

MASTER THESIS

LITERATURE REVIEW IN SEARCH
FOR A GENERIC REPORTING
FRAMEWORK ON COMPLEX
INTERVENTIONS LIKE TEAMSTEPPS

TOWARD COLLABORATIVE
EXCELLENCE IN A SURGERY
DEPARTMENT: A CUSTOMIZED
TEAMSTEPPS APPROACH

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MARCH 2018

UNIVERSITY OF TWENTE.

NOTE

- **THIS MASTER THESIS CONSISTS OF TWO ARTICLES: A LITERATURE REVIEW AND A RESEARCH PAPER. THE INDEX BELOW GIVES AN OVERVIEW OF BOTH ARTICLES. THE START OF EACH ARTICLE IS MARKED WITH THE TITLE IN UPPERCASE.**
- **THIS IS THE CONSOLIDATED VERSION OF THE THESIS. TO REQUEST ACCESS TO THE NON CONSOLIDATED VERSION, CONTACT ROBERT WISSE (R.WISSE@ALUMNUS.UTWENTE.NL) OR WOUTER KEIJSER (WOUTER@KEIJSER.COM).**

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Preface

It is done! After a long period of reading, research, writing, doubt, deleting sentences, doubt, more reading, statistics and more writing, my master thesis is finally finished. I would like to thank everyone that helped me with the research and the writing process of this thesis, especially Wouter Keijser, Celeste Wilderom and Peter van den Berg. And of course, thanks to everyone that supported me during the moments when I needed support.

Robert Wisse

Enschede, March 2018

Definitions

Intervention	A (quality) improvement initiative to be implemented in a (healthcare) organization.
Implementation	An actively planned and deliberately initiated effort with the intention to bring a given intervention into policy an practice within a particular setting (Pfadenhauer et al., 2017).
Context	A set of characteristics and circumstances that consist of active and unique factors, within which the implementation is embedded. As such a context is not a backdrop for implementation, but interacts, influences, modifies and facilitates or constrains the intervention and its implementation (Pfadenhauer et al., 2017).
Setting	The specific physical location, in which the intervention is put into practice (Pfadenhauer et al., 2017).

LITERATURE REVIEW IN SEARCH FOR A GENERIC REPORTING FRAMEWORK ON COMPLEX INTERVENTIONS LIKE TEAMSTEPPS

Purpose – Because of the complexity of quality improvement interventions in healthcare organizations, it is difficult to pinpoint the reasons of failure or success. Extensive, systematic and homogeneous reporting contributes to the improvement of interventions and future implementation studies. The purpose of this paper is to develop a framework to evaluate the reporting of implementation evaluation studies. The complex intervention Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) is used as a test case.

Methodology/approach – The authors developed a framework based on existing implementation and reporting frameworks for evaluating and reporting on (complex) interventions. Then, a literature search was performed to select peer-reviewed journal articles describing learned skills and deployed tools, during a phased implementation of TeamSTEPPS in an interdisciplinary environment, with the use of a Master Trainer. Finally, the developed framework was used to evaluate the extensiveness of reporting of the included articles as well as to inventory of determinants for successful implementation.

Findings – The presented framework seems suitable (in this testcase) for the evaluation of reporting of complex interventions in healthcare organizations. It was found that the detail of reporting in papers describing a TeamSTEPPS implementation is often inadequate.

Research limitations – It is unknown if the presented framework is suitable for the evaluation of reporting on other interventions than TeamSTEPPS.

Practical implications – Implementers can use this framework as a guideline for their intervention evaluation.

Value – This is the first literature review evaluating the reporting of TeamSTEPPS intervention studies. The developed framework offers a structured method to evaluate the reporting of complex interventions.

Keywords Quality improvement, TeamSTEPPS, complex intervention, reporting, framework

Paper type Literature review

Introduction

Especially since the publication of the report 'To err is human: building a safer health system' (Donaldson, Corrigan, & Kohn, 2000), which reported about adverse events in hospitals in the USA, there is a growing attention for patient safety and healthcare quality and the improvement of both concepts.

An important step to improve healthcare quality was taken in 2001, when the US Institute of Medicine (IOM) presented ten rules for redesigning the healthcare system (Institute of Medicine, 2001). IOM stated that healthcare improvement is not only about (patient) safety and adverse events, but healthcare also needs to be more effective, patient-centered, timely, efficient, and equitable. Therefore, the healthcare system needs to, for instance, address the cooperation between clinicians, be more transparent, and anticipate patient needs.

Aron and Headrick (2002) state that to improve the quality of performance, teamwork needs to be improved. In other high reliability industries like aviation and nuclear power it is customary to train staff on teamwork. For instance, Crew Resource Management (CRM) was introduced in the aviation industry and later introduced in healthcare (Aron & Headrick, 2002).

Other often used quality improvement (QI) initiatives are nontechnical skills (NTS) team training, the human factors and ergonomics (HFE) approach, Lean thinking, and Six Sigma. Each QI initiative aims to improve patient safety and healthcare quality in their own way. The last two mentioned initiatives do have a technical view on healthcare. The HFE approach is a QI initiative that focusses on the interaction between humans and elements in the system. With this in mind, procedures and devices are (re)designed (Ballangrud et al., 2017; Carayon et al., 2014). Lean thinking and Six Sigma see a healthcare system as any other service operation (Koning, Verver, Heuvel, Bisgaard, & Does, 2006). Patient safety improvement is combined with cutting costs by improving the operational efficiency.

NTS team training focusses, like CRM, more on team training to improve teamwork. Riley et al. (2011, p. 357) states "NTS are the cognitive and interpersonal skills, supplementing clinical and technical skills, necessary to ensure safe patient care." Another QI initiative that aims to improve teamwork is 'Team Strategies and Tools to Enhance Performance and Patient Safety' (TeamSTEPPS).

TeamSTEPPS

TeamSTEPPS, developed by the Agency for Healthcare Research and Quality (AHRQ) and the Department of Defense (DoD) of the United States, was designed to train healthcare professionals in multidisciplinary settings in order to improve patient safety and healthcare quality (Clancy & Tornberg, 2007).

According to Salas, Sims, and Burke (2005) there are five components of teamwork: team leadership, mutual performance monitoring, backup behavior, adaptability, and team orientation. These are supported by closed-loop communication, mutual trust, and shared mental models. Although the TeamSTEPPS curriculum uses other terms and even combines components, it is based on the work of Salas et al. (2005). TeamSTEPPS offers training in four core competencies: team leadership, situation monitoring, mutual support, and communication. It learns

healthcare professional specific techniques and skills to improve these four components, such as SBAR (Situation Background Assessment Recommendation), handoff and debriefs (Clapper & Kong, 2012).

The TeamSTEPPS toolkit can be tailored in order to fit local health and care settings, from high to low demanding types (Clancy & Tornberg, 2007). Since the introduction of TeamSTEPPS, it is implemented in different healthcare settings, ranging from military hospitals (Deering et al., 2011) to mental health clinics (Stead et al., 2009) and from emergency departments (Jones, Podila, & Powers, 2013) to primary care (Treadwell, Binder, Symes, & Krepper, 2015).

Complex interventions

Because TeamSTEPPS consists of multiple components and interactions it can be said that it is a complex intervention. A complex interventions (CI) is an intervention that consists “of multiple behavioral, technological, and organizational components” (May et al., 2007, p. 2). Craig et al. (2008, p. 2) give a more elaborate definition. Firstly, the intervention must contain several interacting components with many behaviors and high degree of skills required by those delivering or receiving the intervention. Furthermore, there are several groups or organizational levels targeted by the intervention and the intervention can be tailored. Lastly, there are a number and variability of outcomes (Craig et al., 2008; Hawe, Shiell, & Riley, 2009). The cause for change, or the ‘active ingredient’, is hard to define in a CI. Evaluating a CI is therefore difficult and questions like “which interacting component caused the unsuccessful outcome?” and “do all groups respond to the same approach?” are difficult to answer.

Implementation challenges

Despite the fact that TeamSTEPPS is evidence-based, field tested in the US Military Hospital Services (Clancy & Tornberg, 2007) and successfully implemented in different hospitals and settings, the implementation of TeamSTEPPS can fail. According to Clapper and Ng (2013, p. 287) this can be caused by “(a) lack of administrative support and resources, (b) lack of training focus to address hierarchal differences and incivility at all levels of healthcare practice and administration, (c) inadequate TeamSTEPPS instruction and simulation practices, and (d) educators’ resistance to change from CRM concepts.” Other authors report the lack of involvement of physicians as an important reason for failure (Jones et al., 2013; Sheppard, Williams, & Klein, 2013; Wong, Gang, Szyld, & Mahoney, 2016).

Wilkinson, Powell, and Davies (2011) report that healthcare professionals in general are reluctant to engage in QI initiatives. Especially physicians are conservative in adopting new guidelines or techniques. They resist adopting them “based on issues such as agreement, self-efficacy, and environmental factors” (Audet, Doty, Shamasdin, & Schoenbaum, 2005, p. 843). In some countries, physicians are not employed by healthcare organizations, but by their own private foundations. Hospitals and other healthcare organizations hire the physicians through these foundations. Physicians conceive of themselves as (financially) independent from the hospitals (Neale, Vincent, & Darzi, 2007). Training in multidisciplinary teams can create understanding of each other’s roles and it has been shown to improve patient outcomes (Weller, Boyd, & Cumin, 2014). Therefore, physicians should at least consider to engaged in team training.

Reporting

The main objective of intervention evaluation studies is often to find whether the goal of the intervention is met or not. But how and why the intervention works are equally important questions (Brewster et al., 2015). A systematic evaluation contributes to the identification of the active ingredients, and factors impeding the implementation of a CI, or in this case TeamSTEPPS.

Besides the evaluation, the implementation itself needs to be comprehensively reported. Möhler, Bartoszek, and Meyer (2013, p. 2) report that “sufficient information must be available for the judgement of the intervention’s clinical benefits, for replication, or for adaption of an intervention to different settings or countries.” In comparison to conventional (controlled) studies, a complex intervention is particularly difficult to implement due to the unknown ingredients and interactions between components. Although these components may be different in every setting, an accurate description of the implementation process and the impeding and facilitating factors can contribute to the success of the implementation.

Weaver et al. (2010, p. 1756) reported in their literature review about team training in healthcare, that “nearly all reviewed studies failed to specify important content.” And more recently Hariohm, Jeyanthi, Kumar, and Prakash (2017) reported that non-pharmacological interventions in random clinical trials (RCTs) are poorly described.

The goal of this paper is to present a framework which can be used for analysing the extent of reporting the implementation of complex interventions. The complex intervention TeamSTEPPS is used as a testcase in order to test the suitability and applicability of the framework. Secondary objectives are to examine (1) to what extent implementation processes of TeamSTEPPS as a complex intervention are described in the current scientific literature, (2) how the role of physicians in TeamSTEPPS implementation is described and (3) what the facilitating and impeding factors in TeamSTEPPS implementation are.

Theory

In scientific literature there are several frameworks and guidelines that provide a structured method to evaluate the implementation of CIs. In this theory section the most relevant frameworks will be discussed. Furthermore, a way to group facilitating and impeding factors of a intervention will be discussed.

Frameworks and guidelines

Evaluating a complex intervention

In 2000 the Medical Research Council (MRC) developed an evaluation framework for complex interventions (Campbell et al., 2000). It was developed out of the call for better evaluations of non-pharmacological interventions, such as interventions targeted at the healthcare professional (Medical Research Council, 2000). These interventions are less linear than traditional RCTs in healthcare and are therefore more difficult to evaluate.

The goal of this framework is that “the use of an iterative phased approach that harnesses qualitative and quantitative methods should lead to improved study design, execution, and generalizability of results” (Campbell et al., 2000, p. 696). In 2008 and 2015 it was further improved (Craig et al., 2008; Moore et al., 2015). Craig et al. (2008, p. 340) added that the framework “can be used to assess fidelity and quality of implementation, clarify causal mechanisms and identify contextual factors associated with variation in outcomes.”

The MRC framework describes four implementation stages; development, feasibility and piloting, evaluation and, (long-term) implementation (see figure 1). These stages are not necessarily followed up in a linear or cyclical process (Craig et al., 2008).

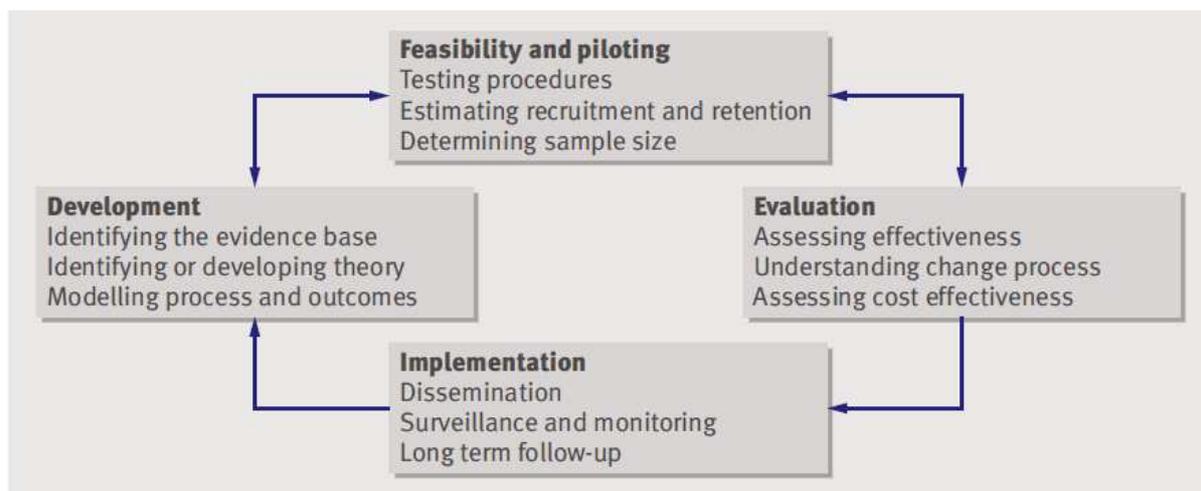


Figure 1: Key elements of the development and evaluating process of a complex intervention (from Craig et al. (2008)).

The MRC framework is parallel process evaluation; the evaluation occurs during the implementation of the intervention. Although the framework can be used for other study designs, it is focused on the evaluation of RCTs. However, most studies about the implementation of TeamSTEPPS are not RCTs. Furthermore, the goal of this paper is to evaluate the reporting of the implementation of TeamSTEPPS, not the implementation itself, the MRC framework can therefore not be used directly for this literature review. Other frameworks may be more useful in the evaluation of TeamSTEPPS implementations.

Evaluating a health promotion intervention

There are many frameworks that guide the evaluation of a health promotion intervention. Health promotion interventions are interventions that target specific groups (e.g., employees) to promote a different lifestyle or behavior (e.g., more exercise during work) to improve their health.

Glasgow, Vogt, and Boles (1999) developed a framework to evaluate community-based and public health interventions. Although the authors do not speak of the phrase ‘complex intervention’, they mention the need for a framework that is designed to evaluate “more complex, less advantageous settings” (Glasgow et al., 1999, p. 1322). The framework (RE-AIM) evaluates five factors: Reach, Efficacy, Adoption, Implementation, and Maintenance. Each dimension is represented on a zero to one scale, interventions are represented by the ‘public health impact score’; the product of the five factors.

For their evaluation study about a worksite health promotion program Wierenga, Engbers, van Empelen, Hildebrandt, and van Mechelen (2012) developed an evaluation framework based on several other frameworks. It uses the categorization proposed by Fleuren, Wiefferink, and Paulussen (2004) to categorize facilitating and impeding factors. Furthermore, the framework evaluates seven steps of the implementation process (Wierenga, Engbers, Van Empelen, & van Mechelen, 2016). These steps are: (1) creating solid support, (2) formation of basic structure, (3) needs assessment, (4) development phase, (5) implementation phase, (6) evaluation and (7) maintenance.

The RE-AIM and the framework from Wierenga et al. (2012) are mainly focused on social-health programs, such as anti-smoking and anti-obese interventions. Because TeamSTEPPS is a teamwork intervention to improve teamwork and communication for healthcare professionals these frameworks may not be fully applicable for this literature review.

Evaluating a team training intervention for healthcare professionals

Weaver et al. (2010) used 11 questions to analyze the reporting of team training interventions targeting clinical care providers in healthcare, or healthcare team training (HTT). The questions were later updated by Marlow et al. (2017). The questions describe the context, participants, and subject of the training and type of delivery during the training. Also, they describe how, and when the training is being evaluated. The list of questions has been used for multiple literature reviews about HTT to identify trends in HTT practice and evaluation, but these literature reviews do not report on the reporting of papers.

The framework by Zhu, Baloh, Ward, and Stewart (2015) is developed for organization-wide implementations of TeamSTEPPS in hospitals. It describes the preparation phase in five steps: (1) assess needs, (2) reflect on context, (3) set goals, (4) develop a shared understanding, and (5) select change agents. Because the framework focusses on the preparation stage of an implementation and is not meant for the evaluation of the total implementation, it is not entirely applicable for this study.

Frameworks and guidelines for reporting

There are several frameworks and guidelines which describe how to best report on an intervention. Specifically, for the reporting on CIs there is the CReDECI 2 guideline (Criteria for Reporting the Development and Evaluation of Complex Interventions in healthcare). It is a reporting guideline that builds on the MRC framework (Möhler, Köpke, & Meyer, 2015). The guideline reports on 13 items, categorized by three stages. The first stage describes the development of the intervention, the second the feasibility and piloting and the third the evaluation of the implementation. CReDECI 2 does not offer criteria for a specific study design and can therefore be used for all study designs.

Impeding and facilitating factors

Impeding and facilitating factors are factors, intended and unintended, that can influence an implementation process and/or outcome. They can be categorized in five categories: (1) characteristics of the socio-political context (e.g. interfering interventions), (2) characteristics of the organization (e.g., the culture, leadership, resources), (3) characteristics of the implementer (e.g. skills, profession), (4) characteristics of the intervention

program (e.g. timing of intervention activities, complexity) and (5) characteristics of the participant (e.g., degree of participation) (Fleuren et al., 2004; Wierenga et al., 2013; Wierenga et al., 2012).

Discussion

In this paper a framework is presented to evaluate the reporting of intervention evaluation studies. The generality of the presented framework can be disputed. As most frameworks on which the presented framework is based are developed to evaluate healthcare interventions, it is uncertain if the framework is suitable for studies describing non-healthcare interventions.

Furthermore, some (general) items from the CReDECI framework were purposely not implemented in the framework (i.e., the description of the intervention's underlying theoretical basis), because they did not concur with an intervention such as TeamSTEPPS which is an existing evidence-based intervention. Therefore, it is recommended to reflect and compare the framework with non-healthcare themed frameworks. Also tests to confirm the general suitability of the framework with non-healthcare interventions, interventions mainly described in random-clinical trial studies, and new emerging interventions are recommended.

The authors picked the frameworks, on which the presented framework is based, from an incomplete list of frameworks. As reported by Bragge, Grimshaw, Lokker, and Colquhoun (2017) there are 280 reporting frameworks and it is therefore nearly impossible to review all. This may limit the completeness of the items in the framework.

The authors are aware that the framework can be more detailed in order to spotlight a specific part of the intervention. Pfadenhauer et al. (2017) for instance, focusses more on the description of interactions between the intervention and the context. Whereas the presented framework focusses more on the actions taken to anticipate on the context before the start of the implementation. However, the authors felt that, for this testcase, the level of detail of the framework was sufficient.

After the development of the framework, TeamSTEPPS intervention evaluation studies were selected to test the framework. It was found that the reporting in these studies is insufficient. As previously noted, in a complex intervention, like TeamSTEPPS, it is difficult to pinpoint what the reasons for implementation failure or success are. It is therefore vital to evaluate the intervention extensively and report in detail. Detailed reporting is not only important for future (Möhler et al., 2013), but is also a waste of resources such as research funding (Hoffmann, Erueti, & Glasziou, 2013).

Although no earlier evaluation on reporting TeamSTEPPS evaluations has been done, other studies report the failure to report important content in other interventions (Hariohm et al., 2017; Weaver et al., 2010). In the articles reviewed in this study, reporting is inadequate for replication and adoption in different settings. It stands out that more recent published articles did clearly not learn from the inadequate reporting of older studies. Additionally, the reporting per component varies between articles. Apparently, there is no consensus on what and how to report. The presented framework can possibly be used as a guide for researchers implementing and

describing a TeamSTEPPS intervention. Also, intervention protocols like the one from Dahl et al. (2017) can help other implementers to improve TeamSTEPPS interventions.

Gillespie, Chaboyer, and Murray (2010, p. 655) state: “Team training is not a one-day or single-session event; therefore, teamwork behaviors need to be acknowledged and reinforced in mentoring sessions and annual performance evaluations.” This calls for special attention to the sustainment phase. However, although the sustainment phase of the intervention is explicitly described in the TeamSTEPPS guide (AHRQ, 2014), only 15 out of the 27 included articles reported sustainment activities. Implementers need to pay more attention to sustaining teamwork behaviours and team performance.

Recently an article was published describing the sustainment of TeamSTEPPS seven months after the implementation (Lee et al., 2017). This is an important development, because sustaining the effects of TeamSTEPPS is reported to be challenging. Literature describes the decline of improvements within six months to a year (Forse, Bramble, & McQuillan, 2011; Thomas & Galla, 2013).

The results from the review confirm the statement of Ward, Zhu, Lampman, and Stewart (2015) that most TeamSTEPPS interventions are done in academic hospitals. Recent research about adverse incidents in the Netherlands found that there was no significant difference in the preventable deaths and adverse events between academic and regional hospitals (Langelaan et al., 2017). So, it seems that implementation of TeamSTEPPS is as important in regional hospitals as in academic hospitals.

To overcome TeamSTEPPS implementation failures, one of the recommendations by Clapper and Ng (2013, p. 288) is the so called saturation model: “departments and organizations may see a change in culture or behaviors if enough learners are trained in a skill or procedure in a short time.” Therefore, the movement of educating healthcare students about TeamSTEPPS in interprofessional education seems promising (for instance Robertson et al. (2010), Baker et al. (2015) and Horsley et al. (2016)).

Another problem mentioned by Clapper and Ng (2013, p. 287) is the “lack of training focus to address hierarchical differences and incivility”. They recommend trainers to rectify existing cultures and to improve the leadership skills of physicians. As several studies report the lack of physician involvement as a reason of failure (Jones et al., 2013; Sheppard et al., 2013; Wong et al., 2016), it becomes more and more important to address this problem. Because of the lack of reporting, it is often unclear if and how this problem is addressed. Future intervention evaluation studies therefore need to report on the performed activities addressing the culture and physicians in more detail.

Conclusion

This paper presented a framework to evaluate the reporting of implementations of complex interventions. The complex intervention TeamSTEPPS was used as a test case. It was found that TeamSTEPPS has been mainly implemented in high-demanding settings in US-based academic hospitals. The effects are mostly researched by conducting a pre-post training or longitudinal study design. Most studies use only one or two levels Kirkpatrick’s levels of training evaluation to evaluate the effectiveness of the implementation. Papers often report the

importance of multidisciplinary participation in the intervention, physician engagement and, managerial leadership support.

Reporting about the implementation in the reviewed articles is inadequate. The used method and the presented framework seem suitable for the evaluation of reporting of complex interventions in general.

References

[on request]

TOWARD COLLABORATIVE EXCELLENCE IN A SURGERY DEPARTMENT: A CUSTOMIZED TEAMSTEPS APPROACH

Purpose – The Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPS) intervention is widely implemented in different settings, however several studies report a lack of physician engagement. This paper describes the implementation and evaluation of a TeamSTEPS intervention with special attention for monodisciplinary teams and medical leadership. The aim of the intervention was to improve teamwork and communication by promoting to speak up.

Methodology/approach – The intervention consisted of three types of (team) training: (1) monodisciplinary sessions, (2) medical leadership assessments, and (3) multidisciplinary sessions. Pre- and post-training surveys, interviews, and incident notifications were used to identify the effect on patient safety, team climate, teamwork and communication.

Findings – It was found that there was a sustained improvement on team structure, leadership and mutual support. Furthermore, there was a significant decrease in the number of incidents. It seems that the customized part of the intervention, the monodisciplinary training sessions and the medical leadership development program, contributed to the effect of the intervention.

Research limitations – The used data collection methods have several weaknesses, which prevented a certain conclusion about the effect of the customized TeamSTEPS approach.

Value – This paper offers a possible solution to improve the engagement of medical staff (physicians) in team training interventions.

Keywords TeamSTEPS, complex intervention, complex adaptive system, medical leadership, quality improvement

Paper type Research paper

Introduction

Since the publication of 'To err is human: building a safer health system' (Donaldson et al., 2000), which reported about adverse events in hospitals in the USA, there is growing attention for patient safety and healthcare quality. For instance, the Netherlands Institute for Health Services Research (NIVEL) and the EMGO Institute for Health and Care Research (EMGO+) report, since 2004 every four years, on the patient safety and adverse events in Dutch hospitals (Baines et al., 2013; Baines, Langelaan, de Bruijne, Spreeuwenberg, & Wagner, 2015; Langelaan et al., 2013). According to the latest report, 39.2% of the (preventable) adverse events is caused in surgery (Langelaan et al., 2017, p. 46). Sanchez, Ferdinand, and Fann (2016) state that two-thirds of surgical adverse events occur in in-patients, and approximately half of these are preventable.

Team training in healthcare

One of the recommendations from the report by Langelaan et al. (2017, p. 88) is to improve the safety culture, communication and teamwork in multidisciplinary teams. Sacks et al. (2015, p. 458) states: "culture improvement appears to be associated with other positive effects, including better patient outcomes and enhanced healthcare efficiency."

In a survey of pediatric cardiac surgery teams by Sanchez et al. (2016) demonstrated that 29% of team members felt they had difficulty speaking up if they perceived a problem, and 41% felt unable to express disagreement. Dankoski, Bickel, and Gusic (2014, p. 1611) advise academic hospitals to "train leaders in relational communication so that they become comfortable with conflict and differing perspectives."

Many more employees need to be skilled at speaking up. Standing up to authority is difficult. In a study about speaking up in the corporate sector, Milliken, Morrison, and Hewlin (2003) found that 85% of employees in their sample felt, at least once, unable to raise an important issue to their supervisor. Edmondson (2003) recommends that team leaders need to facilitate the willingness to speak up openly and create psychological safety, by acknowledging their own fallibility and by emphasizing teamwork.

The quality improvement (QI) initiative Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS), is a team training program that aims to improve team collaboration and communication in healthcare. TeamSTEPPS was developed and designed by the Agency for Healthcare Research and Quality (AHRQ) and the Department of Defense (DoD) of the United States, in order to train healthcare professionals in multidisciplinary settings (Clancy & Tornberg, 2007). The TeamSTEPPS curriculum is based on the theory by Salas et al. (2005). TeamSTEPPS offers training in four core competencies: team leadership, situation monitoring, mutual support and communication. During the TeamSTEPPS training healthcare professionals learn specific techniques to improve for instance speaking up and clear communication.

The TeamSTEPPS toolkit can be tailored in order to fit every environment, from healthcare organizations with high-stress situations to settings where communication and teamwork are more important (Clancy & Tornberg, 2007). Since the introduction, TeamSTEPPS is implemented in different healthcare settings. Ranging from

military hospitals (Deering et al., 2011) to mental health clinics (Stead et al., 2009) and from emergency departments (Jones et al., 2013) to primary care (Treadwell et al., 2015).

Physician engagement

In their article about why TeamSTEPPS interventions may not be working as intended, Clapper and Ng (2013) introduce the saturation model. They argue that in order to change in culture or behavior it is important that as much employees as possible are trained in a short time. Only then, the whole organization or department can adopt the trained behavior or skill. Other studies support this idea. For instance, Weller et al. (2014, p. 151) states that “training that includes all members of the team has been shown to improve patient outcomes.”

Several studies report the lack of physician involvement as an impeding factor in the implementation of TeamSTEPPS (Jones et al., 2013; Sheppard et al., 2013; Wong et al., 2016). The reason of the lack of engagement may be that interdisciplinary collaboration is less valued by physicians than nurses (Braithwaite et al., 2013).

Complex adaptive systems and physician leadership

A complex adaptive system (CAS) is “a dynamic network of agents acting in parallel, constantly reacting to what the other agents are doing, which in turn influences behavior and the network. Control tends to be dispersed and decentralized and the overall behavior of the system is the result of many decisions made constantly by individual agents” (The Health Foundation, 2010, p. 6). Several articles argue that healthcare organizations such as hospitals are complex adaptive systems (Loeb, 2016; Minas, 2005).

Loeb (2016) argues that the definition of CAS aligns with the definition of teams given by Salas, DiazGranados, Weaver, and King (2008, p. 1003) “Teams have meaningful task interdependencies, hold shared and valued objectives, use multiple information sources, possess adaptive mechanisms, and perform through intensive communication processes.” Therefore, it can be argued that “Team training is an attempt to provide CAS agents with tools and strategies that promote self-organization” (Loeb, 2016, p. 15).

Researchers argue that leadership is “an activity rather than a position of formal authority” and “individuals do not become leaders, but individuals choose to exercise leadership” (Cohen & Tedesco, 2009, p. 5). Important skills for leaders in a CAS are self-awareness, shared authority, conflict resolution, and non-punitive critique (Prather & Jones, 2003). They need to understand that change is important and how change can improve the system (Minas, 2005).

Physicians would need to be the leaders in change instead of the inhibitors of change. Prather and Jones (2003) state that a CAS demands a new type of physician leadership and that the traditional power and authority of physicians is outdated.

Study objective

The TeamSTEPPS intervention seems a suitable option to improve the safety culture and the ability to speak up and thus decrease the number of adverse events. However, the success of TeamSTEPPS interventions is obstructed by the lack of physician engagement. TeamSTEPPS focusses on a culture of continuous improvement,

and therefore the theory of CAS and the role of leaders could be used to improve the success of a TeamSTEPPS intervention by engaging physicians and promoting (medical) leadership.

In this study a TeamSTEPPS intervention in a cardiac thoracic surgery department in an academic hospital in the Netherlands is described and evaluated. The TeamSTEPPS curriculum is customized by adding additional training focused on (1) monodisciplinary teams and (2) (medical) leadership by physicians. The objectives of this study are (1) to evaluate the customized TeamSTEPPS implementation, (2) identify the effects and outcomes of the intervention and (3) the role of the customized part (the monodisciplinary training sessions and the medical leadership development program).

Theory

As mentioned the TeamSTEPPS intervention was customized by additional training on two subjects. The first part focused on the improvement of team cohesion and the atmosphere and climate of monodisciplinary teams, the second on the medical leadership development of physicians. In this section the rationale of the customized part of the TeamSTEPPS intervention is further explained.

Monodisciplinary sessions

The monodisciplinary training sessions focus on increasing team cohesion of the monodisciplinary teams. Team cohesion is defined as “the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives” (Tekleab, Quigley, & Tesluk, 2009, p. 174). In their study about team conflict and team cohesion Tekleab et al. (2009) found initial evidence that team cohesion is negatively influenced by conflict. In addition, it is suggested that team cohesion affects team effectiveness (Tuckman, 1965).

At the same time the sessions aim to influence the team climate and the willingness for change of individual team members by discussing collaboration issues and the needs and demands of the staff. It is conceivable that persisting conflict affects the team climate and in the end also the culture of the organization. Damschroder et al. (2009, p. 58) define culture as “norms, values, and basic assumptions of a given organization” and climate as “a phenomenon that can vary across teams or units, and is typically less stable over time compared to culture.” In their systematic review Braithwaite, Herkes, Ludlow, Testa, and Lamprell (2017) found that positive organizational and workplace cultures are related to positive patient outcomes. Creating a more positive culture thus does not have only an effect on the work environment, but also on the quality of healthcare.

Organizational change starts with behavioral change of individuals, which is influenced by the team climate (Damschroder et al., 2009). According to Damschroder et al. (2009, p. 58) there are several sub-constructs that contribute to a positive implementation climate:

- Tension for change: The degree to which stakeholders perceive the current situation as intolerable or needing change.
- Compatibility: The degree of tangible fit between meaning and values attached to the intervention by involved individuals, how those align with individuals' own norms, values, and perceived risks and needs, and how the intervention fits with existing workflows and systems

- Relative priority: Individuals' shared perception of the importance of the implementation within the organization.

In conclusion, it seems that addressing these concepts and improving team cohesion may be an addition to the TeamSTEPPS intervention.

Medical leadership development

Physicians are at the center of healthcare, the pivot between patients and other healthcare professionals. In a recent study by Aveling et al. (2018) about team behaviors in surgery, participants pointed out the need for a 'director'. The participants further stated that, although it can be done by others, surgeons usually should serve as this leader.

Because of the prominent role physicians play in healthcare, physicians are often viewed as leaders, although they often lack the skill to be a leader (Grady, 2016). Smits, Bowden, Wells, and Dickson (2016) and others have shown that leaders do influence the culture of an organization. In healthcare, physicians thus play a vital role in changing behaviors and improving patient safety and healthcare quality. This is also underlined by Grady (2016, p. 256): "Leadership behavior is instrumental to either the encouragement or discouragement of a team's ability to embrace change, including its capacity for generation of new ideas or to be innovative."

In the last decade, multiple initiatives, in several countries, were undertaken in order to improve the leadership abilities of physicians (NHS Leadership Academy, 2010; Platform Medisch Leiderschap & Universiteit Twente, 2015) and there is evidence of the effects of medical leadership on the overall quality of healthcare and factors such as patient mortality and staff well-being (West et al., 2015). Medical leadership development, where physicians learn to lead not out of tradition or authority but as peers, may therefore be a good addition to TeamSTEPPS.

It is reported that surgical team members are not fully aware of their own teamwork skills (Mills, Neily, & Dunn, 2008; Wauben et al., 2011). As Wahr et al. (2013, p. 1141) state it: "selfassessment of communication and teamwork skills by surgeons and anesthesiologists is disturbingly discordant with the opinions of their associated nursing and perfusion staff." Therefore, using an assessment tool to create awareness under physicians about this discrepancy seems like a suitable solution for this problem.

Limitations

[on request]

Discussion

As mentioned in the introduction, physician engagement in TeamSTEPPS interventions is reported as a problem in literature. Although, not all staff was 100 percent engaged and committed to the intervention, the absence was not a problem in this study. There are several factors that contributed to this. Firstly, the multidisciplinary sessions were compulsory, and presence of all disciplines was required. Secondly, the monodisciplinary sessions created a platform for addressing the sense of urgency of the intervention and change the team climate of the to a more open and accepting climate. Other factors such as peer pressure may also have been contributed to physician engagement.

The multidisciplinary sessions contributed to the awareness that every team member is required to speak up about events compromising patient safety, healthcare quality and teamwork. It seems that the multidisciplinary approach of these sessions helped in facilitating this awareness. As one interviewee said: “Because every discipline was represented at the training, you could see that it would also work in real life.”

A remarkable comment made by several interviewees is that they notice a difference between generations. Younger employees are seemingly more willing to speak up than the older generation or employees with more work experience. Furthermore, they do not automatically accept and adopt the established hierarchy; young physicians are more often more open to feedback than older physicians. This ‘rejuvenation effect’ looks like a promising change in the culture of healthcare and hospitals in specific.

An additional change caused by the intervention is that the department is, according to one interviewee, more attractive for new employees. “Before the intervention we were unattractive, but now they say: ‘I would want to work there, there I am taken seriously, and I can develop myself.’” Although, there is no other evidence that this can be substantiated, it seems like this can be an actual result of the intervention.

Interviewees stated that “not all physicians are born leaders” and that “even for physicians this (open) way of communicating is new”. Interprofessional education (IPE) initiatives as described in scientific literature (Brandt, 2018) seem to be a good addition to the education of healthcare professionals to better prepare them for the multidisciplinary environment. Although, it should not be a replacement of team training in professional work environments for team skills should be continuously improved.

Often, sustainment activities are not described in intervention evaluations (Wisse, 2018). Also, remeasurements often take place one to two years after the intervention (Wong et al., 2016). To the authors’ knowledge this paper shows for the first time the effects over a longer period (36 - 51 months).

Conclusion

This paper described and evaluated a customized TeamSTEPPS intervention. It was found that there was a sustained improvement on team structure, leadership and mutual support. Furthermore, there was a significant decrease in the number of incidents.

It seems that the customized part of the intervention, the monodisciplinary training sessions and the MLP, contributed to the effect of the intervention. Although, it is not fully supported by the qualitative data, it seems that the customized part has contributed to an improvement of the (monodisciplinary) team cohesion and the atmosphere on the work floor. Furthermore, it has contributed to a high engagement of physicians in the intervention. The effect of the intervention was sustained for over four years.

This paper underlines several observations from literature about team training, from a recent article by Salas, Zajac, and Marlow (2018): team leadership is necessary, psychological safety matters, and medical team training works. It further promotes the special attention to medical leadership and monodisciplinary team cohesion in TeamSTEPPS interventions.

References

[on request]

Appendices

Appendix I: Team Assessment Questionnaire (TAQ)

Team Foundation

1. The team has a clear vision of what it is supposed to do.
2. The team's activities are guided by a clear Mission Statement/Charter.
3. The team's goals are closely aligned with the goals of the organization.
4. The team has adequate skills and member resources to achieve its goals.
5. Everyone on the team has a clear and vital role.
6. The team has adequate meeting time, space, and resources to achieve all objectives.
7. Team meetings are well attended by all team members.
8. The team can measure its performance effectively.
9. The team understands its customer requirements (internal and/or external).
10. This team is promptly informed of changes in policy or new developments.
11. The department or unit has clear expectations of this team.
12. The team receives adequate training to function effectively.

Team Functioning

13. Team meetings are run efficiently.
14. Everyone on the team participates at an acceptable level.
15. This team works well together.
16. This team works well with other teams/departments in the organization.
17. The goals and objectives of this team will have a positive impact on the organization.
18. The team is on a continuous improvement curve.

Team Performance

19. The team uses an effective short and long-term strategic planning process.
20. The team meets its (internal and/or external) customer requirements.
21. The team is productive.
22. Team functioning doesn't interfere with getting my own job done.

Team Skills

23. The team members communicate well with one another.
24. Constructive feedback is given by the team.
25. Team members are familiar with each other's job responsibilities.
26. The team uses effective decision making processes and problem solving skills.
27. The team monitors and progresses the plan of care.
28. The team can change or improve the way it goes about working on its tasks.

Team Leadership

29. My boss/supervisor promotes participation by the team in key decisions.
30. My boss/supervisor shares responsibilities with team members.
31. My boss/supervisor is an effective leader.
32. I share my ideas/suggestions whether or not my boss/supervisor agrees with my input.
33. My boss/supervisor focuses on building team's technical and interpersonal skills.
34. My boss/supervisor coaches and supports individual team members.
35. My boss/supervisor promotes individual problem solving and intelligent risk taking.
36. My boss/supervisor leads by example.

Team Climate and Atmosphere

37. Team members trust each other.
38. Morale on this team is high.
39. Team members support each other.

40. There are no feelings among team members which might pull this team apart.
41. The team resolves conflicts soon after they occur.
42. I feel free to express my opinions.
43. I have an influence on team decisions.
44. Team members can openly discuss their own problems and issues.
45. Team members show consideration for needs and feelings of other team members.
46. Team members receive recognition for individual performance.

Team Identity

47. I know why I am on a team.
48. I am pleased to be on a team.
49. The team subscribes to a clear set of values.
50. This team is fun to work with.
51. No individual, group or gender dominates team activities.
52. The team has a positive self image.
53. The team recognizes the patient as a critical team member.
54. The team is a safety net for patients.
55. I am a member of a team in which the leader promotes teamwork.

Appendix II: training evaluation questionnaire (translated)

Closed

1. Before the training, the training goals were clear to me
2. The level of the training suited me
3. The level of the training suited my team
4. Practical examples and (case) assignments are connected to our work
5. The training has met my expectations
6. I would recommend this training to others
7. If I have to give the training a grade (1 to 10)
8. This training contributes to our teamwork
9. This training contributes to our quality of care and patient safety

Open

1. If you were not satisfied with the training, the training was balanced, or the training did not meet your expectations, let us know.
2. After this training, what improvements or changes do you expect from you and/or your team?
3. How can we improve the training?
4. Do you have any recommendations?
5. Any other suggestions?

Appendix III: TeamSTEPPS Teamwork Attitude Questionnaire (T-TAQ)

Team Structure

1. It is important to ask patients and their families for feedback regarding patient care.
2. Patients are a critical component of the care team.
3. This facility's administration influences the success of direct care teams.
4. A team's mission is of greater value than the goals of individual team members.
5. Effective team members can anticipate the needs of other team members.
6. High performing teams in health care share common characteristics with high performing teams in other industries.

Leadership

7. It is important for leaders to share information with team members.
8. Leaders should create informal opportunities for team members to share information.
9. Effective leaders view honest mistakes as meaningful learning opportunities.
10. It is a leader's responsibility to model appropriate team behavior.

11. It is important for leaders to take time to discuss with their team members plans for each patient.
12. Team leaders should ensure that team members help each other out when necessary.

Situation Monitoring

13. Individuals can be taught how to scan the environment for important situational cues.
14. Monitoring patients provides an important contribution to effective team performance.
15. Even individuals who are not part of the direct care team should be encouraged to scan for and report changes in patient status.
16. It is important to monitor the emotional and physical status of other team members.
17. It is appropriate for one team member to offer assistance to another who may be too tired or stressed to perform a task.
18. Team members who monitor their emotional and physical status on the job are more effective.

Mutual Support

19. To be effective, team members should understand the work of their fellow team members.
20. Asking for assistance from a team member is a sign that an individual does not know how to do his/her job effectively.
21. Providing assistance to team members is a sign that an individual does not have enough work to do.
22. Offering to help a fellow team member with his/her individual work tasks is an effective tool for improving team performance.
23. It is appropriate to continue to assert a patient safety concern until you are certain that it has been heard.
24. Personal conflicts between team members do not affect patient safety.

Communication

25. Teams that do not communicate effectively significantly increase their risk of committing errors.
26. Poor communication is the most common cause of reported errors.
27. Adverse events may be reduced by maintaining an information exchange with patients and their families.
28. I prefer to work with team members who ask questions about information I provide.
29. It is important to have a standardized method for sharing information when handing off patients.
30. It is nearly impossible to train individuals how to be better communicators.

Appendix IV: Intervention evaluation questionnaire (translated)

Closed

1. Before the intervention, I was able to communicate clear with colleagues on the work floor.
2. Before the intervention, I was able to lead and/or coordinate certain (team)activities on the work floor.
3. Before the intervention, I was able to speak-up about situations or behavior in the interest of the team and/or the patient.
4. Before the intervention, I was able to offer help to a colleague in the interest of the team and/or the patient.
5. After the intervention, I was able to communicate clear with colleagues on the work floor.
6. After the intervention, I was able to lead and/or coordinate certain (team)activities on the work floor.
7. After the intervention, I was able to speak-up about situations or behavior in the interest of the team and/or the patient.
8. After the intervention, I was able to offer help to a colleague in the interest of the team and/or the patient.
9. Due to the intervention the patient safety is improved.
10. Due to the intervention the atmosphere on the work floor is improved.
11. Due to the intervention the job satisfaction has increased.
12. Due to the intervention a culture of dialogue has been established.
13. Due to the intervention the blame culture has been reduced.
14. The effect of the intervention is lasting.
15. The effect of the intervention is temporarily and will decrease over time.
16. The effect of the intervention is decreased since the last team training session.

17. The effect of the intervention is lasting, provided we (the department) take certain actions on sustainability.

Open

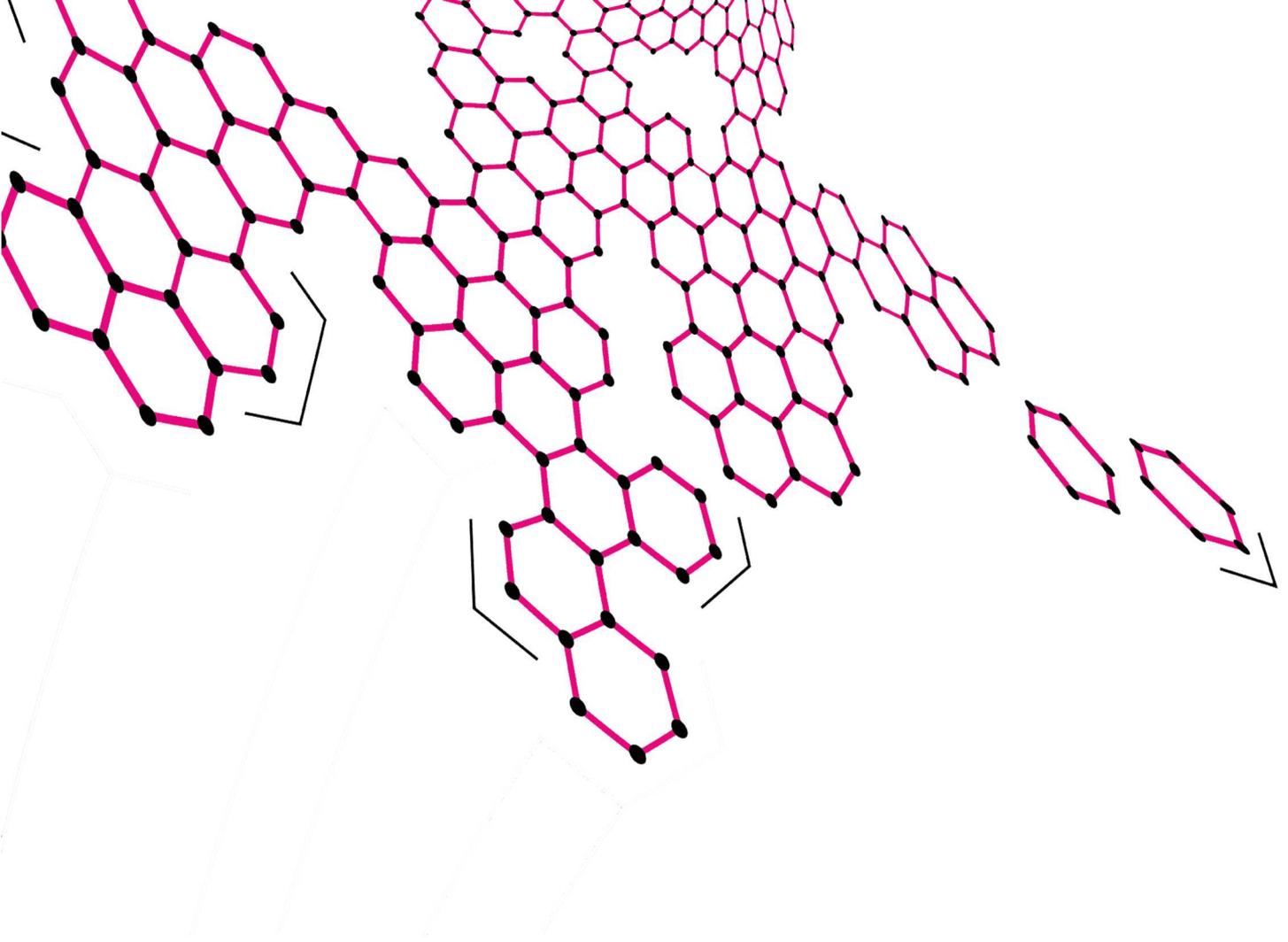
1. In my opinion, the effect (or lack thereof) of the TeamSHOPP process is, in particular, caused by: ...
2. What do you think are possible causes that can reduce (positive) effects? And: how do we as a department prevent these causes from occurring?
3. What ideas or suggestions do you have for the department to retain an effect?
4. Room for comments/suggestions regarding the report figures: ...

Appendix V: Questions first set of interviews (Dutch)

[on request]

Appendix VI: Questions second set of interviews (Dutch)

[on request]



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