Improving Teamwork: Impact of Structured Interdisciplinary Rounds on a Medical Teaching Unit

Kevin J. O'Leary, MD, MS[1], Diane B. Wayne, MD[2], Corinne Haviley, RN, MS[3], Maureen E. Slade, MS, RN, CS[3], Jungwha Lee, PhD, MPH[4], and Mark V. Williams, MD[1]

[1]Division of Hospital Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL, USA; [2]Division of General Internal Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL, USA; [3]Northwestern Memorial Hospital, Chicago, IL, USA; [4]Department of Preventative Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL, USA.

BACKGROUND: Effective collaboration and teamwork is essential in providing safe and effective hospital care. Prior research reveals deficiencies in collaboration on medical teaching units.

OBJECTIVE: The aim of this study was to assess the impact of an intervention, structured inter-disciplinary rounds (SIDR), on hospital care providers' ratings of collaboration and teamwork.

METHODS: The study was a controlled trial comparing an intervention medical teaching unit with a similar control unit. The intervention, SIDR, combined a structured format for communication with a forum for regular interdisciplinary meetings. We surveyed providers on each unit and asked them to rate the quality of communication and collaboration they had experienced with other disciplines using a five-point ordinal scale. We also assessed the teamwork and safety climate using a validated instrument. Multivariable regression analyses were used to assess the impact on length of stay (LOS) and cost.

RESULTS: One hundred forty-seven of 159 (92%) eligible providers completed the survey. Although resident physicians on each unit rated the quality of communication and collaboration with nurses similarly, a greater percentage of nurses gave high ratings to the quality of collaboration with resident physicians on the intervention unit as compared to the control unit (74% vs. 44%; p=0.02). Providers on the intervention unit rated the teamwork climate significantly higher as compared to the control unit (82.4±11.7 vs. 77.3±12.3; p=0.01). The difference was explained by higher teamwork climate ratings on the part of nurses on the intervention unit (83.5±14.7 vs. 74.2±14.1; p=0.005). Ratings of the safety climate were not significantly different between units. Adjusted LOS and hospital costs were not significantly different between units.

CONCLUSIONS: SIDR had a positive effect on nurses' ratings of collaboration and teamwork on a medical teaching unit. Further study is required to assess the impact of SIDR on patient safety measures.

KEY WORDS: teamwork; SIDR; interdisciplinary rounds; communication.
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INTRODUCTION

Communication among hospital care providers is critically important to provide safe and effective care.[1–5] Yet, studies of physicians and nurses in operating rooms, intensive care units (ICUs), and general medical units have revealed widely discrepant views on the quality of collaboration and communication between physicians and nurses.[6–8] Although physicians often gave high ratings to the quality of collaboration with nurses, nurses consistently rated the quality of collaboration with these same physicians relatively poorly.

A significant barrier to communication among providers on patient care units in teaching hospitals is the fluidity and geographic dispersion of team members.[8] Resident physicians, nurses, and other hospital care providers have difficulty finding a way to discuss the care of their patients in person. Research has shown that nurses and resident physicians on patient care units do not communicate consistently and frequently are not in agreement about their patients' plans of care.[9,10]

Interdisciplinary rounds (IDR) have been used as means to assemble patient care unit team members and improve collaboration on the plan of care. Prior research demonstrated improved ratings of collaboration by physicians,[11,12] but the effect of IDR on nurses' ratings of collaboration is not clear. Regarding more concrete outcomes, research indicates variable effects of IDR on length of stay (LOS) and cost. Although

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two studies documented a reduction in LOS and cost with the use of IDR,[11,13] another study showed no effect.[14]

This study had three aims. The first was to assess the impact of an intervention, structured inter-disciplinary rounds (SIDR), on both physicians' and nurses' ratings of collaboration and teamwork and safety climate. The second was to assess the feasibility of the intervention. The third was to assess the impact of the intervention on hospital LOS and cost.

METHODS

Setting and Study Design

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. The study was a controlled trial of an intervention, SIDR, on collaboration and teamwork on general medicine patient care units. One of two similar teaching service units was randomly selected for the intervention, while the other served as a control unit. SIDR was implemented in August 2008 and data were collected over a 6-month study period.

Each teaching service unit consisted of 30 beds and was equipped with continuous cardiac telemetry monitoring. Teaching service physician teams consisted of one attending, one resident, one or two interns, and one or two third year medical students. As a result of a prior intervention, teaching service physician teams were localized to specific units in an effort to improve communication practices among nurses and physicians.[15] Both units had physician localization, and similar structure and staffing of non-physician health care professionals. Unidirectional alphanumeric paging was available to physicians and nurses on both study units and all providers used a fully integrated electronic medical record (EMR) and computerized physician order entry system (CPOE).

Intervention

SIDR combined a structured format for communication and a forum for regular interdisciplinary meetings. A working group, consisting of nurses, resident physicians, pharmacists, and the unit social worker and case manager met weekly for 12 weeks prior to implementation. The working group determined the optimal timing, frequency, and location for SIDR. Additionally, the working group finalized the content of a structured communication tool used during SIDR (See Text Box). The structured communication tool was modeled after prior research demonstrating the benefit of daily goals of care forms[16,17] and ensured that important elements of the plan of care were discussed. Based on the working group's recommendation, SIDR took place each weekday at 11:00 AM in the unit nursing report room and lasted 30–40 minutes. The nurse manager and a unit medical director co-led rounds each day. SIDR was attended by all nurses and resident physicians caring for patients on the unit, as well as the pharmacist, social worker, and case manager assigned to the unit. The structured communication tool was used in SIDR for all patients newly admitted to the unit (admitted in previous 24 hours). The daily plan of care for all other patients (those who were not newly admitted to the unit) was also discussed, but without the aid of a structured communication tool. This decision was made by the working group in an effort to balance effective communication among providers with work efficiency.

Text Box.

Structured Inter-Disciplinary Rounds (SIDR) Communication Tool

OVERALL PLAN OF CARE
- Diagnosis?
- Patient's chief concern?
- Tests today?
- Procedures today?
- Medication changes today?
- Medication Issues?
- Consulting services?
- Expected Discharge date?

DISCHARGE PLANS
- Telemetry needed?
- Discharge needs?
  - Placement?
  - Home health needs?
  - Transportation?

PATIENT SAFETY
- On VTE prophylaxis?
- Can central lines be discontinued (including PICCs)?
- Can Foley catheter bed is continued?
- Can we reduce fall risk?
- Can we reduce pressure ulcer risk?

Provider Survey

Providers working on the intervention and control units during the study period were administered a survey to assess ratings of collaboration and teamwork. The first portion of the survey was based on previously published surveys assessing teamwork attitudes among providers.[6,7] We asked providers to rate the quality of communication and collaboration they had experienced with other disciplines using a five-point ordinal scale (1=very low, 2=low, 3=adequate, 4=high, 5=very high). The second portion of the survey assessed teamwork and safety climate using the teamwork and safety domains of the Safety Attitudes Questionnaire (SAQ) developed by Sexton et al.[18] The SAQ was derived from a questionnaire widely used in commercial aviation, the Flight Management Attitudes Questionairre,[19] with clinical content validity established through observations of teamwork behaviors in operating rooms and neonatal resuscitations.[20,21] The SAQ has demonstrated high internal consistency and test-retest reliability in clinical settings as well as convergent validity in comparisons with similar instruments.[18,22,23] Though the survey questions asking participants to rate the quality of communication and collaboration with other disciplines have not been included in prior studies assessing the reliability and validity of the SAQ tool, a recent study of surgical services by Davenport and colleagues found that ratings of the quality of communication and collaboration with physicians correlated with risk adjusted morbidity (defined as having 1 or more of 21 specific postoperative complications).[24] A final portion of the survey assessed providers' perceptions of whether SIDR improved efficiency of communication, collaboration among team mem-

bers, and patient care using a five-point Likert scale (1= strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree).

Resident physicians received the survey at the completion of each four week clinical rotation. Nurses were surveyed 16–20 weeks after implementation of SIDR. All surveys were administered in a web-based format using an internet link (www.formsite.com from Vroman Systems, Inc.) delivered via email. Respondents entered the survey website using a unique login, which allowed for identification of non-responders. However, survey responses were de-identified. We sent non-responders up to three reminder emails. The low number of social workers, case managers, and pharmacists on each unit precluded our ability to meaningfully assess their perceptions of collaboration and ratings of teamwork and safety climate.

SIDR Characteristics and Attendance

The unit medical director recorded the duration of SIDR, the number of patients on the unit, and the number of patients discussed each day. Attendance for each discipline was also recorded each day during the study period.

Data Analysis

Provider demographic data was compared using chi square and t tests. Percentages of providers rating of the quality of communication and collaboration as high or very high were compared using chi square. Teamwork and safety climate scores were compared using the Mann–Whitney U test. Because some resident physicians rotated onto the study units more than once during the study period, we restricted our analyses to surveys from physicians' initial rotation.

Patient data was obtained from administrative databases for both the control and intervention unit during the 6-month study period. Demographic data was compared using chi square and t tests. Primary discharge diagnosis *ICD-9* codes were grouped into diagnosis clusters using the Healthcare Cost and Utilization Project system of the Agency for Healthcare Research and Quality.[25] Diagnosis clusters were then analyzed using chi square. Unadjusted LOS and costs were compared using the Mann-Whitney U test. We then conducted multivariable linear regression analyses to assess the impact of SIDR on LOS and cost. To satisfy normality requirements and stabilize variance of residuals, we explored two methods of transforming skewed data on LOS and cost: logarithmic conversion and truncation at the mean LOS + 3 SDs. Since both techniques yielded similar results, we chose to present results by using truncation. Covariates for multivariable analyses included age, gender, race, payor, admission source, case-mix, hospitalist as attending physician, discharge disposition, presence of intensive care unit stay during hospitalization, and Medicare Severity-Diagnosis Related Group (MS-DRG) weight. We included hospitalist attending as a covariate based on prior studies demonstrating a reduction in LOS and cost as a result of hospitalists as the attending physician for medical teaching services.[26–28] We defined a hospitalist as an attending whose practice focused exclusively on inpatient care. A prior study had demonstrated an 11% reduction in LOS as a result of IDR.[11] We used LOS data for the study units during the year prior to estimate sample size. With a baseline LOS of 4.5±3.9 days (after truncation at mean LOS +3 SDs), an estimated sample size of 956 patients on each unit would provide 80% power to detect an 11% reduction in LOS. All analyses were conducted using Stata version 10.0 (College Station, Texas).

RESULTS

Characteristics of Providers, Patients, and SIDR

One hundred forty-seven of 159 (92%) eligible providers completed the survey. Specific characteristics of teaching service physicians and nurses are shown in Table 1. Resident physicians were similar on both units. Nurses on the intervention unit had worked at the institution a shorter period of time compared to nurses on the control unit (3.7±3.8 vs. 6.4±5.2 years; p=0.03).

Patient characteristics are shown in Table 2. Patient case mix was similar between the control and intervention unit, with the exception that a slightly higher percentage of patients were admitted with heart failure and acute renal failure on the intervention unit (4% vs. 2%; p=0.04 and 3% vs. 1%; p=0.02, respectively). A larger percentage of patients had a hospitalist as the attending physician on the intervention unit (57% vs. 50%; p=0.002).

SIDR occurred each weekday (with the exception of holidays) during the study period and lasted a mean 33.5±5.7 minutes. On average, 92% of patients on the unit were discussed each day and attendance exceeded 82% for each

Table 1. Characteristics of Providers[a]

	Resident Physicians			Nurses		
	Control Unit (n=41)	Intervention Unit (n=47)	P value	Control Unit (n=25)	Intervention Unit (n=34)	P value
Mean age (SD), y	27.0 (1.7)	27.6 (2.1)	0.10	33.6 (8.3)	30.8 (8.0)	0.21
Women, n (%)	25 (61)	23 (49)	0.26	22 (88)	31 (91)	0.69
Mean time at the Institution (SD), y	1.6 (1.3)	1.8 (1.3)	0.42	6.4 (5.2)	3.7 (3.8)	0.03

[a]*Analyses performed using t tests and chi square*

Table 2. Characteristics of Patients[a]

	Control Unit (n=969)	Intervention Unit (n=843)	P Value
Mean age (SD)	59.9 (19.0)	59.8 (19.4)	0.93
Women, n (%)	527 (54)	456 (54)	0.90
Ethnicity, n (%)			0.64
White	462 (48)	392 (47)	
Black	374 (39)	314 (37)	
Hispanic	65 (7)	65 (8)	
Asian	8 (1)	11 (1)	
Other	60 (6)	60 (7)	
Payor, n (%)			0.83
Medicare	517 (53)	463 (55)	
Private	259 (27)	225 (27)	
Medicaid	132 (14)	103 (12)	
Self pay	61 (6)	52 (6)	
Admission source, n (%)			0.44
Emergency department	840 (87)	714 (85)	
Direct admission	91 (9)	94 (10)	
Transfer	38 (4)	35 (4)	
Case Mix, n (%)			
Urinary tract infection	45 (5)	35 (4)	0.61
Pneumonia	39 (4)	36 (4)	0.79
Nonspecific chest pain	39 (4)	24 (3)	0.17
Congestive heart failure	21 (2)	32 (4)	0.04
Chronic obstructive pulmonary disease	24 (2)	28 (3)	0.28
Skin and subcutaneous tissue infection	29 (3)	21 (2)	0.52
Acute renal failure	13 (1)	25 (3)	0.02
Diabetes mellitus with complications	18 (2)	19 (2)	0.55
Complication of device; implant or graft	16 (2)	21 (2)	0.21
Sickle cell anemia	23 (2)	12 (1)	0.14
Other diagnosis	702 (73)	590 (70)	0.25
Hospitalist as attending physician, n (%)	485 (50)	482 (57)	0.002
Intensive care unit stay during admission, n (%)	52 (5)	46 (5)	0.76
Discharge disposition, n (%)			
Home	802 (83)	695 (83)	0.06
Skilled nursing facility or rehabilitation	152 (16)	119 (14)	
Other facility	8 (1)	15 (2)	
Expired	7 (1)	14 (2)	
Mean Medicare Severity -Diagnosis Related Group weight (SD)	1.14 (0 .80)	1.20 (0.82)	0.12

[a]*Percentages may not equal 100% because of rounding. Analyses performed using t tests and chi square*

discipline. Specifically for resident physicians and nurses, attendance at SIDR was 99% and 90%, respectively.

Ratings of Teamwork and Perceptions of SIDR

As shown in Fig. 1, a similar percentage of resident physicians rated the quality of communication and collaboration with nurses as high or very high on the intervention unit as compared to the control unit (91% vs. 88%; p=0.57). However, a greater percentage of nurses rated the quality of communication and collaboration with resident physicians as high or very high on the intervention unit compared to the control unit (74% vs. 44%; p=0.02).

As shown in Table 3, providers on the intervention unit rated the teamwork climate significantly higher as compared to the control unit (82.4±11.7 vs. 77.3±12.3; p=0.01). The difference was explained by higher teamwork climate ratings on the part of nurses on the intervention unit (83.5±14.7 vs. 74.2±14.1; p=0.005). Ratings of the safety climate were not significantly different between units.

Forty-three of 47 (91%) resident physicians and 26 of 28 (93%) nurses agreed that SIDR improved the efficiency of their work day. All (100%) of the 47 resident physicians and 29 nurses agreed that SIDR improved team collaboration. Forty-six of 47 (98%) resident physicians and all 29 nurses agreed that SIDR improved patient care. All 47 resident physicians and 26 of 33 (79%) nurses indicated that they wanted SIDR to continue indefinitely. The denominator for nurses' responses to questions evaluating the benefit of SIDR varies due to missing data elements.

SIDR Impact on LOS and Cost

The unadjusted mean LOS was not significantly different for the intervention unit as compared to the control unit (4.3±3.7 vs. 4.1±3.5 days; p=0.11). Similarly, unadjusted cost was not significantly different for the intervention unit as compared to the control unit ($9,070.56±8,945.44 vs. $9,044.76±8,439.23; p=0.79). In multivariable analysis using age, gender, ethnicity, payor type, admission source, case-mix, hospitalist as attending physician, intensive care unit stay, discharge disposition, and MS-DRG weight as covariates, the adjusted LOS was 0.19 day longer for the intervention unit as compared to the control unit, but the difference was not statistically

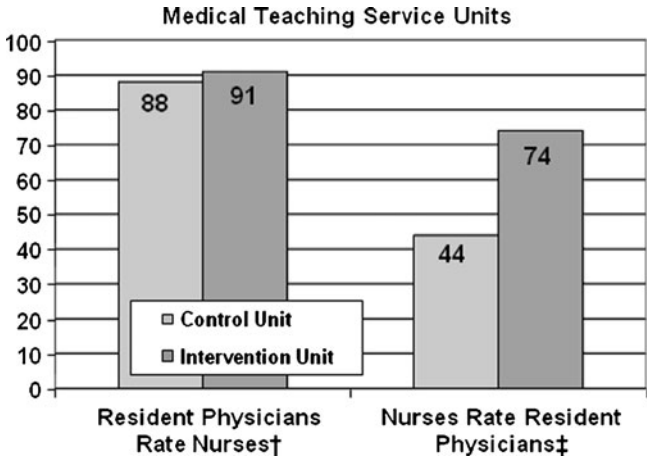

Figure 1. Ratings of the quality of communication and collaboration between nurses and resident physicians*. Figure shows the percentage of providers rating quality of collaboration as high or very high. *Analyses performed using chi square. †p=0.57; ‡p=0.02.

significant (p=0.17). The adjusted cost was $24.05 less for the intervention unit, but the difference was not statistically significant (p=0.94).

DISCUSSION

We found that the use of SIDR significantly improved providers' ratings of collaboration and teamwork on a medical teaching unit. The effect was driven by improved satisfaction with teamwork and collaboration among nurses. This is an important finding because prior research has shown that nurses are often dissatisfied with the quality of communication and collaboration with physicians.[6–8] Potential explanations include fundamental differences between nurses and physicians with regard to status/authority, gender, training, and patient care responsibilities.[6] Unfortunately, a culture of poor teamwork may lead to a workplace in which team members feel unable to approach certain individuals and uncomfortable raising concerns. A recent study involving interviews of resident physicians highlights the problem. Weinberg and colleagues found that, although residents were aware of communication problems with nurses, most believed that this posed no threat to patient care because the nurse's role, as they saw it, was one of simply following orders.[29] Not surprisingly, higher ratings of teamwork culture have been associated with nurse retention.[30,31] SIDR provided a facilitated forum for interdisciplinary discussion, exchange of critical clinical information, and collaboration on the plan of care.

Our findings are also important because poor communication represents a major etiology of preventable adverse events in hospitals.[1–5] Higher ratings of collaboration and teamwork have been associated with better patient outcomes in observational studies.[24,32,33] Further research should evaluate the impact of improved interdisciplinary collaboration as a result of SIDR on the safety of care delivered on inpatient medical units.

Although there was significant improvement in nurse ratings, there was no difference in ratings of communication and collaboration by resident physicians on the intervention and control units. This is likely due to the fact that the vast majority of physicians rated the quality of communication and collaboration with nurses as high or very high at baseline.[8] This makes further improvement difficult to attain. A growing body of evidence indicates that nurses, rather than physicians, are the members of the team least satisfied with collaboration and teamwork.[6–8,23]

Ratings of the safety climate were not significantly different between units in our study. Potential explanations include the intervention's focus on collaboration and teamwork, rather than other aspects of patient safety, including staffing levels, adverse event reporting, and hospital management's response to safety concerns. The potential exists for the unit medical director and nurse manager to collaborate on improving these important aspects of the safety climate.

The vast majority of providers agreed that SIDR improved patient care and that SIDR should continue indefinitely. Importantly, providers also felt that SIDR improved the efficiency of their work day and attendance was high among all disciplines. Prior studies on IDR either did not report attendance or struggled with attendance.[34] Incorporating the input of frontline providers into the design of SIDR allowed us to create an intervention which fit into daily workflow.

We did not detect a benefit to LOS or cost with the use of SIDR. Two prior studies have shown a reduction in LOS and cost with the use of IDR.[11,13] However, one study was conducted approximately 15 years ago and included patients with a longer mean LOS.[13] The second study used a pre-post study design which may not have accounted for unmeasured confounders affecting LOS and cost.[11] A third, smaller study showed no effect on LOS and cost with the use of IDR.[14] In light of the final sample size for the intervention unit being

Table 3. Ratings of Teamwork and Patient Safety Climate by Unit[a]

	Control Unit	Intervention Unit	P value*
All providers	n=66	n=81	
Mean teamwork climate score (SD)	77.3 (12.3)	82.4 (11.7)	0.01
Mean safety climate score (SD)	75.4 (15.3)	76.5 (13.0)	0.90
Nurses	n=25	n=34	
Mean teamwork climate score (SD)	74.2 (14.1)	83.5 (14.7)	0.005
Mean safety climate score (SD)	71.1 (18.7)	74.1 (14.0)	0.65
Physicians	n=41	n=47	
Mean teamwork climate score (SD)	79.1 (10.7)	81.6 (10.8)	0.36
Mean safety climate score (SD)	78.1 (12.4)	78.3 (12.2)	0.98

[a]*As measured by the SAQ. Analyses performed using the Mann–Whitney U test*

slightly less than our intended target, it is possible that our study was underpowered to detect a difference in LOS or cost.

Our study has several limitations. First, it reflects the experience of an intervention unit and a control unit in a single hospital. Larger studies will be required to test the reproducibility and generalizabilty of our findings. Second, as previously mentioned, our study did not directly assess the effect of improved teamwork and collaboration on patient safety. Further study is needed to evaluate this. Although we are not aware of any other interventions to improve interdisciplinary communication on the intervention unit, it is possible that other unknown factors contributed to our findings. We believe this is unlikely due to the magnitude of the improvement in collaboration and the high ratings of SIDR by nurses and physicians on the intervention unit. Our initial analyses did not account for differences in the number of years nurses had been at the hospital. We conducted post-hoc multivariable regression analyses including years employed at the hospital as a covariate. Results were similar and therefore, not reported. Finally, the timing of survey administration for physicians and nurses was not identical. For logistical reasons, physicians were surveyed at the completion of each four week rotation over a six-month period while nurses were surveyed 16–20 weeks after implementation of SIDR. Although it is possible that this may have affected our results, we feel this is unlikely given that ratings of communication and collaboration among providers on the control unit were similar to a prior cross-sectional survey conducted at the same institution.[8]

In summary, SIDR had a positive effect on nurses' ratings of collaboration and teamwork on a medical teaching unit. Future efforts should assess whether improved teamwork as a result of SIDR also translates into safer and higher quality patient care.

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Corresponding Author: *Kevin J. O'Leary, MD, MS; Division of Hospital Medicine, Northwestern University Feinberg School of Medicine, 259 E. Erie Street, Suite 475, Chicago, IL 60611, USA (e-mail: keoleary@nmh.org).*

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