

Impact of Localizing Physicians to Hospital Units on Nurse—Physician Communication and Agreement on the Plan of Care

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BACKGROUND: A significant barrier to communication among patient care providers in hospitals is the geographic dispersion of team members.

OBJECTIVE: To determine whether localizing physicians to specific patient care units improves nurse-physician communication and agreement on patients' plans of care.

METHODS: We conducted structured interviews of a cross-sectional sample of nurses and physicians before and after an intervention to localize physicians to specific patient care units. Interviews characterized patterns of nurse-physician communication and assessed understanding of patients' plans of care. Two internists reviewed responses and rated nurse-physician agreement on six aspects of the plan of care as none, partial, or complete agreement.

RESULTS: Three hundred eleven of 342 (91%) and 291 of 294 (99%) patients' nurses and 301 of 342 (88%) and 285 of 294 (97%) physicians completed the interview during the pre- and post-localization periods. Two hundred nine of 285 (73%) patients were localized to physicians' designated patient care units in the post-localization period. After localization, a higher percentage of patients' nurses and physicians was able to correctly identify one another (93% vs. 71%; $p < 0.001$ and 58% vs. 36%; $p < 0.001$, respectively). Nurses and physicians reported more frequent communication after localization (68% vs. 50%; $p < 0.001$ and 74% vs. 61%; $p < 0.001$, respectively). Nurse-physician agreement was significantly improved for two aspects of the plan of care: planned tests and anticipated length of stay.

CONCLUSIONS: Although nurses and physicians were able to identify one another and communicated more frequently after localizing physicians to specific patient care units, there was little impact on nurse-physician agreement on the plan of care.

KEY WORDS: teamwork; communication; patient safety; multidisciplinary; hospital

J Gen Intern Med 24(11):1223-7

DOI: 10.1007/s11606-009-1113-7

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INTRODUCTION

Communication between nurses and physicians is critically important to provide safe and effective care, as poor communication represents a major etiology of preventable adverse events in hospitals.¹⁻⁵ Without effective communication, nurses and physicians may operate under divergent *mental models* regarding goals of care. Effective teams work with a shared mental model—an organizing knowledge structure of the relationship between tasks facing the team and how team members will interact.⁶ Unfortunately, nurses and physicians do not appear to communicate consistently⁷ and are often not in agreement on the plan of care for hospitalized medical patients.⁸

A significant barrier to communication among providers on patient care units is the fluidity and geographic dispersion of team members.⁹ Unlike in an operating room, physicians and nurses care for multiple patients simultaneously. Though nurses typically care for patients on a single unit, physicians often care for patients on multiple units, making it difficult for physicians and nurses to discuss the care of their patients in person. Early efforts have been reported that organize residents into unit-based, geographically integrated teams as part of a quality improvement initiative.¹⁰ However, the impact of localizing physicians to specific patient care units on physician-nurse communication is unknown. The aim of this study was to characterize patterns of nurse-physician communication and nurse-physician agreement on the plan of care before and after an intervention designed to localize physicians to specific patient care units.

METHODS

Design

We conducted interviews of a cross-sectional sample of patients' nurses and physicians in June 2007 and June 2008, before and after an intervention designed to localize physicians to specific patient care units. Each day during the

Electronic supplementary material The online version of this article (doi:10.1007/s11606-009-1113-7) contains supplementary material, which is available to authorized users.

Received April 20, 2009

Revised August 7, 2009

Accepted August 21, 2009

Published online September 19, 2009

study months, we interviewed patients admitted to general medical services, their nurses and physicians in the afternoon of the patient's 2nd hospital day. Patients were randomly selected from daily hospital census reports for inclusion in the study using a random number generator.

Setting and Participants

The study was conducted at Northwestern Memorial Hospital (NMH), an 897-bed tertiary care teaching hospital in Chicago, Illinois, and was approved by the Institutional Review Board of Northwestern University. General medical patients were admitted to one of two physician services: a housestaff-covered teaching service or a non-housestaff-covered hospitalist service. Teaching service teams consisted of one attending, one resident, one or two interns, and one or two third-year medical students. Hospitalists cared for patients independently without the assistance of housestaff physicians or mid-level providers (i.e., physician assistants or nurse practitioners).

Intervention

Prior to January 2008, medical patients were first assigned to a physician service, and subsequently admitted to one of six units with no attempt to localize physician teams to specific units. Therefore, physicians may have cared for patients on as many as six units on four different floors. In January 2008, an additional medical unit was made available, and physicians were designated to specific units. Three units were designated for the teaching service, and four were designated for hospitalists. Patients requiring admission from the emergency department or a physician's office were first assigned a hospital bed and subsequently a physician service (teaching service or hospitalist) based on their assigned unit. Each teaching service unit was staffed by three teaching service physician teams who cared for all patients admitted to their unit. Each hospitalist service unit was covered by two or three hospitalists. In an effort to optimize localization, physicians did not care for patients off of their assigned unit except to allow readmissions from other services or the outpatient setting to be cared for by the same physician team. No other interventions to improve familiarity, communication, or collaboration among team members were initiated between June 2007 and June 2008.

Interviews of Patients, Nurses, and Physicians

We used a structured interview instrument previously designed by our research team to characterize nurse-physician communication and assess understanding of patients' plan of care (See Appendix available online).⁸ Standardized interviews of patients' nurses and physicians were conducted by a research assistant in the afternoon of the patients' 2nd hospital day. Patients who were unable to speak and/or understand English, or had cognitive impairment were excluded. Nurses and physicians of excluded patients remained eligible for participation in the study.

Patients' nurses were interviewed and asked whether they knew the name of the physician primarily responsible for the care of the patient and whether they had discussed the patient's plan of care with the physician on that day. If discussion had taken place, nurses were asked whether

communication had taken place face-to-face, via telephone, or via textpage. Nurses were then asked specific questions about six aspects of the plan of care for the patient that day, including: the main diagnosis, planned tests, procedures, medication changes, which physician consulting services were expected to see the patient, and the expected length of stay. Nurses' responses to questions about the plan of care were recorded verbatim by the research assistants.

For patients admitted to the teaching service, we defined the inpatient physician as the intern. For patients admitted to the hospitalist service, we defined the inpatient physician as the hospitalist. The rationale for this designation was that these were the physicians primarily responsible for nurse-physician communication. Patients' physicians were interviewed and asked whether they knew the name of the nurse taking care of the patient and whether they had discussed the patient's plan of care with the nurse on that day. The form of communication and specific questions regarding the plan of care for the patient that day were assessed in the same fashion as for the nurses.

In order to minimize confounding due to evolving plans of care and various levels of physician training, all interviews were conducted during the afternoon of patients' 2nd hospital day. This ensured that housestaff physicians were interviewed after their supervising attending had rounded with the team and discussed the plan of care for patients admitted the day prior.

Physician Review for Agreement on the Plan of Care

Two board certified internists (M.P.L. and N.K.) reviewed nurse and physician responses and rated nurse-physician agreement on each aspect of the plan of care as no agreement, partial agreement, or complete agreement. For example, if the nurse responded that the patient's main diagnosis was fainting and the physician responded that it was syncope, complete agreement was given for that aspect of care (primary diagnosis). If the nurse responded that the patient's planned testing for the day included only a lower extremity venous duplex study and the physician responded that the patient was planned for a lower extremity venous duplex study and a CT scan of the chest, partial agreement was given. For anticipated length of stay, we defined complete agreement as an exact match between the nurse and physician, partial agreement as a difference between the nurse and physician of 1 day, and no agreement as a difference between the nurse and physician of more than 1 day. We calculated a Nurse-Physician Summary Agreement Score by assigning 0, 1, or 2 points for no agreement, partial agreement, and complete agreement, respectively, to each of the six aspects of the plan of care. To assess inter-rater reliability, approximately 30% of participant responses underwent duplicate review.

Data Analysis

Demographic data on patients, nurses, and physicians was obtained from administrative databases and interviews, and compared using chi-square and t-tests. We used chi square to evaluate the number and percent of nurses and physicians reporting that communication had occurred, the form of communication, and whether health-care professionals knew

each others' names before and after localization of physicians to specific units. We assessed inter-rater reliability on the plan of care using the weighted kappa statistic. We compared nurse-physician agreement on aspects of the plan of care using chi square and compared the Nurse-Physician Summary Agreement Score using the Mann-Whitney U test. All analyses were conducted using Stata version 10.0 (College Station, Texas).

RESULTS

Three-hundred forty-two patients in the pre-localization period and 294 patients in the post-localization period were eligible to participate in the study. Three hundred eleven of 342 (91%) and 291 of 294 (99%) patients' nurses completed the interview during the pre- and post-localization periods, respectively. Nurse interviews represented 144 different nurses during the pre-localization period and 118 different nurses during the post-localization period because individual nurses may have been interviewed more than once about separate patients in the study. Three hundred one of 342 (88%) and 285 of 294 (97%) patients' physicians completed the interview during the pre- and post-localization periods, respectively. Physician interviews represented 42 different physicians during the pre-localization period and 45 different physicians during the post-localization period because individual physicians may have been interviewed more than once about separate patients in the study.

Participant Characteristics

There were no differences in patient age or gender between the pre- and post-localization periods. More patients in the post-localization period were white as compared to the pre-localization period (54% vs. 48%; $p=0.02$). Nurse and physician characteristics are summarized in Table 1. Nurses were younger, had been working at the hospital for a shorter period of time, and were caring for slightly more patients during the

post-localization period. Physician characteristics were similar between the two periods.

Two hundred nine of 285 (73%) patients were successfully localized to physicians' designated units in the post-localization period. Localization was more successful for teaching service patients than for hospitalist service patients (85% vs. 65%; $p<0.001$). Nurses were almost always assigned to their specific unit (92% pre-localization, 90% post-localization).

Communication between Nurses and Physicians

The reported frequency and types of communication between nurses and physicians during the study is summarized in Table 2. After localization, the ability of patients' nurses to correctly identify physicians improved from 71% to 93%, $p<0.001$. Similarly, the ability of patients' physicians to correctly identify nurses rose from 36% to 58%, $p<0.001$. Nurses reported that communication with patients' physicians occurred more often (68% vs. 50%; $p<0.001$) after localization. Physicians also reported that communication with patients' nurses occurred more often (74% vs. 61%; $p<0.001$) after localization. Both nurses and physicians indicated that face-to-face communication occurred more often (85% vs. 65%; $p<0.001$ and 84% vs. 69%; $p<0.001$ for nurses and physicians, respectively) after localization. Results were generally similar on the teaching service as compared to the hospitalist service.

Agreement Between Nurses and Physicians on the Plan of Care

Agreement between nurses and physicians on aspects of the plan of care is summarized in Table 3. Inter-rater reliability between the internists in their rating of nurse-physician agreement on aspects of the plan of care was high during both the pre- and post-localization periods (weighted kappa range 0.81-1). Nurse-physician agreement was significantly improved after localization for only two of the six aspects of the plan of care: planned tests and anticipated length of stay. The Nurse-Physician Summary Agreement Score was higher for

Table 1. Characteristics of Patients, Nurses, and Physicians

| Characteristic ^a | Nurses | | | Physicians | | |
|--|--------------------------|---------------------------|---------|-------------------------|--------------------------|---------|
| | Pre-localization (n=144) | Post-localization (n=118) | P value | Pre-localization (n=42) | Post-localization (n=45) | P value |
| Mean age (SD), years | 32.9 (9.0) | 30.3 (7.5) | 0.02 | 30.0 (4.2) | 31.0 (3.9) | 0.17 |
| Women, n (%) | 128 (88) | 109 (92) | 0.34 | 22 (52) | 26 (58) | 0.61 |
| Race/ethnicity, n (%) | | | | | | |
| White | 87 (63) | 74 (66) | | 18 (45) | 26 (59) | |
| Black | 7 (5) | 4 (4) | | 1 (3) | 2 (5) | |
| Hispanic | 8 (6) | 10 (9) | | 0 (0) | 0 (0) | |
| Asian | 36 (26) | 21 (19) | | 17 (43) | 16 (36) | |
| Other | 1 (1) | 3 (3) | 0.38 | 4 (10) | 0 (0) | 0.13 |
| Median years since professional school graduation (IQR) | 4.5 (2-11) | 3 (1-8.25) | 0.05 | 2 (1-6) | 2 (1-7) | 0.72 |
| Median years at hospital (IQR) | 3 (1.5-6) | 2.3 (0.8-6) | 0.005 | 2 (1-3.5) | 1.5 (1-2) | 0.58 |
| Provider on usual unit on day of interview, n (%) ^a | 280 (92) | 243 (90) | 0.25 | NA | 209 (73) | NA |
| Mean number of patients on day of interview (SD) ^b | 4.1 (0.7) | 4.3 (0.6) | 0.001 | 9.7 (3.3) | 9.7 (2.8) | 0.9 |

^aN varies slightly due to missing data elements

NA = not applicable

Table 2. Nurses' and Physicians' Patterns of Communication and Ability to Identify Each Other on Day of Interview

| Patterns of communication and identification by provider | Pre-localization | Post-localization | P Value |
|---|------------------|-------------------|---------|
| Nurses (n=310) | | (n=288) | |
| Nurse correctly named physician, n (%) | 219 (71) | 267 (93) | p<0.001 |
| Nurse reported communicating with physician, n (%) | 156 (50) | 197 (68) | p<0.001 |
| Type of communication, n (% those reporting communication) ^a | | | |
| Face-to-face | 85 (65) | 167 (85) | |
| Telephone | 37 (28) | 24 (12) | |
| Text page only | 9 (7) | 6 (3) | p<0.001 |
| Physicians (n=301) | | (n=284) | |
| Physician correctly named nurse, n (%) | 108 (36) | 164 (58) | p<0.001 |
| Physician reported communication with nurse, n (%) | 185 (61) | 209 (74) | p=0.002 |
| Type of communication, n (% those reporting communication) ^b | | | |
| Face-to-face | 126 (69) | 174 (84) | |
| Telephone | 53 (29) | 29 (14) | |
| Text page only | 4 (2) | 5 (2) | p=0.001 |

^aN=131 for pre-localization period due to missing data

^bN=183 and 208 for pre- and post-localizations periods due to missing data

the post-localization period; however, this result was not statistically significant (8.0±2.2 vs. 7.6±2.3; p=0.11). Results for individual aspects of the plan of care as well as the Nurse-Physician Summary Agreement Score were similar whether patients were cared for by physicians on teaching service or the hospitalist service.

DISCUSSION

Geographic dispersion and the dynamic nature of medical teams in hospitals present barriers for nurse-physician communication. We found that hospitalized patients' nurses and physicians were better able to identify one another and

reported greater frequency of communication after a deliberate and successful attempt to localize physicians to specific units. Additionally, nurse-physician agreement on the plan of care was significantly improved in two of six aspects of the plan of care (planned tests and anticipated length of stay). We believe that these results support localization of physicians and nurses to specific units to foster communication between patient caregivers. Our intervention did not improve four areas within the plan of care (primary diagnosis, planned procedures, medication changes, and physician consultations). The explanation for this finding likely relates to the quality of communication among providers, which we did not assess in our study. Research in operating rooms, a setting in which team members work in close proximity to one another, has shown poor ratings in the quality of communication and collaboration among providers.¹¹ Similarly, collaboration among team members in intensive care units has been rated poorly,¹² and studies suggest that structured conversation, through the use of daily goals of care tools, is required to ensure meaningful discussion and a shared understanding of patients' plan of care.^{13,14} Therefore, it seems reasonable to conclude that proximity facilitates communication, but is not sufficient to create a shared understanding among team members.

Formalized team training, based on crew resource management, has also been studied as a potential method to improve collaboration in health-care settings.¹⁵⁻¹⁷ Team training appears to positively influence culture as assessed by teamwork and patient safety climate survey instruments.¹⁵ Seghal and colleagues recently reported on teamwork training on general medical services.¹⁸ Though teamwork training was rated highly among participants in Seghal's study, there was no assessment of improvements in actual teamwork behaviors as a result of the training. The potential benefit of teamwork training will likely be attenuated if health-care providers are not in the same place at the same time. Further research is needed to determine if localizing patient care providers to specific units can be used along with other interventions, such as team training, to further improve communication and collaboration between nurses and physicians.

Our study has several limitations. Our study involved nurses and physicians of general medical service patients at a single teaching hospital. Providers' communication practices may differ among hospitals and hospital services. Although we are not aware of other interventions to improve communication and collaboration between June 2007 and June 2008, it is

Table 3. Agreement Between Nurse and Physician on Aspects of the Plan of Care

| Aspect of care ^a | Pre-localization agreement | | | Post-localization agreement | | | P Value |
|--|----------------------------|---------|----------|-----------------------------|---------|----------|---------|
| | None | Partial | Complete | None | Partial | Complete | |
| Primary diagnosis, n (%) | 75 (26) | 60 (21) | 151 (53) | 55 (20) | 78 (28) | 148 (53) | 0.07 |
| Planned tests, n (%) | 73 (26) | 43 (15) | 165 (59) | 62 (22) | 24 (9) | 194 (69) | 0.01 |
| Planned procedures, n (%) | 31 (11) | 1 (0) | 252 (89) | 19 (7) | 1 (0) | 262 (93) | 0.14 |
| Medication changes, n (%) | 118 (42) | 22 (8) | 144 (51) | 125 (44) | 26 (9) | 130 (46) | 0.54 |
| Physician consultations, n (%) | 109 (39) | 22 (8) | 152 (54) | 108 (38) | 28 (10) | 146 (52) | 0.67 |
| Anticipated length of stay, n (%) ^b | 103 (36) | 87 (31) | 95 (33) | 70 (25) | 75 (27) | 136 (48) | <0.001 |

^aN range 281-286 and 280-282 for the pre- and post-localization periods due to missing data elements

^bLength of stay agreement rated as follows: none = >1 day difference; partial = 1 day difference; complete = no difference (exact match)
NA = not applicable

possible that communication practice patterns may have improved for other reasons. There is also the potential for improvement in communication practices due to physicians and nurses being aware that a study was ongoing. To explore this potential limitation, we conducted a post hoc analysis of providers' reports of communication and ability to correctly identify one another by week of each interview period. We found no evidence that performance improved during either interview period. Another limitation relates to our being unable to completely localize physicians to specific units. It is possible that nurse-physician agreement on the plan of care would have improved further with more complete localization of physicians to designated units.

To our knowledge, no prior research has evaluated the impact of localizing physicians and nurses to specific units on interdisciplinary communication. Mention of geographic dispersion of physicians as a barrier to collaboration in prior reports^{9,10,18,20} suggest that this is a widespread concern.^{19,20} Ongoing interventions at our institution, made possible as a result of localization, include the addition of daily interdisciplinary rounds to review goals of care.^{13,14}

In conclusion, we found improvement in several aspects of nurse-physician communication after physician localization to specific hospital units. Further effort is needed to optimize communication between team members, develop a shared mental model of patient care, and assess the impact of improved communication on the quality of patient care.

Acknowledgements: This study was funded by the Northwestern University Department of Medicine.

Conflict of Interest: None disclosed.

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