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Nurse–Physician Collaboration in General Internal Medicine: A Synthesis of Survey and Ethnographic Techniques

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Abstract

BACKGROUND Effective collaboration between hospital nurses and physicians is associated with patient safety, quality of care, and provider satisfaction. Mutual nurse–physician perceptions of one another's collaboration are typically discrepant. Quantitative and qualitative studies frequently conclude that nurses experience lower satisfaction with nurse–physician collaboration than physicians. Mixed methods studies of nurse–physician collaboration are uncommon; results from one of the two approaches are seldom related to or reported in terms of the others. This paper aims to demonstrate the complementarity of quantitative and qualitative methods for understanding nurse–physician collaboration.

METHODS In medicine wards of 5 hospitals, we surveyed nurses and physicians measuring three facets of collaboration—communication, accommodation, and isolation. In parallel we used shadowing and interviews to explore the quality of nurse–physician collaboration. Data were collected between June 2008 and June 2009.

RESULTS The results indicated difference of nurse–physician ratings of one another's communication was small and not statistically significant; communication timing and skill were reportedly challenging. Nurses perceived physicians as less accommodating than physicians perceived nurses ($P<.01$) and the effect size was medium. Physicians' independent schedules were problematic for nurses. Nurses felt more isolated from physicians than physicians from nurses ($P<.0001$) and the difference was large in standardized units. Hierarchical relationships were related to nurses' isolation; however this could be moderated by leadership support.

CONCLUSION Our mixed-method approach indicates that longstanding maladaptive nurse–physician relationships persist in the inpatient setting, but not uniformly. Communication quality seems mutually acceptable, while accommodation and isolation are more problematic among nurses.

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Implications for Interprofessional Practice

- Nurses and physicians experience sub-optimal communication with one another that impedes opportunity and efforts toward interprofessional collaboration.
- The flexibility of physicians' schedules is discrepant with other health care providers' fixed schedules leading to the perception that physicians are less team-oriented.
- Nurses feel more isolated from physicians than physicians do from nurses, citing poor understanding and an entrenched professional hierarchy as contributing factors.
- Physicians and nurses believe that interprofessional collaboration is desirable and can be enhanced by strong professional leaders who are willing and able to collaborate by example.

Introduction

There is strong international promotion of interprofessional collaboration to improve patient safety, quality of care, and to enhance health professionals' working relationships (e.g. Department of Health 2000, 2001; Institute of Medicine 2001, 2008; Health Canada, 2010). Interprofessional collaboration is a complex and dynamic process that involves the establishment of trust, familiarity, and goal-sharing between health care professionals, as well as a supportive work environment and culture. Communication is a central component of collaboration, and among nurses and physicians it has been a topic of much interprofessional interest. Because they are a core dyad of the inpatient care team, it is important to understand the evolving relationship between nurses and physicians in terms of the quality of their communication, the nature of their interactions, and their perceptions of their relationship in order to continually work toward cohesive interprofessional care.

Literature Review

Separate quantitative and qualitative research has been conducted on nurses' and physicians' experiences of collaboration. Efforts to validate nurse-physician collaboration measurement scales are ongoing (Baggs, 1994; Kenaszchuk, Reeves, Nicholas, & Zwarenstein, 2010b; Ushiro, 2009). Quantitative reports of nurse-physician relationships have shown that nurses' and

physicians' opinions of each other's collaboration are discrepant. Quantitative studies consistently find that nurses experience lower satisfaction with nurse-physician collaboration than doctors do, and that nurses are more critical of physicians' collaboration efforts than doctors are of nurses' efforts (Krogstad, Hofoss, & Hjortdahl, 2004; O'Leary et al., 2010; Verschuren & Masselink, 1997). Nurses report lower levels of communication openness with doctors (Reader, Flin, Mearns, & Cuthbertson, 2007) and lower quality of collaboration and communication than doctors report about nurses (Makary et al., 2006; Sexton et al., 2006). Nurses are more likely to report problematic team- and communication-related behaviours that might endanger patient safety than either physicians or non-clinician managers (Singer et al., 2003). Quantitative research has also revealed associations between nurse-physician collaboration and patient satisfaction as well as with health outcomes and nurses' job satisfaction (Baggs et al., 1999; Kenaszchuk, Wilkins, Reeves, & Zwarenstein, 2010c; Wanzer, Wojtaszczyk, & Kelly, 2009).

Qualitative studies exploring nurse-physician collaboration in hospitals have elaborated on when, where, and why the relationship succeeds or fails. These studies highlighted a range of issues about nurse-physician experiences with collaboration. For instance, interviews in the intensive care unit suggested good collaboration was regarded as availability and receptivity of one profession to and by another (Baggs & Schmitt, 1997). A study

of interprofessional narratives illustrated that high collaboration was experienced by nurses and physicians alike when unplanned opportunities for joint problem-solving were available and appreciation for the knowledge and contribution of the other professional was demonstrated (McGrail, Morse, Glessner, & Gardner, 2009). Other qualitative studies found that establishing trust and respect between nurses and physicians promotes positive collaboration (e.g. Pullon, 2008).

Other qualitative studies have indicated a range of more problematic experiences of nurse-physician collaboration, and how this is part of a wider historical system of power dynamics within which the physician maintains higher status and authority (Corser, 2000; Greenfield, 1999; Stein, 1967), which is enduring (Reeves, Nelson, & Zwarenstein, 2008; Stein, Watts, & Howell, 1990; Stein-Parbury & Liaschenko, 2007). An interview study of medical residents, for example, found that their perceptions toward nurses were consistent with nurses' experiences of being viewed in a mechanistic way, i.e., as a tool to carry out physicians' orders rather than as a professional with an expertise (Weinberg, Miner, & Rivilin, 2009). It has also been suggested that sizeable proportions of nurses are dissatisfied with their interprofessional relationships with doctors (Sirota, 2008). This may be related to physicians' tendencies to de-emphasize relational aspects of patient care in favour of 'case knowledge' which emphasizes medical diagnostic and treatment-of-disease approaches (Stein-Parbury & Liaschenko, 2007). In the operating room, observational research showed how nurses use a variety of communication strategies, including not communicating at all, to negotiate constraints on their role autonomy in relation to physicians' (Gardezi et al., 2009). Observations of nurses' disengagement from collaborative practice have found that physicians neglect to incorporate the core values of nursing practice into interprofessional care, thus impacting nurses' willingness to collaborate (Miller et al., 2008).

Despite substantial research on the topic, mixed methods techniques (e.g. Sandelowski, 2000) are used infrequently to understand nurse-physician collaboration. This paper reports quantitative and qualitative results from studying nurse-physician collaboration in general internal medicine (GIM)

units. We have integrated survey and ethnographic methods to understand the range of collaboration experiences. We believe that an integrated analytic approach to nurse-physician collaboration allows us to quantitatively identify and qualitatively explore three meaningful components of collaboration as they shape and are shaped by the nurse-physician dyad: communication, accommodation, and isolation. Our synthesis of survey and ethnographic data offers new insights on the evolving nurse-physician relationship in acute care.

Methods

The aim of the study was to explore interprofessional collaboration in the GIM units of community hospitals. We analyzed survey and ethnographic data to understand how nurses and physicians rate one another on communication, accommodation, and isolation, and to qualitatively understand their collaboration experiences along these dimensions. Communication, accommodation, and isolation are three aspects of nurse-physician collaboration that some authors on this article identified earlier with confirmatory factor analysis (Kenaszchuk et al., 2010b). The study design was a sequential mixed methods approach with equal parts quantitative and qualitative using survey and ethnographic methods.

Sample/Participants

Quantitative

The survey was fielded in the inpatient GIM units of five hospitals. We attempted to obtain a completed survey from all nurses and resident and attending physicians who worked full- and part-time between June 2008 and July 2009. The recruitment strategy was based largely on each hospital's preferences. The project manager and GIM unit administrators jointly considered best methods to inform nurses and physicians of the survey and ensure that they received it and returned it upon completion. An Internet version of the survey was hosted on a commercial survey company's web site. At one research site where the potential number of respondents was small, e-mail invitations were sent to individual practitioners. Two sites inserted a hyperlink on their medicine department's Intranet page. A paper version was distributed by the project manager

during interprofessional team meetings when the GIM unit administrator requested it.

Power and sample size calculations were not performed in planning for survey administration and data analysis. Based on past experiences using the scale, and on recent published literature, we anticipated obtaining sizable mean score differences (Makary et al. 2006), small standard deviations, and effect sizes in the medium range or greater with nurse and physician sample sizes similar to those in our study (Reader et al. 2007). Current literature also indicates that substantial mean score differences in nurse–physician mutual ratings were possible (O’Leary et al. 2010).

Qualitative

A purposive sample of key informants was recruited from each participating hospital. Participants were selected based on their professional roles on the health care team and within the medicine programs. The study researcher contacted potential participants by e-mail or telephone and invited them to an interview. Twenty interviews were completed with nurses and physicians, including six direct care nurses, six unit managers trained in nursing, one program director trained in nursing, and seven physicians (including one former and four current chiefs of medicine, and two staff physicians). Participating nurses were trained as registered nurses or advanced practice nurses. No individuals declined participation. Participants were recruited to the point of thematic data saturation, that is, when no new findings or themes emerged from the interview data. Five shadowing episodes (one per site) were also carried out to confirm or disconfirm interview data. All participants were made aware that the purpose of the research was to enhance our understanding of interprofessional communication and collaboration in the general internal medicine setting. There was no further specific information given to participants that might introduce any bias to the observational data. Observations were used to develop a more in-depth and rich understanding of participant experiences with interprofessional collaboration as described in the interviews. Observations included staff members who were not interviewed for the study but were made aware of the observations and their purpose in advance.

Data collection

Quantitative

The outcome measurement scale is a major adaptation of the Nurses’ Opinion Questionnaire (Adams, Bond, & Arber, 1995). The adapted scale uses a new 3-factor structure to measure dimensions of nurse–physician relationships in inpatient care settings: communication between nurses and physicians, accommodation by one group to the other’s optimal work practices, and isolation resulting from excessive detachment between the groups (see Table 1, following page).

Summated scores were calculated based on five items in each of the communication and accommodation subscales and 3 items in the isolation subscale. Four response options were available for the items: strongly disagree (1), disagree (2), agree (3), and strongly agree (4). Maximum possible scores were 20, 20, and 12, respectively. The scale was designed for administration to multiple health professional groups. Its 13 items request nurses to rate physicians on the construct items and physicians to rate nurses likewise. This is a round robin design where respondents are proxy reporters on the collaboration behaviours of group targets, and each group is a target of other-group respondents.

Qualitative

Ethnographic methods were used to develop contextually-relevant understandings of participants’ beliefs and behaviours (Hammersley & Atkinson 1995). We used semi-structured interviews and participant shadowing to understand nurses’ and physicians’ experiences with collaboration. Interview questions were designed to elicit participants’ experiences with communication and the collaborative nature of their work. Shadowing participants on the wards was subsequently used to contextualize and triangulate interview findings.

Data were collected between June 2008 and October 2008. Interviews were arranged at the convenience of participants. Interview durations were 25–45 minutes and were recorded by handwritten notes which were immediately transcribed into reflective, reconstructed field notes by the researcher

Table 1. *Interprofessional Collaboration Scale factors and items*

Num.	Factor label/item text
Communication	
1	<We> have a good understanding with <them> about our respective responsibilities.
3	^I feel that patient treatment and care are not adequately discussed between <us> and <them>.
9	<They> anticipate when <we> will need their help.
10	Important information is always passed on between <us> and <them>.
11	^Disagreements with <them> often remain unresolved.
Accommodation	
2	<They> are usually willing to take into account the convenience of <us> when planning their work.
4	<We> and <they> share similar ideas about how to treat patients.
5	<They> are willing to discuss <our> issues.
6	<They> cooperate with the way we organize <our> care.
7	<They> would be willing to cooperate with new <our> practices.
Isolation	
8	^The <they> do not usually ask for <our> opinions.
12	^<They> think their work is more important than the work of <us>.
13	^<They> would not be willing to discuss their new practices with <us>.

Note: ^ reverse-coded; terms in angle braces (<...>) are replaced with 'nurses' and 'physicians' according to the respondent and target profession

(Sanjek, 1990). Observational data were collected following the interviews in order to further explore interprofessional communication patterns, the nature of the GIM context as well as compare the emerging findings from the interview data. For instance, if an interviewee described communication tensions during interprofessional rounds, the observer would shadow that participant during rounds to gain insight to his or her experience therein. Shadowing occurred on weekdays only. Descriptive observational notes were written by hand and later transcribed into reconstructed field notes by the researcher (Sanjek, 1990).

Ethical considerations

Research ethics approval was obtained from each participating hospital. For the survey, participant anonymity was achieved by requesting minimal personally identifying information. A statement on the survey cover page indicated that submitting the survey was implied consent to participate. For the qualitative component of the study, informed consent was obtained from all interview participants. All transcripts and field notes were anonymized.

Data analysis and synthesis

Quantitative

Item responses were screened for missing data. Among physicians no more than 4% of returned surveys had item-level missing data within a subscale. Among nurses the figure was 12%. The 13 scale items were analyzed for data missing completely at random (MCAR) using Little's (1988) omnibus test. The chi-square statistic was not statistically significant ($\chi^2 = 328.4$, $P = .29$), suggesting that data were missing completely at random, but this test is not definitive (Enders, 2010). Listwise deletion of observations with any missing item-level data was employed for main analyses. Replication analyses were performed using other methods for missing data.

Internal consistency reliability of nurse and physician responses was estimated with Cronbach's coefficient alpha. The structural equation modelling approach of Maydeu-Olivares, Coffman, Garcia-Forero, and Gallardo-Pujol (2010) was used to calculate the 95% confidence interval (CI) for alpha and test the significance of the difference between alpha from

physicians' and nurses' mutual ratings on subscales (Fan & Thompson, 2001).

We used robust statistics (Wilcox & Keselman, 2003) to test mean scale score differences for nurse–physician mutual ratings. Yuen's T-test statistic (Yuen, 1974) and Wilcox's (2005) R function were used to test if mean score differences were statistically different from zero. Statistical significance (α) was set at .05 and 95% CIs for the mean difference is presented. Robust versions of Cohen's d effect sizes and 95% CIs were computed (Algina, Keselman, & Penfield, 2005a) using the calculator described in Algina, Keselman, & Penfield (2005b). In a two-group problem the method permits the standard deviation of either group to be used to standardize the difference. Because of the elevated prominence of nurses in medicine wards, we scaled the effect size on nurses' data. Therefore we used the variances of nurses' ratings to calculate effect sizes and estimate confidence intervals for each subscale. The probability of superiority was read from Grissom's (1994) Table 1 based on obtained robust d effect sizes.

Qualitative

The qualitative data were analysed using an inductive approach (Hammersley & Atkinson, 1995) and a constant comparative analysis of the data was performed (Pope, Ziebland, & Mays, 2000). One author read and coded interview transcripts and observational field notes for common themes relating to nurse–physician and physician–nurse experiences with collaboration. The codes were shared with two members of the research team for discussion and refinement of themes.

To synthesize the quantitative and qualitative findings we aligned our three survey subscales with our thematic categorization of the qualitative data. Clusters of qualitative data that reflected facets of communication, accommodation, and isolation were explored to generate the analytic categories presented here. We used these facets as sensitizing concepts to capture nuances in the qualitative data pertaining to scale items and their factors. Here, integrating quantitative and qualitative findings serves the conceptual purpose of complementarity (Sandelowski, 2000), elaborating the results of quantitative study findings and exploring the relationship between the two.

Quality

Psychometric properties and scale items of the survey were published earlier (Kenaszchuk et al., 2010b). Internal consistency reliability for each of the subscales was acceptable ($>.70$). Qualitative findings were validated in two ways. First, multiple data collection methods – interviews and observations – provided one form of triangulation which enhanced the trustworthiness of the data (Creswell & Miller, 2000). Observations were conducted sequentially and used to confirm or disconfirm emergent findings from the interviews. Second, different researcher perspectives were used for validation in the analysis stage where quantitative and qualitative findings were integrated.

Results

Quantitative and qualitative results are presented together. Themes generated from qualitative data that align with the survey constructs are elaborated to provide deeper insight into nurse–physician and physician–nurse collaboration.

Survey Response and Reliability

Surveys were returned from 51 physicians and 190 nurses. Results are in Table 2 (following page). There were 49 useable surveys returned from physicians for each of the three subscales (communication, accommodation and isolation) and between 169 and 178 from nurses (Table 2, column 1). Most of the coefficient alpha values were near 0.60; the mean was 0.63. The 95% CIs were usually wide and indicated that the upper limits were likely > 0.70 (Table 2, column 2). In hypothesis tests, coefficient alpha differences for nurses and physicians were not statistically significant (Table 2, column 3).

Communication

For communication, nurse–physician mutual mean score ratings were equivalent, 12.8 (Table 2, columns 4–6). The effect size was 0.04 with a 95% CI from -0.27 – 0.39 . The probability of superiority was 0.51 (Table 2, column 7).

Based on these quantitative scores, our qualitative data offer illumination in three areas of communication: timing, patient care discussion, and skill.

Table 2. Statistical test results for nurse–physician mutuaratings: 3 subscales

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rater-target (N)	Alpha (95% CI)	95% CI for diff	Raw mean	95% CI for dif- ference ²	T ² (P)	ES ³ (95% CI) PS ⁴
Communication						
Phys→Nurse (49)	0.65 (0.50–0.81)	-0.12–0.26 P=0.49 ¹	12.8	-0.70–0.50	0.26 (.79)	0.04 (-0.27–0.39) 0.51
Nurse→Phys (169)	0.58 (0.47–0.70)		12.8			
Accommodation						
Phys→Nurse (49)	0.65 (0.45–0.84)	-0.33–0.09 P=0.27 ¹	13.9	0.53–1.63	3.88 (.00)	0.44 (0.20–0.70) 0.62
Nurse→Phys (170)	0.76 (0.69–0.83)		12.9			
Isolation						
Phys→Nurse (49)	0.52 (0.15–0.89)	-0.49–0.28 P=0.59 ¹	8.6	1.00–1.70	7.47 (<.0001)	0.75 (0.52–0.97) 0.70
Nurse→Phys (178)	0.62 (0.51–0.74)		7.3			

Note: ¹Z statistic ²Yuen's test ³Robust Cohen's *d* based on variance of nurse distribution ⁴Probability of superiority

Timing

Qualitative data revealed that nurses did not generally feel that patients were discussed with physicians in a timely fashion. A majority of nurse participants felt that in spite of being able to page physicians to discuss patient care, pages were either not returned within a reasonable amount of time or were returned with contempt. Two nurse informants described delayed nurse–physician communications that affected the timely exchange of patient information:

There are some doctors that are not as...diligent or caring as others. They don't return pages and we only page when it's serious. We'll get pretty mad when it's not returned and then we have to send a patient to the ICU as a result. I believe that if you take responsibility as a doctor then you'd better turn that damn pager on. [RN]

Most nurses can give you an example of a time that they paged a physician and got yelled at for it. One physician gets agitated if the nurse who paged him

doesn't have answers to his questions when he asks them. Some physicians will just hang up on them. [Unit Manager]

By comparison, one physician felt that he was readily available for discussion with nurses, explaining, "People don't need to page me really, they will just see me on the floor and approach me with questions." [MD]

Patient care discussion

Nurse managers agreed that while some doctors were effective communicators willing to review patient information jointly with nurses, this did not apply universally to all doctors on their units:

Some physicians are excellent with the charge nurse, for example, sitting down to go over patients. Other physicians it's like you don't even know they are on the floor. [Unit manager]

From the physician perspective there was a similar appreciation for patient care discussion during

scheduled rounds. One physician said, “The charge nurse pools the patient information from the nurses and she gives us the run down, the highlights.” [MD]

Skill

Nurse descriptions of physicians’ communication skill ranged from offensive to non-existent. This was particularly noted on consultant staffed wards:

[We] have some physicians who are mean and rude and no one wants to approach them. Some of them come up to the unit and everyone scatters. There is one person who is a great physician but he’s hot and cold so nurses will get the charge nurse to approach him for them. Some nurses have had the physicians yell at them directly and so will not approach them again. [Unit manager]

On the non-hospitalist units the communication is not there. The physicians are not speaking to the direct care nurses or the allied health unless they are approached by them. [Unit manager]

A physician also expressed frustration with nurses’ communication skill by saying that she struggled to understand why one particular nurse received “all of these nursing awards when she’s the most useless person.” [MD]

Accommodation

For accommodation, physician ratings of nurses (13.9) was 1 point higher than nurse ratings of physicians and the difference was significant ($P < .01$). The effect size was 0.44 with a 95% CI from 0.20–0.70. The probability of superiority was 0.62.

Based on these scores, our qualitative data yielded the following insight into the area of accommodation.

Scheduled versus unscheduled care time

Front line nurses and nurse managers believed collaboration with some physicians was significantly impacted by physicians’ schedules, which were independent from those of other team members. In some units the physicians were said to “come and go,”

and were unavailable to participate in pre-planned discussions. Nurses believed that physicians did not consider others’ schedules; they made important patient-related decisions without team discussion:

The key for this site is physician engagement to bring the team together. We are still floundering at the end when physicians come in and discharge the patient without giving the team enough notice. [RN program director]

Effective nurse–physician communication was sometimes opportunistic, performed at the convenience of physicians passing the nursing station:

A male MD is leaving the nurses’ station when the charge nurse calls out to him, “Dr. [last name],” she says. She asks for an update on a patient, which he gives before leaving. [Observational field note]

Isolation

For the isolation subscale lower scores indicated qualitatively worse nurse–physician working relationships, and more isolation. Nurses’ mean rating of physicians was 1.3 points lower than physicians’ mean rating of nurses, 7.3 versus 8.6. The 95% CI for the difference was 1.0–1.7 points ($P < .0001$). The effect size was 0.75 with a 95% CI from 0.52–0.97. The probability of superiority was 0.70.

Based on these scores, our qualitative data offered illumination in three areas of isolation: leadership support, physician authority, and changing perceptions.

Leadership support

A number of nurses reported that physicians were open to discussing work-related concerns. Where nurses experienced resistance from physicians, support from physician leaders helped to address conflicts appropriately:

When any frustration is reported it’s usually not a systems issue but an individual one with an individual doctor. And when such a situation arises I’ll talk directly to the chief about it. For example, a new neurologist started a little while ago, he was a

sarcastic asshole and I went to the chief about him and it never happened again. [Nurse Manager]

Leadership support for collaboration was also emphasized by a physician chief who described his unit's success at bringing nurses and physicians together to discuss issues:

[You need] key leadership from the physician and nursing groups. You can do a lot of role definition and endless diversity and sensitivity training but it will only work if you have champions on either side. You need to choose to cultivate and support. [MD]

Another physician chief confirmed the importance of willingness to discuss issues between the nursing and physician leaders to enhance collaboration on the front line:

When a nurse handles herself poorly at a code, I will speak to her and then if I didn't feel satisfied that it was a one-time event I would speak to the charge nurse or the manager. I feel I have outstanding communication with my co-administrators. If they have a problem with a doctor they will take it to me. [MD]

Physician authority

Physicians' collaboration efforts were perceived by interviewees to be poor in units where physicians exhibited attitudes of authority and upheld "traditional" ideas about the role of the nurse and her standing in the professional hierarchy. Nurses believed that these physicians viewed themselves as being above the nurses. This created hostility and isolation. One nurse said, "I watch the nurses with the physicians and [physicians] treat them like they're clerical staff. I'm proud when the nurses say 'it's not clear or I don't agree with that.'"

A physician also described how poor role understanding and lack of respect for a new nursing role among traditional-thinking physicians contributed to detachment between his unit staff:

It was really difficult to create an appreciation for the nurse practitioner among the internists because she wasn't a doctor. There's a general lack of connectedness between the doctors, nurses and allied health staff. [MD]

Changing perceptions

Nurses and physicians believed that positive changes in nurse-physician collaboration occur as physician perceptions of the nurse's role modernize. In some units, lack of traditional barriers and nursing professionalization helped decrease nurse-physician isolation:

There used to be a bullying mentality on medicine but today the communication with the doctors is good. The informal communication lines are strong and it's pretty darn positive and pleasant to work here. There's no power struggle. [Unit Manager]

We also have a great nursing leader and a culturally diverse staff. There used to be the traditional barriers between physicians and other staff and a gender barrier as well but this has disappeared. [MD]

In addition, some nurses believed more junior physicians are sensitized in training to issues of interprofessional collaboration which is enhancing nurse-physician relations.

Discussion

Previous nurse-physician studies have primarily been single-method designs that used survey or interview data to investigate interprofessional collaboration. Previous quantitative research finds inequality between nurse and physician ratings of collaboration, with nurses reporting lower levels of satisfaction with physicians' collaboration than physicians of nurses' collaboration. Some qualitative studies support this finding (Weinberg et al., 2009); others highlight mutually positive experiences of nurse-physician collaboration (McGrail et al., 2009). The synthesis of our quantitative and qualitative techniques has allowed us to identify forms of nurse-physician collaboration quantitatively and subsequently illustrated them and their nuances with qualitative data of those participants' experiences. Our survey results support previous research on discrepant nurse-physician collaboration ratings, particularly in the areas of accommodation and isolation. Qualitative data from the same units revealed a number of nuances that can be targeted to enhance interprofessional collaboration.

Nurses and physicians mutually rated one another below average on the communication items. Our qualitative exploration of communication identified areas for improvement in terms of the structure and processes of communication. For nurses, communication timing and delayed physician response to paging was a conflict point that obstructed collaboration. In addition, many physicians were perceived to lack the necessary communication skill for effective collaboration to happen. Physicians, however, did not express these frustrations to the same degree as nurses. For both groups, planned one-on-one patient rounds were experienced as positive communication opportunities and both appreciated the ability to discuss patients at length. This can be attributed to the fact that regular interprofessional rounds meet aspects of the communication needs of both groups in that they are structured conversations, are also pre-planned and focus on exchanging specific information about patients.

Physicians rated nurses higher on accommodation than nurses rated physicians. In some units physicians divided their time between inpatient and outpatient care while nurses cared exclusively for inpatients. Our interviews revealed that the discrepancy between physicians' flexible schedules and others' fixed schedules can cause strain. When physician work became more patient-oriented, it began to appear less team-oriented when, for instance, nurses and other health professionals were uninformed about a physician-led process like patient discharge, they perceived this to be poor physician collaboration. Both physician and nurse interviewees believed that strong support from professional practice leaders, and leaders' ability to work together, enhanced collaboration.

Nurses rated physicians lower on the isolation items than physicians rated nurses. Nurses felt more disengaged from physicians than physicians from nurses. Both groups cited poor role understanding and the entrenched professional hierarchy among many senior physicians as contributing factors. Yet our qualitative findings also highlighted an important shift in this facet that was not apparent in survey results. Physicians' attitudes about the nursing profession and nursing roles are changing. In some units the variation in nurses' experiences of isolation from junior physicians was attributed to the change

in junior physicians' attitudes toward the nurses with whom they work. A comparative look at the differences in junior (<10 years in practice) and senior physicians' approaches to interprofessional work, as well as junior and senior nurses', is an area for future research that can explore more closely the evolution of this aspect of the nurse-physician relationship.

Our measurement scale tapped communication, accommodation, and isolation as facets of nurse-physician collaboration. Incongruous nurse-physician mutual perceptions of team collaboration are familiar to health services researchers. Less well known are the scale-free standardized effect sizes associated with nurse-physician differences. Earlier studies of nurse-physician relationships were not designed with mutual-group ratings and effect sizes in mind. Several recent articles either test significance of mutual ratings differences without presenting effect sizes (Makary et al., 2006; O'Leary et al., 2010), or present effect sizes for items that were not clearly developed as elements of summated scales whose data validity and reliability (Reader et al., 2007) could be examined.

By synthesizing quantitative and qualitative data, we attempted to provide new perspectives on interprofessional care by using ethnographic data to contextualize effect sizes. On two scale facets there were mean score differences of mutual ratings that translated to effect sizes conventionally considered medium to large. The effect size CI for isolation covered a range between medium and large. The probability of superiority estimates calibrate nurse-physician relationships clearly on two subscales. There was a substantially greater probability that a physician's ratings of nurses' accommodation and isolation was higher than a nurse's ratings of physicians'. Perhaps as expected, physicians were more likely to judge nurses positively than they were to be judged positively by nurses. This relationship was most apparent when isolation was considered. These effect sizes are likely generalizable and representative of other inpatient medical/surgical units. For example, we were able to calculate *d*-type effect sizes (Cohen, 1988) from published statistics relating to two items resembling items in our study that Thomas, Sexton, and Helmreich (2003) administered to critical care nurses and physicians. Both effect sizes were in medium-to-large ranges.

Mutual nurse–physician discrepancies in perceptions of working practices of the other group seem to be pervasive. Therefore, the relevant communities—including academic researchers, hospital professional practice leaders, and clinical educators—should be aware that mutual differences on some dimensions of the nurse–physician relationship may be substantial in quantitative effect size terms and are likely larger than previous quantitative studies suggest.

These results are relevant for future mixed methods research on nurse–physician collaboration. In earlier work, we analyzed rank agreements across hospital sites between measurement scale data from nurses and qualitative observation and interviews (Kenaszchuk et al., 2010a). Agreement on rank orderings was highest and significantly greater than chance between fieldwork observation and the scale constructs of accommodation primarily, and isolation secondarily. Consequently, we believe that modest statistical agreement between qualitative and quantitative data collected in inpatient settings indicates that medium or large effect size differences in mutual nurse–physician scale ratings could be co-existent. In other words, other qualitative results similar to ours may well characterize hospital settings where nurse–physician differences of mutual perceptions are medium or large when interpreted as effect sizes. Furthermore, the variation of experiences revealed in our qualitative results suggest that the implications of nurses rating physicians lower on collaboration scales are not entirely clear. Quantitative and qualitative methods are helpful for understanding this topic.

Interventions to improve health services quality may be implemented as cluster-randomized trials delivered to practicing ward teams. When teams, wards, or hospitals are used in group randomized trials, researchers can employ quantitative and qualitative methods in planning stages. If they investigate consensus between quantitative and ethnographic data sources, they should expect to find at least modest agreement if cross-site data are transformed to relative rank orderings. Overall nurse–physician discrepancies should be expected, and could vary in size between research sites. Our multidimensional measurement scale can identify nurse–physician relationship problems for quality improvement interventions. An integrated multi-

method approach to this topic can achieve a more meaningful understanding of the spectrum of interprofessional collaboration in the clinical setting, and begin to help conceptualize its improvement.

Limitations

The qualitative data here may be limited by the small sample size. However, key physician and nurse informants in this study had many years of experience from which to contextualize the quality of their interprofessional relations and work.

The response rate to the interprofessional survey could not be determined with confidence. At some hospitals it was difficult to enumerate the nurses and physicians who worked in the GIM units and to monitor survey distribution. The overall response rate among both professional groups is believed to be less than 50%, and higher among nurses than physicians. It is possible that the obtained responses are not representative of survey non-responders.

The project was a multi-site design. The analysis did not incorporate possible between-hospital differences. In multilevel modeling terminology, the GIM units are clusters. It is reasonable to expect that within GIM units participants' survey responses are non-independent to some degree, i.e., correlated. Non-independence may have been consequential for reported statistical significance levels. Other nurse-physician studies should consider whether the data have a hierarchical structure that could be modeled with a mixed-effects model.

Conclusion

This mixed method approach to understanding the nurse-physician dyad in general internal medicine has identified and elaborated upon three dimensions of collaboration: communication, accommodation, and isolation. The synthesis of quantitative and qualitative findings is useful for identifying sites of tension between the professions, and subsequently exploring the meaningfulness of specific experiences that contribute to these. In our global evolution toward interprofessional patient centered care, this methodological approach can be used to understand the significance of health care professionals' attitudes and beliefs about interprofessional collaboration, and

to develop tailored interventions that will maximize opportunities for them to engage with one another in mutually meaningful ways to achieve this.

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