ABSTRACT

Hospital errors are intractable problems that pose a threat to the safety of healthcare consumers. Despite efforts to improve the care of hospitalized patients, adverse events continue to increase. The Institute of Medicine estimated 98,000 deaths occur annually from preventable medical errors alone. More than half of all medical errors can be traced to poor communication, problems with teamwork, and ineffective collaboration between healthcare providers. The Agency for Healthcare Research and Quality (AHRQ) in collaboration with the Department of Defense (DOD) developed an evidence-based approach to patient care delivery. Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) delivers innovative techniques that improve communication and patient safety outcomes. TeamSTEPPS utilizes evidence-based teamwork that team members can apply to their healthcare settings. Four critical areas are addressed with TeamSTEPPS training: leadership, situation monitoring, mutual support, and communication. The research studies employed five quasi-experimental and one descriptive study design. The evidence from the research clearly supports the implementation of TeamSTEPPS to various healthcare settings. The authors of these studies acknowledged the importance of effective teams in daily patient care delivery. Team members reported satisfaction implementing the strategies offered through TeamSTEPPS.

INTRODUCTION

Medication errors have been identified as the leading cause of hospital-based errors followed by healthcare-associated infections (HAIs), surgical errors, and procedure errors.1 These errors have led to exponential costs to our healthcare system. An estimated $28 to $33 billion has been reported in yearly healthcare expenditures from these errors.2 These statistics are staggering and reflect an immediate need for action to improve patient care delivery.

According to Mahoney et al.,3 collaboration and communication are critical elements for optimal patient care delivery and environmental cultures of safety using effective team models. Effective teams share the following characteristics: mutual trust, understanding of roles, and conflict resolution skills. Four critical areas are addressed with TeamSTEPPS training: leadership, situation monitoring, mutual support, and communication.4 Successful strategies incorporate adoption of a shared mental model and the use of a common language. Examples of common language tools included: call-out, situation, background, assessment, recommendation (SBAR), and check back. Adverse events can occur if team members fail to engage in any of these essential elements.

TeamSTEPPS is an evidence-based teamwork approach that can be utilized by healthcare professionals to improve patient safety.5 “TeamSTEPPS is based on the concept of creating and sustaining a culture of safety.”6 The goal is patient safety with the use of improved methods of communication and application of teamwork principles.
MATERIALS AND METHODS

TeamSTEPPS in Psychiatric Settings
Mahoney et al.\(^3\) conducted research on the implementation of TeamSTEPPS in a psychiatric setting to improve team performance among healthcare team members. A unit assessment of the organisation recognised individuals were working in silos and lacked a shared mental model. The research question was clearly identified and appropriate key terms were searched for literature review. The method of investigation addressed three key areas: (a) assessment, (b) planning, training, implementing, and (c) sustaining. Team Assessment Questionnaire (TAQ), a survey tool of TeamSTEPPS, was given to participants at pre- and post-training periods. The reliability of the instrument was tested using Cronbach’s alpha and was 0.98. A descriptive analysis was done using a t test of 0.01 as statistically significant from pre- and post-survey results. Statistically significance findings were ascertained in five of the seven subscales measured.

TeamSTEPPS through Simulation
Meier et al.\(^7\) applied TeamSTEPPS as a part of the curriculum for medical students. The goal was to help students become more effective team members, improve their knowledge on the principles of teamwork, and improve team-related competencies. Methods consisted of multiple sessions in an elective class setting, tools from TeamSTEPPS, videotaped simulation scenarios, and role-play. The following methods were chosen to evaluate effectiveness: multiple-choice exams, Likert scales, and performance ratings of simulation exercises. Two blinded reviewers were used at pre- and post-implementation periods to analyse the simulation exercises. Global rating scales, nontechnical skills evaluation instruments (NOTECHS), Statistical Packages for the Social Sciences (SPSS), and paired sample t test were used to analyse data. A p value of <0.05 was defined as statistically significant.

TeamSTEPPS in Obstetrical Units
The study by Sheppard et al.\(^8\) explored the implementation of TeamSTEPPS to several obstetrical units in one organisation with the goal of improving communication and patient safety. Basic statistical methods were used to capture data and measurement tools consisted of Teamwork Evaluation of Non-technical Skills (TENTS) and patient satisfaction scores. Data was collected at pre- and post-implementation periods during TeamSTEPPS training. The researchers did not provide statistical methods such as odds ratios or confidence intervals to analyse their data. Outcome data was graphed using visual charts to measure the four components of TeamSTEPPS.

TeamSTEPPS in the Emergency Department
Turner\(^9\) described the experience of one emergency department that implemented TeamSTEPPS. A need assessment was conducted without clearly identifying the research question. A programme was developed to implement the fundamental elements of TeamSTEPPS with the intention of immediate buy-in from participants. Training strategies included simulation, vignettes created by staff, and reinforcement of TeamSTEPPS verbiage. Specific tools from TeamSTEPPS such as briefs, huddles, and de-briefs were implemented to improve communication and patient safety. They did not conduct any specific analysis of the chosen tools and strategies prior to the implementation of their programme. Effectiveness of the programme was evaluated after each training session through a TeamSTEPPS questionnaire. The information was used to improve future training sessions. However, there was not a valid tool utilised to organise the data collected as well as outcome data from baseline surveys.

TeamSTEPPS in Pediatric and Intensive Care Units
The study conducted by Mayer et al.\(^10\) clearly identified the research question; evaluating the effects on team performance and patient outcomes through the implementation of TeamSTEPPS. A detailed background assessment was conducted to support the need for the programme. A review of the literature was completed to find the best approaches to teach and design a change team for this project. Objectives, implementation strategies, assessment methods, and periods of data collection were clearly outlined for this study. The intervention design used was a seven evidence-based success factors approach described by Salas et al.\(^11\) Evaluation methods were conducted at pre- and post-implementation periods and included the following: staff surveys, staff interviews for qualitative purposes, and observation. Measurement outcome data for all objectives were done using p values.

TeamSTEPPS using Train the Trainer Model
The article by Stead et al.\(^4\) presented a clearly focused question for study. They researched the effectiveness of staff attitudes and behaviours along with the impact of patient care through the implementation of TeamSTEPPS in a psychiatric unit. No specific databases were identified despite the researchers’ focus on cases of error and communication in clinical practice. Specific observations were made at pre- and post-implementation stages. Data collection methods included field notes, recording sheets, reflective diaries, and Likert scales. Data was calculated using an analysis of variance method. Evaluation methods consisted of observation and surveys before and after TeamSTEPPS training. Z scores were used to evaluate outcome data. A 67% increase in error avoidance and 58% reduction in observable errors were noted from this study.

RESULTS
Evidence from the studies pointed to favourable outcomes with the implementation of TeamSTEPPS in various microsystems. Participants perceived the programme to be...
positive in promoting a culture of safety. Increased communication and improvement in teamwork were effective tools identified to maintain safe surroundings and positive patient outcomes. Flexibility of the programme and the ability to customise principles resulted in an increased likelihood of utilising the approaches. Team members reported favourable results with the use of huddling, briefing, and de-briefing as communication tools. Participants who engaged in role play scenarios, team building exercises, and communication techniques reported feeling better equipped to handle patient-care issues.

**TeamSTEPPS in Psychiatric Settings**

The study conducted by Sheppard et al.\(^7\) investigated the benefits of TeamSTEPPS through simulation. Participants perceived the programme to be positive in promoting a culture of safety. Increased communication and improvement in teamwork were identified to evaluate teamwork: (a) communication, (b) team leadership, (c) situation monitoring, (d) mutual support, and (e) overall leadership.\(^10\) Significant improvements were seen in all elements of teamwork after 1 month. At 6 and 12 months, improvements in staff perceptions of teamwork and communication remained significant. According to Mayer et al.\(^10\) significant improvements were observed in ECMO and a decrease in HAI rates were observed after implementation of TeamSTEPPS. There was no significant difference observed in RRT from pre- to post-implementation of TeamSTEPPS.

The study by Mayer et al.\(^10\) was one of the strongest that provided evidence and scientific rigor to support their research. Although their findings reinforced the successful implementation of TeamSTEPPS to healthcare settings, they did acknowledge limitations to their study. The researchers pointed out that not having a control group and other valid factors limited their ability to make a causal relationship from the implementation of TeamSTEPPS. Another limitation was the observational data might not have been reliable since a proven tool was not used to analyse the data collected. Also, there was only one individual used to collect observational data.

**TeamSTEPPS in Obstetrical Units**

The research by Meier et al.\(^7\) using simulation exercises on medical students lends favour to the continued use of simulation as a means of helping those in the healthcare field transition from classroom to actual practice settings. Kirkpatrick’s theoretical framework had a positive impact on learning for these students. Strong statistical data methods were employed to evaluate the impact of TeamSTEPPS.

**TeamSTEPPS in the Emergency Department**

The study conducted by Turner\(^9\) lacked an effective plan, was loosely integrated, and poorly organised into their practice setting. The research failed to provide baseline data to support the need for change despite identifying a need for change was necessary. Since there were no valid measurement tools used to analyse data, it affected the external validity of the study.

**TeamSTEPPS in Pediatric and Intensive Care Units**

The study conducted by Mayer et al.\(^10\) investigated the benefits of TeamSTEPPS on two units, the pediatric intensive care unit (PICU) and surgical intensive care unit (SICU). PICU and SICU were selected for this study with the belief that successful implementation would maximise future organisational spread.

Four components were identified for improvement: (a) interviews with key staff involved in the initiative, (b) direct observations of teamwork, (c) organisational staff surveys, and (d) clinical outcomes data.\(^10\) The following elements were identified to evaluate teamwork: (a) communication, (b) team leadership, (c) situation monitoring, (d) mutual support, and (e) overall leadership.\(^10\)

Significant improvements were seen in all elements of teamwork after 1 month. At 6 and 12 months, improvements in staff perceptions of teamwork and communication remained significant. According to Mayer et al.\(^10\) significant improvements were observed in ECMO and a decrease in HAI rates were observed after implementation of TeamSTEPPS. There was no significant difference observed in RRT from pre- to post-implementation of TeamSTEPPS.

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**DISCUSSION**

A potential weakness of the implementation of TeamSTEPPS was the lack of a control group to measure success.\(^10\) Barriers to implementation of TeamSTEPPS included employees who were rudimentary thinkers, inconsistent in team commitment, those without a shared mental model, and those who lacked motivation to implement the new strategies. Sustainability was identified as a potential weakness if team cohesiveness was not maintained.

Evidence from the studies pointed to favourable outcomes with the implementation of TeamSTEPPS in various microsystems. Participants perceived the programme to be positive in promoting a culture of safety. Increased communication and improvement in teamwork were effective tools identified to maintain safe surroundings and positive patient outcomes. Flexibility of the programme and the ability to customise principles resulted in an increased likelihood of utilising the approaches. Team members reported favourable results with
the use of huddling, briefing, and de-briefing as communication tools. Participants who engaged in role play scenarios, team building exercises, and communication techniques reported feeling better equipped to handle patient-care issues.

CONCLUSION

Several key elements were identified as a means of improving communication and patient-care delivery. These included simulation, huddles, vignettes applicable to each setting, and action plans to support sustainability. The integration of TeamSTEPPS simulation beginning at the academia level creates the foundation for healthcare providers to build upon. Creating change teams was identified as a means of framing effective teams and maintaining sustainability of the TeamSTEPPS programme.

It is equally important for management to involve frontline staff through the redesign process to ensure transparency of all changes implemented. This approach appeals to members of the team, as they become a part of the process of change. Through continued use, a shared common language is adopted among healthcare teams when communicating with one another, promoting sustainability of the programme.

Since TeamSTEPPS is a relatively new concept, it is not surprising that a meta-analysis or meta-synthesis has not been conducted at this time. As the TeamSTEPPS approach continues to gain acceptance in various healthcare settings, a meta-analysis is likely to follow. Current research studies have presented rich qualitative data such as patient and employee satisfaction surveys. Therefore, a mixed method research study would further strengthen and support the use of TeamSTEPPS.

REFERENCES