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Good Catch! Using Interdisciplinary Teams and Team Reflexivity to Improve Patient Safety

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Abstract

Interdisciplinary teams play an important role implementing innovations that facilitate the quality and safety of patient care (West, Hirst, Richter, & Shipton, 2004). This paper examined the role of reflexivity in team innovation implementation and its association with an objective patient safety outcome, inpatient fall rates (a fall is an unintended downward displacement of a patient's body to the ground or other object). In this study, we implemented, supported, and evaluated interdisciplinary teams intended to decrease fall risk in 16 small rural hospitals. These hospitals were part of a collaborative that sought to increase knowledge and facilitate reflexivity about fall event reporting and fall risk reduction structures and processes. We assessed team reflexivity at the start and at the end of the two-year intervention and innovation implementation at the end of the intervention. The 16 hospitals reported objective fall event data and patient days throughout the project, which we used to calculate comparative rates for assisted, unassisted, and injurious falls. The results suggest that teams benefited from the intervention, increasing reflexivity from the start of the project to the end, which was related to innovation implementation and decreases in fall rates. Theoretical and practical application of the results are discussed.

Key words: Healthcare, teams, reflexivity, patient falls, innovation implementation

Introduction

Inpatient falls are a common, costly, and serious adverse event in all hospitals (Healey & Scobie, 2007). Although most falls are preventable (Morse, Black, Oberle, & Donahue, 1989), approximately 3% of hospitalized patients fall each year resulting in nearly one million falls in U.S. hospitals and up to half of all falls result in some form of injury (Weiss & Elixhauser, 2014; Oliver, Healey, & Haines, 2010). Injuries from a fall may increase the length of a patient's stay in the hospital, require hospitals to use additional resources to assess and care for injuries, and increase the risk of hospital readmission or an admission to another type of care facility (Oliver et al., 2010; Tinetti, Speechley, & Ginter, 1988; Tinetti & Williams, 1997; Wong et al., 2011). Consequently, healthcare organizations develop fall risk reduction programs to identify and implement evidence-based innovations intended to minimize the risk of falls and fall-related injury.

Teams are often used to develop and implement innovations (West et al., 2004; West, 2002a, 2002b), to support the implementation of quality improvement initiatives (U.S. Department of Health and Human Services, 2011), and to initiate new patient safety practices (Taylor et al., 2011). Team innovation is a key tool that healthcare organizations leverage to improve processes and practices, particularly quality and safety (Dixon-Woods, Amalberti, Goodman, Bergman, & Glasziou, 2011; West, Hirst, Richter, & Shipton, 2004). Team innovation is "the intentional introduction and application within a team, of ideas, processes, products or procedures new to the team, designed to significantly benefit the individual, the team, the organization, or wider society" (West & Wallace, 1991, p. 303).

Although team innovation is essential to the generation of new ideas for quality improvement, the implementation of those innovative ideas is more challenging (Klein &

Knight, 2005; West, 2002b), and healthcare organizations tend to struggle with quality improvement innovation implementation (Nembhard, Alexander, Hoff, & Ramanujam, 2009). One important aspect of team composition, functional diversity, where team members differ in knowledge, skill, educational background, or organizational role (Milliken, Bartel, & Kurtzberg, 2003), improves team performance particularly for innovation (Bell, Villado, Lukasik, Belau, & Briggs, 2011; Damanpour, 1991; Hülsheger, Anderson, & Salgado, 2009). Teams with members who contribute diverse expertise and skills are likely to perform better on innovation tasks.

Teams composed of members from various educational backgrounds and different expertise (i.e. interdisciplinary teams), have been suggested to improve patient safety and the adoption of innovation (Schippers, West, & Dawson, 2015). Interdisciplinary teams, however, tend to augment some of the issues that teams struggle with such as effective communication and knowledge integration (Reiter-Palmon, de Vreede, & de Vreede, 2013). Team reflexivity is one team process that has been related to team learning, knowledge integration, and innovation among interdisciplinary teams (Schippers et al., 2015). Team reflexivity promotes awareness of goals and strategies to achieve those goals as well as identification of factors that may make goal attainment less likely (Schippers, Den Hartog, & Koopman, 2007). When teams engage in reflexivity, team members consider possible modifications and adaptation of current practices to ensure that the goal is met (West et al., 2004).

The purpose of this study is to investigate how promoting reflexivity within interdisciplinary teams can encourage team innovation, innovation implementation, and improve patient safety (i.e., decrease fall risk) in healthcare organizations. Based on past research evaluating team reflexivity, we believe that interdisciplinary teams that engage in reflexivity implement innovations more effectively. Additionally, we expect that team reflexivity can be

improved via team-level interventions, and that team reflexivity is related to an objective outcome, patient safety as benchmarked by patient fall rates.

Interdisciplinary Teams and Team Reflexivity

The use of interdisciplinary teams in medicine has increased in recent years (Baker, Day, & Salas, 2006; Lemieux-Charles & McGuire, 2006; O'Leary, Sehgal, Terrell, & Williams, 2012). Interdisciplinary teams are suggested as one possible way to reduce medical errors and increase the quality of patient care (Rosen & Callaly, 2005). In the context of decreasing patient fall risk, actual fall rates were reduced when hospitals used interdisciplinary teams to coordinate and implement their fall risk reduction program (e.g., Barker, Kamar, Morton, & Berlowitz, 2009; Gowdy & Godfrey, 2003; Szumlas, Groszek, Kitt, Payson, & Stack, 2004; von Renteln-Kruse & Krause, 2007).

While interdisciplinary teams are common in the medical field, fall risk reduction teams are often comprised of nurses and quality improvement personnel and may not include other disciplines (Jones, Venema, Nailon, Skinner, High, & Kennel, 2014). Further, communication failures within and between teams, which can be compounded in interdisciplinary teams, negatively affect patient safety and innovation (Leonard, Graham, & Bonacum, 2004; Leonard & Frankel, 2011; Reiter-Palmon, de Vreede, & de Vreede, 2013). Therefore, understanding how interdisciplinary teams can improve team processes in managing and implementing innovations while avoiding the difficulties associated with interdisciplinary teams, is important.

One process that facilitates team learning, communication, and innovation, and may facilitate decreasing fall rates when interdisciplinary teams are involved, is reflexivity (West et al., 2004). Team reflexivity is "the extent to which group members overtly reflect upon the group's objectives, strategies and processes, and adapt them to current or anticipated

circumstances" (West, 1996, p. 559). The three key components of reflexivity are reflection, planning, and action. Reflection requires team members to think about and discuss issues that are important for performance and learning. Planning puts the reflection into the context of potential change. Action is the implementation of the change. Using these key components, when teams reflect, team members systematically discuss and assess past performance (both failure and success) in order to learn and develop future action plans for improving performance (Ellis, Carette, Anseel, & Lievens, 2014; Schippers, Edmondson, & West, 2014).

In the organizational literature, team reflexivity has been shown to improve team performance (Gurtner, Tschan, Semmer, & Nägele, 2007; Schippers, Den Hartog, Koopman, & Wienk, 2003; Schippers et al., 2007; Tjosvold, Hui, & Yu, 2003) and innovation (Carmeli, Sheaffer, Binyamin, Reiter-Palmon, & Shimoni, 2014; De Dreu, 2002; Müller, Herbig, & Petrovic, 2009; Schippers et al., 2015; Tjosvold, Tang, & West, 2004). Further, Schippers et al. (2014) recently suggested that team reflexivity can serve to prevent team information processing failures. When teams reflect about their goals, their processes, learn from errors and implement changes in processes as a result of reflection, team effectiveness and innovation are improved. Also, team reflexivity facilitates a relationship between team diversity (inherent in interdisciplinary teams) and positive outcomes (Konradt Schippers, Garbers, & Steenfatt, 2015; Schippers et al., 2003). Therefore, it is expected that interdisciplinary healthcare teams that are reflexive may produce better outcomes than their non-reflexive peers.

Training for Team Reflexivity

While team reflexivity is related to important organizational outcomes, the processes by which teams become reflective and the processes by which reflexivity influences desired outcomes are less clear. Previous work suggests that reflexivity in teams does not occur

automatically or in a spontaneous fashion (Schippers et al., 2007). Rather, teams seem to focus on getting work done so that reviewing and learning from past work often takes a back seat (Carroll & Rosson, 1987; Allen, Baran, & Scott, 2010). Therefore, it has been suggested that it is important to train teams to reflect (Schippers et al., 2014).

In an experimental study Gurtner et al. (2007) asked participants to reflect as a team, reflect individually, or did not provide reflexivity instructions (a control condition). The results suggested that instructions to reflect resulted in improved performance, however, contrary to expectations, individual reflection resulted in higher performance compared to the group reflexivity condition. This latter finding was suggested to be a result of limited discussion during reflection in teams. A study by Konradt et al. (2015) addressed this issue by providing participants with more specific instructions regarding reflexivity. Teams that were given specific instructions on how to reflect were more likely to engage in reflexivity as compared to teams that did not receive these instructions. Further, the teams with specific instructions also showed greater improvement in performance, as well as improved shared mental models and increased adaptation. Interestingly, the research on the effect of team interventions on the development of team reflexivity over time is still limited and in need of additional study.

In this paper we focus on a team reflexivity intervention intended to improve an important aspect of patient safety – inpatient fall risk reduction. Dynamic models of team reflexivity propose that information and feedback given to teams, as a result of a team performance episode, impact team performance through reflection (Konradt et al., 2016). Consistent with this approach, our intervention included two types of activities intended to improve reflexivity through reflection and action among interdisciplinary fall risk reduction (FRR) teams: (1) collaborative interventions including the 16 FRR teams that were intended to

facilitate reflection about the evidence-base for reducing fall risks and promote information sharing and problem solving across the collaborative and (2) individual team interventions intended to guide individual teams to reflect about priorities for improvement and the etiology of the various types of falls in their specific context (additional information is provided in the method section). Because these interventions unfold through the training process and over time, the best test of such an intervention is to measure team reflexivity over time. As such, we measured team reflexivity at the beginning of the intervention (Time 1) and at the end of the intervention (Time 2). Following the call of Schippers et al. (2015) to evaluate reflexivity interventions, and based on the work conducted on interventions for team reflexivity, we hypothesize that

H1: An intervention to improve reflexivity will be related to increased reflexivity from time 1 (at the beginning of the project) to time 2 (end of the intervention).

Reflexivity and Implementation of Innovations

Reflexivity may be particularly important to support the implementation of innovations for patient safety. The etiology of patient safety events such as medication errors, hospital acquired infections, and falls is typically multifaceted consisting of patient and system factors. Consequently, the development of innovations to improve patient safety should benefit from the input of multiple disciplines (Dixon-Woods & Pronovost, 2016). Multiple studies using different team types and settings established a relationship between reflexivity and team innovation (Carter & West, 1998; De Dreu, 2002; Schippers et al., 2015; Shin, 2014; Tjosvold et al., 2004). Carter and West, using TV production teams, found that reflexivity related to team innovation as measured by manager's evaluation as well as audience ratings. Schippers et al. found that team reflexivity in healthcare teams related to innovation measured by experts evaluating the impact,

novelty, radicalness and magnitude of consequences of the innovation. Tjosvold et al. found that team reflexivity related to managers' evaluations of team innovation in a sample of 100 work teams in China. Based on the research presented above, we propose the following hypothesis:

H2: Team reflexivity will be related to team assessment of innovation implementation.

Reflexivity, Innovation Implementation, and Patient Safety

While typical outcomes evaluated in past research were those of innovation and team effectiveness, we also expect that reflexivity will be related to more objective outcomes. Specifically, teams that engage in reflection are more likely to learn from errors and determine ways to improve work. By discussing the etiology of errors, developing action plans to mitigate root causes of errors, implementing these actions plans, and monitoring the success of the implementation, teams high in reflexivity are more likely to improve subsequent performance (Reiter-Palmon, Kennel, Allen, Jones, & Skinner, 2015; Schippers, Homan, & van Knippenberg, 2013; Vashdi, Bamberger, Erez, & Weiss-Meilik, 2007; for a review see Schippers et al., 2014). A previous cross-sectional study revealed that when teams engaged in behaviors such as collecting, analyzing, and learning from data to make modifications to the fall risk reduction program, hospital fall rates were lower as compared to teams that did not engage in these behaviors (Jones et al., 2014). While Jones et al. found that reflecting about fall-related data was related to fall rates, they did not use an established scale of reflexivity. Therefore, in a more direct test of reflexivity's role in this important outcome, and based on the previously identified relationship between reflexivity and performance, we hypothesize that

H3: Team reflexivity will be negatively related to fall rates.

In terms of innovation implementation, Klein and Sorra (1996) suggested that innovation implementation is directly tied to innovation effectiveness (i.e. the actual use of the innovation

by members of the organization). As a result of actual and consistent use of these innovations, we would expect that fall rates will be lower when innovations are implemented effectively as compared to when implementation is less effective. As teams engage in innovations with the clear purpose of reducing fall risk, we expect that teams that view their innovation efforts more positively will also experience a reduction in fall rates. In this case, we expect perceptions of successful innovation implementation to be related to the objective outcome of fall rates.

H4: Team assessment of innovation implementation will be negatively related to fall rates.

Method

Participants and Procedure

From August 2012 (project start) to July 2014 (project end), 16 small rural hospitals in the central U.S. participated in a research project funded by the Agency for Healthcare Research and Quality (AHRQ) called Collaboration and Proactive Teamwork Used to Reduce (CAPTURE) Falls (https://www.unmc.edu/patient-safety/capturefalls/). The purpose of CAPTURE Falls was to improve the safe practice of inpatient fall risk reduction supported by interdisciplinary teamwork and thus decrease the risk of falls as measured by fall rates in small rural hospitals.

At the start of the project, each hospital established an interdisciplinary FRR team to implement and coordinate their hospital's fall risk reduction program. Due to the multifactorial etiology of falls, recommended team members included professionals from the disciplines of nursing, pharmacy, physical and/or occupational therapy, and patient safety or quality improvement (Jones et al., 2014). At the start of the program, half of the hospitals had a team in place that reviewed falls, but only one of these teams included members that represented the four

recommended disciplines (see Table 1). Most of the hospitals that had pre-existing teams included members from nursing and patient safety or quality improvement only. Thus, all but one of the interdisciplinary FRR teams were newly-formed at the start of the project.

During the first quarter of the project, members of the CAPTURE Falls research team conducted a site visit at each hospital. During this site visit, FRR team members identified priorities for improvement in their fall risk reduction program and learned to report all falls using standardized definitions and reporting forms. To determine priorities for improvement, we guided each team in a review of their gap analysis, which compared their hospital's current fall risk reduction structures and processes to evidence-based best practices. Baseline gap analyses were completed prior to the start of the CAPTURE Falls project (Jones et al., 2014). After collaborating with the researchers to develop their action plan for improvement, each team completed individual assessments of their team reflexivity. Of note, we did not require FRR teams to include any specific intervention in their action plans. Frequent action plan items included, "implement new fall risk reduction equipment," "create and conduct hospital wide education regarding purpose and outcomes of the fall risk reduction program," "implement a valid fall risk assessment tool," and "implement post-fall huddles to learn from fall events." On average, hospitals had 10 items on their action plans, with a range of 7 to 19 items across the 16 hospitals. Thus, action plans were unique and reflected a team's perception of the needs of their hospital.

As part of learning to report falls, we educated FRR teams to use the AHRQ definition of a fall and to collect patient- and system-related factors about the fall event consistent with AHRQ common formats. The AHRQ definition is: "A fall is a sudden, unintended, uncontrolled, downward displacement of a patient's body to the ground or other object (e.g., onto a bed, chair,

or bedside mat)" and includes assisted falls—when a patient begins to fall and is assisted to the ground by another person (PSO Privacy Protection Center, 2016). Within the project, we specified that assisted falls were only those in which the patient was assisted by hospital staff and not by a family member/visitor. It is important for teams to reflect upon factors that contribute to unassisted vs. assisted falls because assisted falls are less likely to result in injury than unassisted falls (Staggs, Mion, & Shorr, 2014). When staff report assisted falls, they provide information to the team about the effectiveness of training in safe transfers/mobility as mobilizing patients at the earliest opportunity is needed to prevent functional decline during hospitalization. Thus, assisted falls are a system success while unassisted falls are a system failure.

The CAPTURE Falls research team offered collaborative and individual education and support to the FRR teams to facilitate innovation implementation, reflection, and learning. The first form of collaborative education was development and delivery of 11 one-hour educational learning modules via webinar for FRR teams and other hospital staff. Content included selecting a fall risk assessment tool based on its psychometric properties, choosing fall risk reduction interventions, using teamwork, using data, and implementing post-fall huddles. These 11 learning modules are organized as an online toolkit (i.e., reflexivity intervention) that FRR teams can freely access (https://www.unmc.edu/patient-safety/capturefalls/learningmodules/index.html). The second form of collaborative education consisted of conducting nineteen 30-minute monthly support conference calls with all 16 FRR teams to further explore the evidence base for fall risk reduction, clarify issues related to fall event reporting, share lessons learned from individual and aggregate analysis of fall events, and problem solve to overcome implementation barriers. This element of the reflexivity intervention offered collective feedback to teams to reflect on their performance relevant to the topic of

discussion. Summaries of these calls were posted in the online toolkit to support ongoing team reflection (https://www.unmc.edu/patient-safety/capturefalls/supportcalls.html). For example, we developed additional supporting tools for teams to use to reflect about their fall risk assessment tools and to choose a tool that has the best predictive value in their facility.

Individual FRR team education and support consisted of quarterly 30-60 minute conference calls with the research team. On average, each team participated in six of these individual support calls. This element of the intervention was designed to facilitate reflection on individual team performance and assist the team in taking action to improve team performance related to the team's goal to coordinate, manage, and implement the hospital's fall risk reduction program. During these calls, FRR teams updated the research team on their action plan implementation progress (i.e., progress toward goal attainment), the research team provided feedback about the accuracy of each FRR team's fall event reporting, both teams engaged in collaborative problem solving about the etiology of assisted vs. unassisted and injurious vs. non-injurious falls, and both team discussed strategies to overcome barriers to implementation within a team's specific context (see Figure 1). Such constructive feedback can facilitate reflective processes in teams (Konradt et al., 2016).

The research team conducted a second site visit at each hospital during the final quarter of the project. During this site visit, the FRR team members completed an individual reassessment of their team reflexivity and updated their scorecard to reflect implementation progress during the two year project. They also evaluated the ease to implement each action plan item, the extent to which each item was implemented, and the impact of each item on achieving the goal of decreasing fall risk.

Measures

Team reflexivity. Individual FRR team members completed Carter and West's (1998) six-item team reflexivity assessment (*1 = Strongly disagree, 5 = Strongly agree*). This scale was selected as it was brief, validated, and the most researched and validated scale for team reflexivity available at the time of the study. Further, this scale has been used extensively in healthcare settings (Schipers et al., 2015; Konradt et al., 2016). A baseline measure was completed during the first site visit, (average r_{wg} = .64) and re-evaluated at the end of the project (average r_{wg} = .72) two years later. Note, the first r_{wg} reflects the value during the first site visit, with the newly formed teams, thus the level of agreement for reflexivity was not expected to be as high as at the end of the project once the team worked together. Items were adapted to reference fall risk reduction (e.g., "The team often reviews its objectives *regarding our fall risk reduction program*") to anchor perceptions of reflexivity around the teams' activities to support fall risk reduction. Team members were not identified, so it was not possible to link individual data from time 1 to time 2 – only hospital level data. One FRR team did not complete the reflexivity assessment at the beginning of the project because they had not met before the site visit and had no frame of reference to complete the assessment. Thus, the sample size for analyses conducted with this variable is 15 hospitals.

Inpatient fall rates. Hospitals, regulatory agencies, the federal government, and patient safety researchers use standardized inpatient fall rates (falls per 1000 patient days) to evaluate and compare the risk of fall events over time within hospitals with different types of units and across hospitals that vary in volume and patient populations (National Quality Forum, 2013). To calculate fall rates in our sample of hospitals, we: (a) requested patient days annually and at the end of the project from each hospital, (b) added the total number of days inpatients received care to the total number of days (hours/24) patients were under observation to create a "total patient

days" denominator, (c) divided the number of falls by the total patient days, and, (d) multiplied the final value by 1,000 to create a fall rate per 1,000 patient days. This approach is considered a standardized method and is the foundation for comparative benchmarking (Brown, Donaldson, Bolton & Aydin, 2010). We calculated three fall rates: (a) a total fall rate (i.e., all falls including assisted and unassisted falls were in the numerator); (b) an injurious fall rate (i.e., injurious falls were in the numerator, which includes minor harm to death and may have been assisted or unassisted); and (c) an unassisted fall rate (i.e., unassisted falls in which the patient did not receive hands-on assistance from hospital staff were in the numerator). While the three fall rates are highly correlated, as total fall rates include assisted and unassisted falls, as well as injurious and non-injurious falls, and unassisted falls tend to be related to injurious falls, hypotheses evaluating fall rates used all three measures, as they provide somewhat distinct information. For example, injurious fall rates tend to be more costly to the hospital, and assisted fall rates are considered a system success in that staff were in the right place at the right time to provide assistance (Brown et al., 2010). Fall rates used in this study reflected patient days and falls from the final seven months of the project.

Innovation implementation. Based upon their gap analysis and collaborative and individual education, FRR teams developed customized action plans detailing the innovations they intended to implement during the two-year project. Action plans and respective innovation implementation progress were collected from the fall teams and verified by members of the project research team during the quarterly individual team calls. At the end of the project, FRR team members individually evaluated every action plan item for the following three criteria: ease of implementation (*1 = Very difficult, 5 = Very easy*), extent of implementation (*1 = Have not started to implement, 5 = Fully implemented*), and impact of the innovation on the goal of

reducing patient fall risk (*1 = Very low impact, 5 = Very high impact*). The ease, extent, and impact scores for each innovation were averaged across the respective team members within each hospital; average r_{wg} values were .68 for ease of implementation, .72 for extent of implementation, and .72 for impact of implementation, lending support for aggregation. Innovations with a team average score of 4 (out of a possible 5) on ease, extent, and impact were counted as easy/very easy to implement, mostly/fully implemented, and having high/very high impact, respectively. The three scores showed high correlations ranging from .71 to .76, and therefore these scores were combined to create a new total score for team innovation implementation. This team innovation implementation scale showed good reliability with a Cronbach alpha of .86.

Results

Table 2 provides variable means, standard deviations, and correlations. Hypothesis 1 predicted that FRR team reflexivity would improve over time as a result of participation in the CAPTURE Falls project. A dependent-samples *t*-test indicated that FRR teams' reflexivity significantly increased from the project start ($M = 3.40$, $SD = .45$) to the project end ($M = 3.97$, $SD = .29$), $t(14) = 5.47$, $p < .001$, supporting Hypothesis 1.

Hypothesis 2 predicted that FRR team reflexivity would relate to team innovation implementation. A multiple regression analysis (see Table 3) was conducted to test the relationship between team reflexivity at the end of the project, while controlling for team reflexivity as measured at the start of the project as a covariate, and team innovation implementation. After controlling for FRR team reflexivity as measured at the start of the project (which was non-significant in both models), FRR team reflexivity at the project end was

significantly and positively related to team innovation implementation, β = .62, t = 2.28, p = .042, supporting Hypothesis 2.

Hypothesis 3 suggested that patient fall rates would be lower in hospitals in which FRR teams reported greater reflexivity. Team reflexivity at the end of the project was significantly related to lower total fall rates (r = -.45, p = .041) and lower unassisted fall rates (r = -.41, p = .055) at the end of the project, but not to injurious fall rates (see Table 2). A multiple regression analysis (see Table 4) was conducted to further test the relationship between team reflexivity at the end of the project, while controlling for team reflexivity as measured at the start of the project as a covariate, and the three fall rate outcomes of total fall rates, injurious fall rates, and unassisted fall rates. After controlling for FRR team reflexivity as measured at the start of the project, FRR team reflexivity at the end of the project was not significantly related to the three fall rate outcomes of interest. Thus, Hypothesis 3 was partially supported.

Hypothesis 4 suggested that innovation implementation would relate to patient falls. Total, injurious, or unassisted fall rates at the end of the project were not significantly related to the innovation implementation scale. Thus, this hypothesis was not supported.

Discussion

Overall, the results of this study provide further evidence regarding the role of reflexivity in innovation and innovation implementation. First, reflexivity of interdisciplinary teams increased following a two-year intervention that was intended to improve team reflexivity. Second, reflexivity was related to perceptions of innovation implementation as well as an objective measure of patient safety—inpatient fall rates. The latter finding is of particular importance, as this is one of the first studies to show not only the relationship between reflexivity and the development, implementation, and evaluation innovation success, but also with an

important and objective outcome measure. Further, reflexivity was related to lower total and unassisted falls rates. The relationship between reflexivity and unassisted falls is of particular importance because unassisted falls represent the greatest preventable risk of injury due to falls (Staggs et al., 2014). Assisted falls in which neither the patient nor hospital staff are harmed represent system success in the context of the need to mobilize patients early in their stay. Early mobilization has been associated with a shortened length of stay and improved mobility at discharge (Schaller et al., 2016). Assisted falls can be considered "good catches" that provide information about system function without harm to a patient. Assisted falls are typically underreported despite the fact that learning from these "good catches" is integral to effective quality improvement and patient safety programs (Altman, Clancy, & Blendon, 2004) as they indicate that staff are aware of risks and know the actions to be taken to mitigate that risk. As such, in a sample of hospitals educated about the value of reporting assisted falls, we would expect to see the greatest association between effective fall risk reduction innovation implementation and the unassisted fall rate. We did not find a relationship between reflexivity and injurious fall rates, which is likely due to the fact that the probability of fall-related injury is more closely related to patient characteristics such as age, medication, and presence of osteoporosis than system factors. The relationship between reflexivity and fall rates should also be considered in light of the findings from the multiple regression, when taking into account reflexivity in time 1, reflexivity in time 2 was no longer predictive. However, given the small sample size, the sizable correlation between reflexivity in time 1 and time 2, and the size of the regression weights this result is not surprising, and may be indicative of low power and type II error.

Interestingly, we did not find a relationship between team assessment of innovation implementation and the outcome of fall rates. There may be a number of reasons for not finding this relationship. First, perceptions of innovation implementation and fall rates were both evaluated at the end of the project (end of project fall rates were calculated for the last seven months of the project). It is possible that the relationship between innovation implementation and fall rates requires more time to develop between measurement occasions for adoption of innovation use to impact the outcome of interest. Thus, if we evaluated fall rates again at a later date post-completion of the CAPTURE Falls project, we may find a relationship between innovation implementation and fall rates. Second, the measure of innovation implementation evaluated the perceptions of the FRR team. It may be that these perceptions are not accurate and do not reflect the level of innovation implementation in the hospital, and as a result are not related to fall rates. However, given the FRR team members' active roles in generating and implementing the innovations, these team members may be best suited to assess and evaluate the implemented innovations (Real & Poole, 2005). Third, there may be a factor that moderates the relationship between innovation implementation and fall rates that we have not measured. Finally, our small sample size of 15 may simply be under-powered to detect this relationship.

Theoretical Implications

In terms of theoretical implications, this study adds to the growing literature about reflexivity and its relationship to organizational innovation. Specifically, this study replicated past research indicating that reflexivity is related to innovation implementation. However, we extend this work in two ways. First, this study addressed the call by Schippers et al. (2014) for more research on the effect of interventions to improve reflexivity. Teams in this study participated in an intervention that was designed to improve key aspects of reflexivity about a

patient safety problem, including team discussion about root causes of falls, implementing evidence-based processes to decrease fall risk, and monitoring the effectiveness of this implementation. Second, this study provided support for the relationship between reflexivity and objective performance, measured here as fall rates. Both total fall rates and unassisted fall rates were found to be related to reflexivity, adding to our understanding of the relationship between team reflexivity and performance.

Additionally, this study adds to the limited research on reflexivity in interdisciplinary teams. Previous work suggests that reflexivity allows interdisciplinary teams to capitalize on the diversity of knowledge of team members and overcome difficulties in social processes, and therefore perform better (Konradt et al., 2015; Pieterse, van Knippenbergh, & van Ginkel, 2011). This study confirms that interdisciplinary teams appear to perform better, as measured by an objective and important patient safety outcome, when they engage in reflexivity. Reflexivity also related to improved team performance as operationalized by team innovation implementation. Innovations teams reported to be of high impact on fall risk reduction and easy to implement included pharmacy medication reviews, fall prevention equipment, and physical therapy evaluations. Future research should further investigate the specific aspects of the interdisciplinary team interactions, those perhaps unmeasured moderating factors that facilitated the changes in fall risk reduction processes and resulted in decreases in fall rates.

Finally, the reflexivity measure in this study was modified to reflect specifically fall risk reduction. This modification meant that there was a match between our various measure of outcomes (as opposed to measuring reflexivity in general and then evaluating the specific criterion of falls). Known as the bandwidth fidelity dilemma, this issue is prevalent in personnel selection, but is rarely addressed in other domains (Ones & Viswesvaran, 1996). The findings

from this study may be useful in extending to other domains, and tailoring the reflexivity measure for the specific purpose of the team.

Practical Implications

This paper suggests a number of important implications for practice in healthcare and perhaps other settings where safety is a concern. First, this study found a relationship between team reflexivity and fall rates. The relationship between unassisted fall rates and team reflexivity is of particular practical significance. It is expected that unassisted fall rates and fall-related injury will decline as FRR teams implement innovations that improve the reliability of the hospital's fall risk reduction program. Decreasing unassisted fall rates represents a reduction in the greatest preventable risk of injury due to falls (Staggs et al., 2014). Falls are inevitable as hospital staff seek to mobilize patients to prevent the adverse effects of bedrest. Thus, decreasing unassisted fall rates is an indicator of high quality, safe patient care. Another important implication of this finding is that hospitals may want to use interdisciplinary teams to evaluate falls, causes of falls, and recommend improvements in processes and procedures to reduce falls because interdisciplinary teams have more diverse knowledge and skills to draw on when reflecting about the causes of patient falls, and the varying strategies needed to address those causes. Other patient safety problems and other industries where complex interdisciplinary problems exist may also benefit from using teams of interdisciplinary professionals who are able to reflect, though additional research is needed to substantiate this possibility.

Second, hospitals should engage in interventions to facilitate the development of reflexivity in order to gain the full benefits of an interdisciplinary fall risk reduction team. Our study demonstrated that teams improve their reflexivity from early in the intervention, prior to the start of formal project activities, to the end of the intervention. The training in this particular

intervention included the development of reflexivity through collaborative and individual team education and support. **Limitations and Future Directions**

As with all studies, this study is not without its limitations. The most important limitation of this study is the small sample size, 15 hospitals with complete data. The small sample size had a number of effects. First, it made finding significant results more difficult. However, even with such a small sample, significant results emerged with moderate to high relationships. The second issue associated with a small sample size is that of the generalizability and stability of the results. As such, it is important to replicate these results in another, potentially larger, sample. The third issue is that we were not able to test for potential moderators and mediators which would have allowed for a more nuanced understanding of the relationship between reflexivity, innovation implementation, and patient fall rates. In fact, we have tried to test for a mediated model of reflexivity leading to innovation which would lead to reduced falls, and were not able to find a significant mediation effect, likely due to low power. Further, future research should also evaluate qualitative data that may allow for a better understanding of the potential mediators and moderators of this relationship. However, given the real-world significance and implications of the problem studied, this study provides initial evidence regarding the importance of interdisciplinary team reflexivity to the outcome of decreased fall rates.

The second limitation of this study is the use of an extensive intervention that took place over two years, which included repeated training interactions between study subjects (16 hospitals) and an expert research team. This type of intervention is time consuming and expensive, but also is most likely to increase reflexivity in the teams. However, it is not clear which of the multiple training interactions between the research team and the FRR teams were critical for development of reflexivity. Thus, future research is needed to identify the essential

elements of the intervention that facilitate development of reflexivity and should be included in a more parsimonious training intervention. However, one caveat to simplifying the intervention is that the impact of the intervention as studied is improved patient safety. We would need to be cautious that modifying the intervention to decrease its complexity does not decrease reflexivity and the impact on patient safety. Indeed, care must be taken when considering how best to reduce costs through intervention simplification.

Another important limitation to consider is that the measures of reflexivity and perceptions of innovation implementation occurred at the same time. While we found that reflexivity was predictive of innovation implementation above and beyond reflexivity measured at the start of the project, this does not completely address the common source bias issue (Conway & Lance, 2010). The relationship found between reflexivity and fall rates, which were measured independently and objectively, does provide additional evidence to the impact of reflexivity. Additionally, appropriate survey building and other common methodological efforts were made to reduce and mitigate common method bias where possible.

Finally, the study used a one group pretest post-test design and did not include a control group. As such we cannot fully rule out competing hypotheses and know for certain that the intervention was the cause of the change in reflexivity and decreased falls. Future research should also include a control group to allow for a fuller test of the relationship between the intervention and outcomes.

Conclusion

The results of this study add to the body of literature that indicates that reflexivity is critical for interdisciplinary team innovation implementation. Specifically, the findings of this study indicate that the reflexivity of the interdisciplinary teams that were designated by the

hospital to decrease fall risk was related to innovation implementation and also to objective measures of patient safety – total and unassisted fall rates. Further, this study also addressed the call to evaluate whether interventions designed to improve reflexivity are related to the desired outcome of interest.

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Table 1

Fall Risk Reduction Accountability Structure and Fall Team Composition Pre- and Post-CAPTURE Falls

	Pre-CAPTURE Falls		Post-CAPTURE Falls	
Hospital ID	Structure	Interdisciplinary Team with All Four Key Disciplines Represented	Structure	Interdisciplinary Team with All Four Key Disciplines Represented
1	Team	No	Team	Yes
2	Team	No	Team	No[a]
3	No One	--	Team	No[a]
4	Team	No	Team	No[c]
5	Individual	--	Team	No[b]
6	No One	--	Team	Yes
7	Individual	--	Team	No[a]
8	Team	No	Team	Yes
9	Individual	--	Team	Yes
10	Individual	--	Team	Yes
11	Team	No	Team	No[c]
12	Team	No	Team	No[b]
13	Team	No	Team	Yes
14	No One	--	Team	Yes
15	Team	Yes	Team	Yes
16	Individual	--	Team	No[cd]

Note. Key disciplines included quality improvement, nursing, physical therapy, and pharmacy.
[a]No quality improvement. [b]No physical therapist, but occupational therapy involved. [c]No pharmacist. [d]No registered nurse.

Table 2

Descriptive Statistics and Correlations between Variables

	M	*SD*	1	2	3	4	5	6	7	8	9
1. Team Reflexivity SoP	3.40	.45	(.82)								
2. Team Reflexivity Score EoP	3.99	.29	.48*	(.70)							
3. Number of innovations easy or very easy to implement	3.81	3.10	.32	.58**	--						
4. Number of innovations mostly or fully implemented	6.88	3.01	-.06	.51*	.71**	--					
5. Number of innovations having high or very high impact	8.00	3.61	-.04	.48*	.76**	.72**	--				
6. Innovation Implementation	3.97	.23	.17	.59**	.61**	.72**	.50*	(.89)			
7. Total Fall Rate EoP	4.51	1.88	-.37^{t}	-.45*	-.01	.25	.02	-.07	--		
8. Injurious Fall Rate EoP	1.97	2.29	-.21	-.19	-.10	.16	.05	.04	.80**	--	
9. Unassisted Fall Rate EoP	3.71	2.02	-.33	-.41^{t}	-.13	.15	.00	-.12	.94**	.87**	--

Note. $N = 16$. Cronbach alpha reliabilities reported on the diagonal in parentheses.

$^{t}p < .10$, * $p < .05$, ** $p < .01$.

SoP = start of project. EoP = end of project.

Table 3

Multiple Regression Analyses Predicting Innovation Implementation from Reflexivity

Dependent Variable	Model	Variable	*b*	*SE*	β	R^2	ΔR^2
Innovation Implementation	1	Intercept	3.65	.49		.03	
		Team Reflexivity SoP	.09	.14	.17		
	2	Intercept	2.19	.77		$.32^{t}$	.29*
		Team Reflexivity SoP	-.06	.14	-.12		
		Team Reflexivity EoP	.50	.22	.62*		

Note. $N = 15$.

$^{t}p < .10$, $*p < .05$, $**p < .01$.

SoP = start of project. EoP = end of project.

Table 4

Multiple Regression Analyses Predicting Fall Rates from Team Reflexivity

Dependent Variable	Model	Variable	*b*	*SE*	β	R^2	ΔR^2
Total Fall Rate EoP	1	Intercept	9.78	3.58		.14	
		Team Reflexivity SoP	-1.50	1.04	-.37^t		
	2	Intercept	14.70	6.49		.19	.06
		Team Reflexivity SoP	-.97	1.20	-.24		
		Team Reflexivity EoP	-1.70	1.86	-.27		
Injurious Fall Rate EoP	1	Intercept	5.66	4.91		.04	
		Team Reflexivity SoP	-1.08	1.43	-.20		
	2	Intercept	8.90	9.13		.06	.01
		Team Reflexivity SoP	-.74	1.69	-.14		
		Team Reflexivity EoP	-1.11	2.61	-.14		
Unassisted Fall Rate EoP	1	Intercept	8.91	4.06		.11	
		Team Reflexivity SoP	-1.49	1.18	-.33		
	2	Intercept	14.59	7.35		.17	.06
		Team Reflexivity SoP	-.89	1.36	-.20		
		Team Reflexivity EoP	-1.96	2.10	-.28		

Note. $N = 15$.

$^t p < .10$, $^* p < .05$, $^{**} p < .01$.

SoP = start of project. EoP = end of project.

Figure 1

Methods for Intervention and Implementation of Reflexivity Among Fall Risk Reduction Teams