has impacts on both collegiality, collaboration, and on patient safety outcomes and is a key pillar of effective teamworking and collective leadership across a healthcare system.[47] Despite a large amount of data on the association between patient safety outcomes and huddles, we noted the limited number of studies published on the sole impact of huddle implementation and its outcomes on the healthcare team. A wide variety of intervention design and evaluation methods were used in previous studies in this area.[7] As a result, it is difficult to compare findings across studies. Some key emergent themes from the studies identified included 'sense of community', 'trust', and 'hierarchy'.

Sense of Community:

Healthcare teams experience frequent staffing changes due to the ongoing training and rotation of staff in different hospitals, particularly among doctors in training[48]. One important finding of our review is that the implementation of a daily huddle improved teamwork by facilitating team members to communicate with each other in-person on a daily basis. This has been shown in the literature to be a specific intervention that improves multidisciplinary teamwork[21]. The huddle allows multidisciplinary teams to raise safety incidents, to address staffing gaps, and to outline the goals of care for each patient effectively and collaboratively.

Frequently used terms in the conclusions of the studies included in our review included 'practice climate', 'working environments', and 'teamwork attitudes'. The huddle brought the team together on a daily basis to remind them of their overall team goal – to improve the health and wellbeing of their patients collectively. This heightened sense of community has a positive impact on the overall satisfaction of employees and empowered them to work more productively and efficiently as a team.[20]

Trust:

Previous systematic reviews have highlighted the importance of trust relationships on staff members intention to leave and work engagement.[49] Those reviews also examined the influence of trust, communication, and job satisfaction on healthcare workers' performance. Our review suggests that the implementation of huddles is one such intervention that improves trust in a workplace. Increased levels of trust were particularly noted in three higher quality studies included in our review.[35,36,38] This increased level of trust resulted in higher safety incident reporting and improved interprofessional dynamics, leading to higher satisfaction among care providers.

Hierarchical Differences:

Historically, interactions between healthcare teams have been dominated by doctors,[50] and staff often classify their 'team' as the other staff members of the same profession (e.g. medical team, nursing team etc.). This contrasts to high reliability organisations such as military aviation and nuclear power who work more collaboratively, and also have low accident and failure rates.[51] Seven studies in our review[1,32,34-37,40] reported that huddles improved communication between various professional groups, primarily between doctors and nurses. Having a structured interdisciplinary gathering bridges the communication barrier and allows the multidisciplinary team to work more cohesively and collaborate collectively on a daily basis. However, one study reported lower levels of job satisfaction with resident doctors taking part in the huddle.[35] This was due to a feeling of decreased autonomy and that it added to their often-overstretched workload.[52] This review highlights the importance that all team members take part in the huddle, regardless of seniority, to ensure it is an ongoing process and to benefit from the collaboration and collegiality it can facilitate. This collaboration and collegiality is a key component of improving teamwork among healthcare providers.

Strengths and limitations:

An important strength of this review is that it has systematically collated evidence on the impact huddles can have on a healthcare team's job satisfaction and teamwork. The lack of published data on the impact of the huddle on work engagement highlights the need for future research in this area. The review adopted

broad inclusion criteria and interrogated five major research databases to identify as many relevant studies as possible. This review used two different appraisal tools to minimise bias and appraise the quality of included studies. Due to the fact surveys used in the studies identified tended to report more positive outcomes, the mixed methods approach of many of the studies included allowed us to see both sides more clearly, while simultaneously allowing the data specifically to the huddle to be extracted and reviewed.

The variability in intervention models and in the measurement tools used in the studies we reviewed reflects the lack of a standardised framework for huddle implementation and appraisal. Intervention models varied from entire new care processes that incorporated a huddle[33] to a night-shift interprofessional huddle.[36] Within these, the comparable interventions were variously reported as 'briefs', 'huddles', or 'pre-rounds'. This lack of common language makes synthesising data and comparing studies challenging. This has previously been documented in reviews related to huddles and patient handoffs.[7,53] We would support the proposed taxonomy and standardisation of reporting measures for future huddle-related studies as proposed by *Franklin et al*,[7] however we would also suggest that staff satisfaction is measured by a validated survey, such as the Satisfaction of Employees in Health Care survey (SEHC)[54] or the Hospital Survey on Patient Safety Culture (HSOPSC)[55] as part of the safety culture measures to support future comparability of studies.

However, a limitation of this review is that many studies implemented whole new care processes, rather than just introducing the huddle concept. This makes it challenging to isolate the impact of the huddle when part of a complex intervention. Additionally, the use of a validated common survey to evaluate outcomes was rare. Publication bias may result in successful huddle programme implementations being over-represented in the literature we identified. Finally, almost all the studies in our review were uncontrolled, pre-post studies, conducted in a single hospital/ward, in one country, with relatively small sample sizes, and a lack of rigorous study designs. All the studies included took place in the UK or the USA. We therefore cannot generalise the findings to other health service contexts, or to low and middle-income countries.

CONCLUSION:

The findings of this systematic review highlight the potential value of a daily multidisciplinary healthcare team huddle in terms of improved job satisfaction and teamwork for the healthcare staff involved. It contributes an up-to-date synthesis of literature to the current body of work on healthcare staff retention, communication in healthcare teams, and the importance of collegiality for both staff and patient outcomes. Our review suggests that through strengthening workplace trust relationships, increasing the sense of community and collaboration on healthcare teams, and applying collective leadership models to reduce hierarchical frameworks that currently exist in healthcare settings, it may be possible to decrease turnover intention and improve the overall engagement of staff. With the aforementioned high turnover rates of medical staff in the UK and Ireland, it is important for the healthcare services to implement changes sooner rather than later.

Although much has been written about the value of huddles in healthcare settings, there is an apparent lack of high-quality, peer-reviewed evidence regarding the direct impact of huddles on job satisfaction, teamwork and particularly on work engagement. Further research – particularly controlled studies on adoption, implementation, and outcomes for healthcare team culture – is needed for this important intervention that can strengthen health systems from community level to acute care.

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Conflict of Interest Statements:

None declared

Table 1: Mixed Methods Appraisal Tool

MIXED METHODS:	Are there clear research questions?	Do the collected data allow to address the resear...
Hastings	Yes	Yes
Jain	Yes	Can't tell
Rodriguez	Yes	Yes
RCT:		
Monash	Yes	Yes
QUANTITATIVE		
Newman	Yes	Yes
Pannick	Yes	Yes
Scotten	Yes	Yes
Thomas	Yes	Yes
Dingley	Yes	Yes
QUALITATIVE:		
Goldenhar	Yes	Yes
O'Malley	Yes	Yes
Stapley	Yes	Yes

Table 2: Summary of Findings:

Reference	Study Design	Setting	Study Sample Size	Methods of Evaluation	Intervention
Dingley *et al*, 2008	Uncontrolled pre-post study	University-based hospital (USA)	2 hospital units (495 communication events)	Analysis of 495 communication events	Structured communication tool including huddle during each shift
Goldenhar *et al*, 2013	Qualitative study using semi-structured interviews and focus groups	University-based hospital (USA)	10 key informants, 21 focus group participants	Analysis of interview and focus group data	3-level huddle system operating at different levels of the staff structure. Group training to implement huddling
Hastings *et al*, 2016	Mixed methods using interviews and uncontrolled pre-post surveys of staff and patients, plus administrative records	University-based hospital (USA)	15 interviews with staff post, 25 staff surveys pre- and post-, 26 patient surveys pre-, 37 patient surveys post-intervention	Qualitative analysis of interview data, qualitative analysis of staff and patient surveys, quantitative analysis of key indicators from administrative data.	New model on delivering care including regular huddles during the day

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Reference	Study Design	Setting	Study Sample Size	Methods of Evaluation	Intervention
Jain *et al*, 2015	Pilot study	University-based hospital (USA)	3 surgeons, plus surgical teams (totalling 65 operations)	Baseline and timepoint measurement of surgical outcomes, interruptions, and questions from a worksheet completed by surgeons for each day's cases.	Daily pre-operative huddle using template with entire surgical team
Monash *et al*, 2017	Cluster RCT	University-based hospital (USA)	Intervention arm: 19 attendings + 60 trainees; 595 patients. Control arm: 17 attendings + 61 trainees; 605 patients.	Audit of adherence to practice recommendations; patient satisfaction questionnaires using Likert-type scales; staff questionnaires based on previously-published work	Workshop to train teams on daily pre-round huddle as part of a package of 5 Attending Round practices
Newman *et al*, 2016	Retrospective cohort study	University-based hospital (USA)	Resident (n= 26 Pre and 25 Post), Cardiologist (n= 14 pre and 17 post) and Nursing (n= 14 pre and 15 post)	Retrospective chart review + retrospective pre-post survey on satisfaction with the intervention and impact of the intervention on team-based communication	Intervention arm teams were trained in 5 Attending Round practices: 1) pre-rounds huddle; 2) bedside rounds; 3) nurse integration; 4) real-time order entry; 5) whiteboard updates. The control arm continued normal practices..

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Reference	Study Design	Setting	Study Sample Size	Methods of Evaluation	Intervention
O'Malley *et al*, 2015	Qualitative study using in-depth interviews	Community-based facilities (USA)	63 respondents ranging from physicians to front-desk staff.	In-depth interviews using standardised protocol followed by qualitative analysis.	Team huddles to support communications (exact type not specified as this paper accessed a large number of organisations/teams)
Pannick *et al*, 2017	Prospective stepped-wedge non-randomised cluster controlled trial	University-based hospital (UK)	85 staff members from 7 interdisciplinary medical ward teams	Anonymised patient and ward level outcomes extracted from routinely collected data sets. Anonymous staff surveys were administered at baseline and 6 month timepoint.	Prospective Clinical Team Surveillance (PCTS) - Intervention program comprised structured team briefing, facilitation, and feedback
Rodriguez *et al*, 2015	Mixed methods study using interviews and surveys of staff	Community-based facilities (USA)	79 teamlet member interviews + 418 clinician and staff PCMH survey responses (total number of individuals unclear)	Analysis of interview and survey data followed by qualitative and quantitative analysis.	Patient Aligned Care Teams (PACT) initiative including structural reorganisation of teams

Reference	Study Design	Setting	Study Sample Size	Methods of Evaluation	Intervention
Scotten *et al*, 2015	Uncontrolled pre-post study	University-based hospital (USA)	65 faculties –number of participants unclear	Analysis of questionnaire data completed at baseline and timepoints, with providers using T-TAQ[+], T-TPQ[++], ITPS[§], AITCS[¶], and patients using EHCPS[#]	TeamSTEPPS introduced with in situ simulations and development of an interprofessional transitional care model intervention which included telehealth approaches for patient / provider communication
Stapley *et al*, 2018	Qualitative study using semi-structured interviews	University-based hospital (UK)	76 staff	Qualitative analysis of interview data.	'SAFE' (Situation Awareness for Everyone) programme which incorporates huddling
Thomas *et al*, 2013	Quality improvement report	Community-based facilities (USA)	Whole system (1300 staff)	Adoption of TeamSTEPPS competencies was assessed using direct observation and anecdotes. Effects of the training was evaluated, using Hospital Survey on Patient Safety Culture and targeted variables.	TeamSTEPPS training was implemented across the system after piloting.

+T-TAQ = TeamSTEPPS Teamwork Attitude questionnaire

++ T-TPQ = TeamSTEPPS Teamwork Perception questionnaire

§ ITPS = Interprofessional Team Performance Scale

¶ AITCS = Assessment of Interprofessional Team Collaboration Scale

EHCPS = Engagement with Healthcare Provider Scale

Table 3: Intervention Characteristics

Reference	Length	Content	Delivery
Dingley *et al*, 2008	24 months	Provider/Team communication toolkit: ISBAR$^+$ Team Huddles Multidisciplinary rounds using daily goal sheets	Lectures and interactive group activities on an organisational and departmental level with follow-up education over months, information notebooks, concept posters, visual reminders, PowerPoint presentation, 'champion' roles.
Goldenhar *et al*, 2013	5 years	Inter-related tiered huddle system: Unit huddle Inpatient huddle Daily operations brief	Employed safety officers, trained senior staff on implementation, gradually introduced the concept following a pilot, expanded number and participants of huddles over time
Hastings *et al*, 2016	14 months	New care processes: Name Occupation Duty More timely initial patient assessment Comfort rounding by HCAs Bedside shift report by RNs Patient whiteboards Rapid rounds Care hub huddles regularly	Collaborative practice lead available to help guide staff and provide feedback, reorganisation of teams to help implementation
Jain *et al*, 2015	1 month for baseline, 6 weeks for data collection	Daily pre-operative huddle with entire surgical team completed prior to first case of the day	Surgeons given a template to follow for the huddle, instructed by author on how to perform huddle
Monash *et al*, 2017	Unclear	Attending Rounds introduced: Pre-round huddle Bedside rounds Integrating bedside nurses Completing real-time order entry using bedside computers Updating patient's whiteboard with care plan	Study investigators led a 1.5hr workshop to train teams allocated to the intervention arm, informational handouts distributed, control arm not informed of study aims

Reference	Length	Content	Delivery
Newman *et al*, 2016	24 months	Night-shift interprofessional huddle: Rounding process with overnight residents and bedside nurses followed by conference call among residents, charge nurse, and at-home cardiologist Potential concerns discussed with resident, charge nurse, and cardiologist	Not detailed.
O'Malley *et al*, 2015	N/A	Generally a morning or afternoon huddle that lasted 5-10 minutes with physician, assistants, nurses, and sometimes front-desk staff.	N/A
Pannick *et al*, 2017	6 months	Hospital Event Analysis Describing Significant Unanticipated Problems (HEADS-UP) briefing: Daily briefings with teams Briefings could be led by any member of the ward team	Visual format delivered to teams with options of making minor changes, facilitator to raise concerns of frontline teams about issues raised in the HEADS-UP briefings to bring about tangible unit and organisational-level changes
Rodriguez *et al*, 2015	3 years at last data collection	Huddle adoption and use as part of Patient Aligned Care Teams Initiative	N/A
Scotten *et al*, 2015	12 months	TeamSTEPPS: ISBAR^{+} format Daily briefs CUS^{++} communication tool to identify safety concerns	Train-the-trainer methodology, 2 hour sessions for team members on the project.
Stapley *et al*, 2018	16 months total, data collected at 4 months	Situation Awareness For Everyone (SAFE): Huddling ISBAR^{+} PEWS§	Not specified.

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Reference	Length	Content	Delivery
Thomas *et al*, 2013	3 years	TeamSTEPPS[¶]: Briefs, huddles, debriefs Cross-monitoring, feedback, advocacy, two-challenge rule CUS[++], DESC[#] script, Collaboration, ISBAR[+] Call-out, check-back, handoff	2.5 day master trainer course, 4hr fundamental course for all staff providing direct patient care, essentials course for all non-clinical staff

+ ISBAR; Identify, Situation, Background, Assessment, Recommendation

++ CUS; I am Concerned, I am Uncomfortable, This is a Safety issue

§PEWS; Paediatric Early Warning Systems

¶ TeamSTEPPS; Team Strategies and Tools to Enhance Performance and Patient Safety

DESC; D, Describe the specific situation; E, Express your concerns about the action; S, Suggest other alternatives; C, Consequences should be stated

Figure Legends:

Figure 1: PRISMA flow diagram of selection of eligible studies

Identification

Records identified through database searching (PubMed, CINAHL, PsycInfo, EMBASE, Cochrane)
(n = 436)

Additional records identified through other sources
(n = 9)

Screening

Titles and abstracts screened
(n = 445)

Duplicates excluded
(n = 14)

Eligibility

Full-text articles assessed for eligibility
(n = 20)

Full-text articles excluded
(n = 8)

Included

Studies included in narrative synthesis
(n = 12)