An Evaluation of Shared Mental Models and Mutual Trust on General Medical Units: Implications for Collaboration, Teamwork, and Patient Safety

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Objectives: This study examines nurse-physician teamwork and collaboration, a critical component in the delivery of safe patient care, on general medical units. To that end, we assess shared mental models and mutual trust, 2 coordinating mechanisms that help facilitate teamwork, among nurses and physicians working on general medical units.

Methods: Data were collected from 37 nurses and 42 physicians at an urban teaching medical center in the Northeastern United States. Shared mental model questionnaire items were iteratively developed with experts' input to ensure content validity. Mutual trust items were adapted from an existing scale; items were reliable. Data were analyzed using χ^2 and independent 2-tailed t tests.

Results: Physicians and nurses reported significant differences in their perceptions of the professional responsible for a variety of roles (e.g., advocating for the patient [$P = 0.0007$], identifying a near miss/error [$P = 0.003$]). Medication reconciliation is only role for which nurses perceive less responsibility than physicians perceive nurses have. Regarding mutual trust, both groups reported significantly more trust within their own professions; both groups reported similar levels of trust in physicians, with physicians reporting significantly less trust in their nursing colleagues than nurses perceive ($P < 0.0001$).

Conclusions: Although many efforts have been directed at improving nurse-physician collaboration, more work is needed. To that end, we propose increasing knowledge about their respective roles, providing opportunities for nurse and physician collaboration through rounding or committee work and enhancing the preparedness and professionalism of interactions.

Key Words: collaboration, teamwork, shared mental models, mutual trust

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W hen physicians and nurses collaborate, they have the potential to engage in effective teamwork while providing improved patient care[1,2] and avoid sentinel events and medical errors that occur in hospital patient care.[3–5] Indeed, experts suggest that "quality suffers when caregivers do not work in teams" (p 846).[6] Collaboration between nurses and physicians, therefore, is a critical component in the delivery of patient care and has the potential to impact patient safety. Nurse-physician collaboration has long been recognized as important to achieving optimal outcomes including those related to the critically ill patient.[7–10] Henneman et al[11] in their concept analysis of collaboration in health care described collaboration as a complex process that requires competence and commitment on the part of all participants involved. It requires that participants respect and trust each other and view

themselves as members of a team who contribute to a common goal. This characterization is similar to a definition formulated by Baggs et al[12] when referring to collaboration between intensive care nurses and physicians, where they identified the key to effective collaboration as nurses and physicians working cooperatively as they share responsibilities for problem solving, decision making, and performing plans of care.

The concept of collaboration is often used interchangeably with teamwork, but the 2 are not the same. Both collaboration and teamwork require that individuals trust and respect each other. Teamwork and collaboration also both require excellent communication and coordination among team members to achieve important goals. Unlike teamwork, which often occurs in a hierarchical manner, where plans of care are developed by one group and performed by others, collaboration requires shared decision making, goal setting, and implementation of a plan of care.[11] As a result, our view is that teamwork is necessary but insufficient for collaboration to occur.[13]

The distinction between collaboration and teamwork is particularly important because hospitals are placing significant emphasis on promoting teamwork as a means of obtaining high-quality and safe care. Training programs, such as TeamSTEPPS,[14] are being implemented to provide structure for team-based processes and ultimately improve collaboration among health care professionals.[15] Despite the general acknowledgment of the benefits of health professionals working together and the widespread implementation of team-training programs, nurse and physician collaboration remains an elusive goal.[16,17]

The settings in which collaboration must occur may have direct impact on how easily or elusive effective teamwork and collaboration may be achieved. The majority of studies evaluating teamwork and team training have been conducted with teams that have a very narrow focus of care (e.g., radiology, obstetrics)[18] or with team members that work in close physical proximity to each other (e.g., operating rooms or emergency departments).[19,20] Only recently has teamwork been described on general medical units (GMUs) where team membership routinely changes as the patient care needs change.[13] The characteristics of this clinical setting present unique challenges, not only for studying teamwork and collaboration but also for implementing teamwork strategies.

The purpose of this study was to examine shared mental models and mutual trust, 2 elements of teamwork, among nurses and physicians working on GMUs. Shared mental models and mutual trust are 2 of the 3 coordinating mechanisms used in the TeamSTEPPS framework[21]; closed-loop communication is the third. (Closed-loop communication, the coordinating mechanism we did not study, is directly trainable through tools such as SBAR (Situation, Background, Assessment, Recommendations/Requests)[22,23] and I PASS (Illness severity, Patient summary, Action list, Situation awareness and contingency planning, Synthesis by receiver),[24] whereas shared mental models and mutual trust require time to develop [shared mental models[25]; mutual trust[26]].) Shared mental models are "individually held knowledge structures that help team

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members function collaboratively in their environments and are comprised of … content, similarity, accuracy and dynamics" (p 7).[27] Mutual trust is "the shared belief that team members will perform their roles and protect the interests of their teammates" (p 1582).[21] These 2 mechanisms align with the themes of shared responsibilities and trust embedded in the conceptual definition of collaboration as it relates to nurses and physicians,[11,12] and they play an important role in the safe delivery of care.[28,29]

METHODS

Setting, Participants, and Procedure

The study was conducted as part of a larger study conducted in an urban teaching medical center in the Northeastern United States.[13] A convenience sample of nurses and physicians working on 3 of the GMUs of the medical center were asked to complete a survey. The majority of physicians responding to the surveys were resident physicians in training. Institutional review board approval was obtained from the medical center's institutional review board before conducting the study. There were no exclusion criteria for participation in the study. Written informed consent was obtained from subjects before administration of the surveys.

Measures

A survey was developed to measure the 2 coordinating mechanisms of interest. A pilot study was conducted to test the ease of use for subjects in understanding the instructions and completing the survey. These data were not included in the sample; it was, however, collected at the same location to ensure that the survey was piloted with a population similar to the one with which the study was conducted. To our knowledge, no subjects were in both the pilot and the full study. Based on the results of the pilot study, instructions for completing the survey were modified. The updated version of the survey was approved by the institutional review board and used for this research.

A 7-point Likert scale was used for all survey items. A 7-point scale was used to provide more variability in responses. Specific anchors are described in the following sections.

Shared Mental Models

To assess shared mental models between physicians and nurses, we focused on the professional roles of these groups with respect to caring for patients on GMUs. This focus was selected because shared mental models may be held about a variety of contents simultaneously,[27] and in health care, the team member roles have been identified as a critical content domain.[30]

An expert panel of nurses and physicians who worked at the medical center developed a list of roles for which physicians and nurses were responsible based on knowledge of each professionals' scope of practice and about which they would benefit from having shared mental models. This approach is similar to that of Kaas et al,[31] who studied prescriptive practice collaboration between clinical nurse specialists and psychiatrists. This original list of roles was reviewed by a second, different group of experts who offered suggestions for additional items and clarity. The final list was revised based on this input. The final set of 22 items had a 96% agreement among the 4 final experts, which further supported the content validity of the survey instrument. The final instrument contained a list of the 22 items that directed respondents to rate the professional they believed had responsibility for a specific role (e.g., making medical diagnosis, administering medications) on a Likert scale from 1 to 7 scale with 1 = only doctors, 4 = doctors and nurses equally, and 7 = only nurses.

Mutual Trust

A 6-item mutual trust scale was adapted from Roberts and O'Reilly.[32] Respondents rated their perception of interactions with nurses and physicians on their specific unit on a 7-point Likert scale (1 = strongly disagree, 4 = neutral, 7 = strongly agree) by repeating the same items twice, once with the physician as the referent and once with the nurse as the referent. Example items include "I freely discuss problems and difficulties regarding patient care with DOCTOR." and "The information about this patient that I receive from the NURSES on this patient's team is accurate." The Cronbach α for the physician's and nurse's mutual trust questions are 0.74 and 0.81, respectively.

Analysis

A χ^2 analysis was conducted to compare demographics between the groups. Independent 2-tailed t tests were used to compare responses between nurses and physicians.

RESULTS

Surveys were completed by 37 nurses and 42 physicians, representing a 39% response rate. The sample demographics are presented in Table 1. Significant differences were identified between the 2 groups' ages, sexes, and races. Nurses reported a mean (SD) age of 36.9 (10.5) years, whereas physicians reported a mean (SD) age of 31.6 (5.65) years ($t = 2.6$, $P = 0.01$). The majority of nurses and physicians were female, 94% and 56%, respectively ($\chi^2 = 13.25$, $P = 0.0003$). Finally, the majority of nurses and physicians identified as white, 97% and 62%, respectively ($\chi^2 = 16.67$, $P = 0.0008$). These demographics are consistent with those of the Northeastern United States.

The results comparing nurses' and physicians' shared mental models about roles are presented in Table 2. In 14 of the 22 mental models, the 2 groups report significant differences ($P \leq 0.05$) in perceived role responsibilities. These significantly different mental models representing perceived role are depicted in Figure 1 and arranged based on the nurses' responses, starting with the roles for which nurses see they have the most responsibility. Of those 14 roles for which the 2 groups perceive differences, only medication reconciliation is reported by the nurses as a role for which they have *less* responsibility than physicians perceive the nurse has; for all other roles, the nurses identify that they have more responsibility than the physicians perceive the nurse has. A second notable pattern is that for all but 4 of the roles, the nurses perceived the tasks as being shared equally between nurses and physicians (i.e., mean [SD] ratings at 4 [0.5] on a 7-point scale, where 4 = doctors and nurses equally).

In Table 3, the results regarding mutual trust are reported. Nurses and physicians report significantly more mutual trust with others in their own profession. Specifically, nurses rated trusting other nurses at 5.76 (on a 7-point scale) while rating that they trust physicians at 5.24 ($t = 2.44$. $P = 0.02$); physicians rated trusting other physicians at 5.37 while rating that they trust nurses at 4.97 ($t = -2.06$, $P = 0.04$). We also tested for differences in the levels of mutual trust between professions for both nurses and physicians. We found that both nurses and physicians trust

TABLE 1. Sample Demographics

		Nurses	Physicians	Significance Test
Age	Mean (SD), y	36.9 (10.5)	31.6 (5.65)	$t = 2.6$, $P = 0.01$
Sex	Female, %	94	56	$\chi^2 = 13.25$, $P = 0.0003$
Race	White, %	97	62	$\chi^2 = 16.67$, $P = 0.0008$

TABLE 2. Testing for Shared Mental Models of Role Responsibilities

Roles	Nurse (n = 37)		Physician (n = 43)		*t*	*P*
	Mean	**SD**	**Mean**	**SD**		
Administering medications	6.11	0.77	6.26	0.79	−0.84	0.4
Advocating for the patient	4.57	0.87	4.00	0.44	3.61	0.0007
Communicating discharge instructions to the patient and/or family	4.19	0.74	4.02	0.46	1.18	0.24
Communicating with the family	4.11	0.39	3.86	0.80	1.79	0.08
Complying with guidelines (e.g., heart failure, pneumonia)	3.89	0.91	2.93	1.14	4.12	<0.0001
Conducting a history and physical exam	2.54	1.26	2.16	1.11	1.42	0.16
Coordinating care	4.22	0.63	3.70	0.77	3.26	0.002
Developing a plan of care	3.95	0.23	2.93	0.99	6.56	<0.0001
Discussing any anxiety or fear the patient may have had about her or his medical condition and treatment	4.03	0.64	3.49	0.88	3.07	0.003
Discussing advanced directives with the patient and/or family	3.97	1.17	2.35	1.07	6.50	<0.0001
Explaining new medications	4.08	0.72	2.79	1.08	6.35	<0.0001
Explaining treatments or test to the patient and/or family	3.38	0.89	2.72	0.93	3.20	0.002
Giving patient prognostic information	1.95	1.00	1.65	0.78	1.48	0.14
Identifying a near miss/error	4.43	0.77	4.02	0.15	3.20	0.003
Implementing deep venous thrombosis prophylaxis protocols	3.67	0.63	3.21	1.36	1.97	0.05
Involving the patient and/or family in decisions about the plan for care	3.81	0.66	3.02	0.86	4.54	<0.0001
Keeping the patient and/or family informed about the patient's medical condition and treatment	3.68	0.78	3.19	0.98	2.44	0.02
Making medical diagnoses	1.70	1.20	1.91	0.78	−0.89	0.38
Participating in rounds	3.58	0.73	3.53	0.77	0.29	0.78
Providing mouth care	5.92	1.28	6.21	1.01	−1.13	0.26
Reconciling medications	3.03	1.25	4.05	0.65	−4.40	<0.0001
Taking vital signs	5.92	0.92	5.44	0.96	2.26	0.03

physicians at approximately the same level (5.24 and 5.37, respectively; *P* = 0.55). The level of trust each group reports having in nurses, however, is significantly different, with nurses reporting significantly more trust in nurses than physicians report having in nurses (5.76 and 4.97, respectively; *P* = 0.0001).

DISCUSSION

Our study results provide new insight into why collaboration between nurses and physicians remains a challenge and continues to require attention. The reported differences in mental models about role responsibilities and mutual trust between groups create barriers to collaboration on GMUs. Several of our findings were not unexpected. First, nonsignificant differences in perception of role responsibility were found in tasks with clearly delineated practice boundaries (e.g., physicians making medical diagnoses, nurses providing oral care). Three roles were perceived by nurses and physicians to be shared equally between professions, namely communicating discharge instructions, communicating with family, and participating in rounds. Moreover, both nurses and physicians reported significantly greater mutual trust with those in their professional groups than with those in the other group.
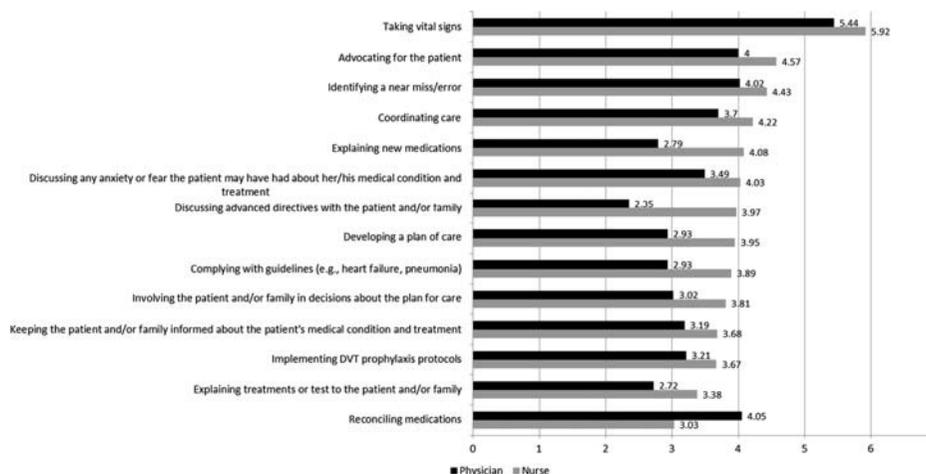

FIGURE 1. Examining roles for which nurses and physicians have significantly different mental models.

TABLE 3. Testing for Mutual Trust Within and Between Nurses and Physicians

	Nurse (n = 37)	Physician (n = 43)	t test
Trust nurses	5.76 (0.81)	4.97 (0.82)	4.04, P = 0.0001
Trust physicians	5.24 (0.94)	5.37 (0.79)	−0.6, P = 0.55
t test	2.44, P = 0.02	−2.06, P = 0.04	

An unexpected finding was physicians' perceptions of primary responsibility for completing many tasks that nurses reported were shared equally by both disciplines. This characterization was true for discussing advanced directives, informing patients about new medications, discussing anxiety with patient and family members, coordinating care, and keeping patients and family members informed about their conditions and treatments. All of these responsibilities fall under the nurses' practice act and are performed on a continuous basis by the nurse providing direct patient care. Although a physician may talk to patients about new medications during daily rounds, a patient's nursing care plan includes teaching patients about new medications they have been prescribed. Nurses are also responsible for making sure care is coordinated within the hospital and for incorporating follow-up care into discharge planning. These findings are similar to those from Thomas et al,[33] who found discrepant teamwork perceptions between nurses and physicians, where nurses reported needing more input in decision making and consideration when input is given.

Interestingly, the only significantly different perception of provider roles where the physicians perceived shared responsibility with nurses was medication reconciliation, whereas nurses perceived this task to be more of a physician responsibility. This difference in perception about who should have responsibility for medication reconciliation is concerning. Clearly, the potential for errors exists when physicians expect that nurses are sharing this responsibility while nurses perceive physicians are managing this task.

Two additional significant differences in mental models about responsibilities are also worth noting, namely, the differences in perspectives about the responsibility for identifying a near miss and advocating for the patient. Both items were perceived as being shared between nurses and physicians by both parties, but the significant differences between disciplines are attributable to nurses indicating slightly more responsibility for these 2 activities. The significance may not be a difference in perspective as much as it may be an artifact of the amount of patient contact each discipline has and the consideration they give to patient needs. Nurses are colocated with the patients and, therefore, have more opportunities to identify near misses as they, for instance, administer drugs prescribed by physicians. In addition, because nurses have a "home" unit, they take responsibility for identifying "system" issues that impact the patients on their unit. Physicians, on the other hand, work on multiple units and so may not have that same investment or opportunity. Weller et al[34] reported that although junior doctors and nurses saw their roles as complementary and expressed mutual respect for one another, system issues such as lack of a shared "home base" and lack of leadership supporting teamwork served as barriers to collaboration. Regarding patient advocacy, the evidence from both physicians and nurses suggests that physicians may not adequately consider the mental welfare and social needs of patients.[35] Nurses, however, may gather information about patients' and their families' wishes with respect to their care that may be critical input to the decisions being made about care.

Regarding mutual trust, we found that both groups reported similar levels of trust in physicians, but the physicians reported significantly lower trust in nurses. This disconnect may be a function of the differences in shared mental models related to role responsibilities. Pullon[36] suggests that assessments of role competence may lead to respect and, ultimately, to trust. If physicians do not perceive that the nurses share certain responsibilities, as previously discussed, they may not be familiar with their ability to complete those tasks. In other words, they may question their competence, which may lead to lower levels of trust. In a study by Weinberg et al,[17] resident physicians reported having strong doubts about nurse competence and believed the nurses' role to be one of following orders.

Nurses and physicians agree that high-quality, safe patient care is the ultimate goal,[34,36] and researchers suggest that teamwork is necessary to achieve that goal.[6,8,12,21] Teamwork training has been offered, but collaboration between nurses and physicians is still lacking.[6,16,17] The question becomes what can be done to increase shared mental models, increase mutual trust, and ultimately improve collaboration and enhance patient safety? We present 3 strategies to address this question.

First, both disciplines but particularly physicians require increased knowledge of the respective roles each discipline is capable of performing. In other words, they need shared mental models about how role responsibilities are distributed. This knowledge can be gained through training and through increased interprofessional activities during their medical education process. If physicians have more insight into the nurses' roles, responsibilities, and educational background, through, for example, learning exercises in simulated patient care environments, they would be likely to have increased respect and ultimately trust in the nurse. Pullon[36] suggests that the shift from respecting others to trusting them requires a combination of understanding their professional roles and believing that individuals can do their jobs. This first strategy is aimed at enhancing knowledge about professional roles. The second and third strategies are designed to enhance relationships among individuals.

Our second strategy is to provide more opportunities for nurse and physician interactions beyond the educational setting. These opportunities could be patient focused such as including nurses as full partners during daily bedside rounds or during postevent debriefing sessions (e.g., post–cardiac arrest resuscitation). The interactions could also occur through other activities such as interprofessional committee work (e.g., quality and safety committees). Shared participation and goal setting, such as around quality and safety initiatives, are likely to result in increased commitment of both parties.

Finally, our third strategy is to enhance the preparedness and professionalism of interactions. Tija et al[37] found that nurses and physicians perceived that (1) nurses were often unprepared for physician interactions about patients and (2) physicians were often unprofessional during these interactions. One possible option may be to have the nurses and physicians engage in asynchronous communication about patients when this communication needs to occur after rounds. Nurses will be prepared to convey their message about the patient (versus recalling the issues when physicians call back after they have moved on to other activities),

and physicians will not be interrupted, which may lead to some of their unprofessional behavior.

A second suggestion for enhancing preparedness and professionalism is to work on increasing self-confidence, particularly in novice nurses and physicians. Self-confidence may be enhanced when individuals perceive an ability to communicate as equals. The introduction of SBAR as a means of structuring communication between nurses and physicians is an example of an intervention that facilitates more effective communication and possibly more self-confidence on the part of those compiling the information to be exchanged through the clear structure required. The trajectory from competence to respect to trust proposed by Pullon[36] requires that clinicians view competence in both others and themselves. Mentoring the less experienced care providers to increase their self-confidence may enhance their preparedness and professionalism, thereby making interactions more meaningful.

This study has several limitations. First, the list of roles and responsibilities regarding shared mental models is not exhaustive. Other roles may also be critical to the delivery of safe, effective care. Our approach to creating this list, however, was sound in that it included roles that are definitely unique to a discipline (i.e., ordering medication) and others known to be shared by virtue of a medical center policy (e.g., medication reconciliation). Second, data were collected from only one hospital, but our study population included all interns and residents who served 7 units within the hospital and nurses from 3 different units with different patient populations. Third, all surveys, particularly those from a convenience sample such as ours, have the potential for response bias. Finally, the majority of physicians surveyed were trainees, which limits generalizability to the community hospital setting but is very representative of the academic medical setting.

CONCLUSIONS

In conclusion, our findings lend new insight into why nurse-physician collaboration remains a challenge in the patient care setting in general and for patient safety in particular. Future researchers need to identify interventions to address the differences between nurses and physicians regarding mutual trust and shared mental models. The ultimate goal is to increase patient safety through more effective collaboration, facilitated by shared mental models and mutual trust.

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