Background  Indwelling urinary and vascular catheters are a common cause of health care–associated infections. Interventions designed to reduce catheter use can be ineffective if they are not integrated into the workflow and communication streams of busy clinicians.

Objectives  To characterize communication barriers between physicians and nurses and to understand how these barriers affect appropriate use and removal of indwelling urinary and vascular catheters.

Methods  Individual and small-group semistructured interviews were conducted with physicians and nurses in a progressive care unit of an academic hospital. Common themes were identified, analyzed, and then organized using a conceptual framework of contextual barriers to communication: organizational, cognitive, and social complexity.

Results  Several barriers to communication between physicians and nurses contributed to inappropriate use and delayed removal of catheters. Workflow misalignment between clinicians was a barrier associated with organizational complexity, issues with electronic medical records and pagers were associated with cognitive complexity, and strained relationships between clinicians and rigid hierarchies were associated with social complexity.

Conclusions  Communication is contextual, and improving physician-nurse communication about appropriate catheter use may require innovations that address the identified contextual barriers. (American Journal of Critical Care. 2019;28:290-298)
Interventions designed to reduce catheter use can be ineffective if they are not integrated into the workflow and communication streams of busy clinicians.

Our team is interested in using new technologies to improve awareness about catheters and facilitate effective communication between clinicians about catheter use. Routine communication between clinicians involves several types of interaction: interactions mediated by technology such as alerts and messaging in the electronic record system; notification by pager, text messages, and phone calls; and the traditional but increasingly infrequent face-to-face communication during bedside rounds. Technologies such as electronic medical records (EMRs) have the potential to standardize catheter documentation and schedule reminders for removal, but they can also disrupt communication by interrupting workflow and having nonintuitive user interfaces. As part of a multiphase study to inform the use of technology to improve communication between physicians and nurses, we conducted a qualitative study to characterize communication-related barriers between physicians and nurses and understand how these barriers affect appropriate use and removal of indwelling urinary and vascular catheters.

Methods

This study is being conducted at Michigan Medicine, a large academic medical center in Ann Arbor, Michigan. The work described here is the problem analysis phase of a larger project to develop technological tools to improve communication between clinicians about catheter use. From May to August 2016, we interviewed physicians, registered nurses, physician assistants, and nurse practitioners to learn about the challenges they experience in the monitoring and surveillance of indwelling urinary and vascular catheters. We also gathered suggestions for how these activities could be improved through the use of technology.

We used purposeful sampling because our goal was to understand the phenomena of interest by selecting information-rich cases, not to generalize about a population by statistical inference. All of the nurses, physician assistants, and nurse practitioners who provided care for patients on a single progressive care unit of the academic medical center were invited, via email or in person, to participate in the study. Because it was an open unit, physicians provided care for patients on multiple units, so we purposefully recruited a variety of physicians as well (eg, physician leaders, hospitalists, residents). The diverse professions of the study participants provided a variety of perspectives on catheter workflow and catheter management activities. These diverse perspectives were important for understanding how catheters are used and how they are removed.
Semistructured face-to-face interviews were conducted with the participants from June to August 2016. Written informed consent was obtained before each interview. The participants were interviewed in private offices, either individually or in pairs to accommodate their busy clinical schedules. All interviews were led by 1 of 3 experts in qualitative methods (J.F., M.Q., or J.M.). One other member of the research team (J.M.A.) was also present during interviews to assist with obtaining consent, audio recording, and note-taking. Interview questions were about monitoring indwelling urinary and vascular catheters and communicating related information among members of the care team (see Table 1 for representative questions from the semistructured interview guide). All interviews were audio recorded and professionally transcribed. We preserved participants’ anonymity by stripping transcripts of all identifying information and using role as the only identifier. The institutional review board at our institution’s medical school approved this study (HUM00106108).

We qualitatively analyzed interview transcripts by both inductive and deductive approaches.10 We used an inductive approach to develop code reports and identify themes, and we used a deductive approach to identify a relevant conceptual framework and organize the findings within that framework. Four members of the research team read a sample of interviews and developed a preliminary coding scheme (M.M., J.M.A., M.Q., J.F.). Then, 2 members of the research team (M.Q., J.M.A.) read all interview transcripts, independently coded them, and used an iterative process to develop a codebook that included the overarching themes identified before coding as well as themes identified inductively from the transcripts. The coders (M.Q., J.M.A.) met regularly to discuss and resolve any discrepancies in coding. The qualitative data were organized, classified, and sorted with NVivo 11 software (QSR International Pty. Ltd). Common themes across all clinician interviews were identified. The first author (M.M.) reviewed the code reports, identified emerging themes related to communication, and discussed the themes with the wider team to analyze the results.

We then used a deductive approach to characterize our findings. After the themes were generated, we searched the literature for sensitizing concepts11 around which to structure our results, as has been done by others.12 We selected the conceptual framework described by Pirnejad et al13 to organize our results. Pirnejad et al describe communication space and how information and communication technology can be used to enhance communication in health care.13 According to Pirnejad et al, in addition to a communicator, information, and a medium to transmit information, organizational, cognitive, and social complexity play an important role in the effectiveness of communication.

Results

Eight nurses, 7 physicians, 3 physician assistants, and 1 nurse practitioner participated in a total of 13 individual and 3 small-group interviews. The nurses had a mean of 4 years of experience in their current positions. The 7 physicians who participated included 1 resident, 1 fellow, and 5 attending-level physicians, representing general medicine and surgery. Each participant commented on both urinary and vascular catheters. All of the participants described communication as one of several persistent barriers to removing

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Main interview questions</th>
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<tr>
<td><strong>1.</strong> We’re interested in how you monitor and communicate about indwelling urinary catheters (commonly known as Foley catheters). Interviewer questions:</td>
<td><strong>2.</strong> Now let’s talk about monitoring venous catheters (CVCs or PICCs). Interviewer questions:</td>
</tr>
<tr>
<td>a. Is there a process currently for monitoring who has a catheter and how long they’ve been in place? Please describe.</td>
<td>a. Is there a process for monitoring who has a CVC or PICC and how long the catheter has been in place?</td>
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<tr>
<td>b. How do you decide if a patient’s urinary catheter is being used for an appropriate reason? (If they ask what appropriate means, it means providing the patient more benefit than risk of harm.)</td>
<td>b. Who decides when it’s time to remove a CVC or PICC?</td>
</tr>
<tr>
<td>c. Who usually recognizes that a urinary catheter is no longer needed?</td>
<td>c. How did you usually communicate with the physician/nurse about removing a CVC or PICC? When in your daily workflow?</td>
</tr>
<tr>
<td>d. Who decides when to remove them?</td>
<td>d. How well does the process work?</td>
</tr>
<tr>
<td>e. Is communication between nurses and physicians needed to remove a catheter? If so, what does that look like?</td>
<td>e. Is there a process for monitoring who has a CVC or PICC and how long the catheter has been in place?</td>
</tr>
<tr>
<td>f. How well does the process work?</td>
<td>f. Who decides when it’s time to remove a CVC or PICC?</td>
</tr>
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</table>

Abbreviations: CVC, central venous catheter; PICC, peripherally inserted central catheter.
unnecessary catheters. We were struck by the number and variety of communication-related barriers reported by study participants. We classified the communication-related barriers that the participants identified into the 3 categories described by Pirnejad et al:\textsuperscript{13} organizational, cognitive, and social complexity (Table 2).

### Communication Barriers Related to Organizational Complexity

Organizational complexity arises from time and resource constraints imposed by an organization.

These organizational constraints require personnel to coordinate their activities with one another to
The diverse professions of the participants yielded a variety of perspectives on catheter workflow and catheter management activities, which is important for understanding how catheters are used and how they are removed. Workflow misalignment between nurses and physicians, as well as between different physician specialties, was a barrier to communication about catheters during rounds. Participants reported that patient rounds were the most likely time for nurse-physician communication to occur, but differences in workflow patterns between physicians and nurses made it difficult for nurses to attend patient rounds.

When the physicians were rounding, nurses were busy with patient care activities. Both physicians and nurses described this misalignment. A physician said, “It’s just impossible and like not something I can do and actually keep up with my flow of work because like finding the nurse, getting them to the bedside, making sure you are actually there when that happens is next to impossible.” A nurse commented, “They rounded when I was in my other room for about 35 seconds so we didn’t talk about [the] Foley. We didn’t get a chance to have a conversation.” The rounding times of surgeons were determined by their operating room schedules, and the timing was often incompatible with nurses’ workflow because the surgeons rounded during the nursing shift change. A nurse interviewee told us, “The surgeons round very early in the morning so I don’t get a chance to see them.”

Differences in workflow patterns among physician specialties also acted as a barrier to nurse participation during rounds, which limited opportunities for communication about catheters. One nurse said, “There’s like two [different specialty] teams and they don’t follow a pattern, you know.”

Differences in workflow patterns among physician teams also affected quality improvement activities, specifically hampering the effectiveness of a communication tool developed in an attempt to overcome lack of nursing presence during rounds: “It [the communication tool] kind of worked with the pulmonary service but it totally didn’t work with surgeons.”

Communication Barriers Related to Cognitive Complexity

Successfully conveying and understanding a message requires cognitive effort on the part of the communicators. The use of a wide variety of communication channels (eg, verbal, nonverbal) and media (eg, paper, EMR, pagers) adds to the cognitive complexity of communication in the health care setting. Communication barriers related to cognitive complexity that we identified in this study included training and usability issues with the EMR, some reliance on paper in an organization that had an EMR, and issues with pager usage.

Participants reported that retrieving catheter-related information from the EMR, such as catheter indication, was cognitively complex and time-consuming. All clinicians received formal didactic training in the use of the EMR, but the training alone was insufficient to ensure competence. One physician said, “You have to learn how to find that information, and that’s another barrier to getting that information you need to actually make the [clinical] decision.” A nurse commented on usability issues with the EMR: “It would be interesting to see how many clicks it actually is from booting up, clicking to find where you actually get to the PICC [peripherally inserted central catheter] line information. Right now, everything is so buried but that’s the one thing [in the EMR] we all have to go to.” Another EMR-related barrier was the way in which information was displayed. One nurse said, “Sometimes, in the charting it’s hard to tell when some of them [catheters] are placed.” Another nurse said, “You can’t even see it. You have to hover on it to discover it,” suggesting that the information may be available but not always visible.

The problem accessing information about catheters from the EMR was compounded by some reliance on paper in addition to the EMR. A physician assistant commented, “It’s part of our duty that if we see a Foley bag at bedside, we should know [the indication for the catheter] . . . but there is not a section in our printout that says that.” Reliance on paper generated more cognitive work for clinicians, because to make decisions about the ongoing need for catheters they first had to remember whether the necessary information could be found on paper or in the EMR.

Although pagers are primarily a communication tool, unlike the EMR, participants reported that pager use presented communication-related barriers to appropriate catheter use and removal. Pagers do not facilitate discussion, as another communication medium such as a telephone call would. Nurses
often felt the need to consult physicians before removing catheters, despite being empowered to remove indwelling urinary catheters without a physician order, and they frequently used pagers for this purpose. If the physician did not acknowledge the page, the nurse did not know whether to remove the catheter or not. In addition, pagers do not have any mechanism for prioritizing incoming messages, so the task of deciding which pages to respond to and when to respond to them added to physicians’ cognitive burden. Physicians were paged in the context of an already high cognitive load, and because of this they occasionally missed pages, which could delay catheter removal.

**Workflow misalignment between clinicians, issues with electronic medical records and pagers, and rigid hierarchies were all barriers to communication about appropriate use of catheters.**

**Discussion**

We used qualitative analysis to identify barriers to communication about indwelling urinary and vascular catheter management and classified the barriers into organizational, cognitive, and social complexity as described in Pirnejad and colleagues’ communication space framework. The conceptual framework helped uncover obstacles to reducing catheter use that otherwise might have remained hidden. In most cases, barriers were not unique to either indwelling urinary or vascular catheters, but spanned both catheter types. These findings may help identify potential targets for improvement and are graphically summarized in the Figure.
The conceptual framework describing contextual barriers to communication helped uncover obstacles to reducing catheter use that otherwise might have remained hidden.

Source of information about catheters. Workflow pattern differences between physicians and nurses and between different physician specialties made it difficult for physicians to locate nurses when they came to the unit for rounds and made it difficult for nurses to participate. Similarly, physicians and nurses who work on general care units are not usually in the same place for long periods and face obstacles to discussing patient care in person.

The unit that was the focus of this study follows the open model of care. Strategies to improve communication and reduce infectious complications may be more challenging to implement in open units, where patients’ primary physician teams have patients on several floors of the hospital. Primary teams physically visit and round in open units at various times of day, depending on their caseload and other factors; this makes it difficult for nurses and physicians to align their schedules to be together at the bedside for communication purposes.

In contrast, closed units are staffed by a single consistent team of physicians. The closed care model facilitates standardization of care delivery and consistent rounding times, which may result in fewer infectious complications.

The EMR and multiple forms of communication added cognitive complexity to clinicians’ tasks and contributed to communication barriers. Our findings echo those of others who have reported that communication practices can change when organizations move from a paper-based to an electronic patient record–keeping system. Structuring communication exchanges in electronic format can create ambiguity and reduce flexibility, so it is not surprising that some of our interviewees were unable to determine through documentation whether a patient had a catheter or not. The nurses in our study reported that they used pagers to communicate with physicians, but we heard from physicians that they could be inundated with pages and therefore sometimes missed pager messages. Interrupting one’s work to view a pager message causes disruption in working memory, so some physicians may have ignored pager interruptions in an attempt to stay focused on the task at hand. But if physicians did not respond to pages in a timely manner, communication about catheters could be delayed or missed entirely.

Social complexity contributed to communication barriers because of poor interpersonal relationships between nurses and physicians and professional and organizational hierarchies. Differences in social status between physicians and nurses have long been recognized as a barrier to communication because lower status individuals such as nurses do not always initiate a message about their concerns with those of higher status, such as physicians. Interpersonal relationships and hierarchies have been associated with barriers to communicating concerns about an unfolding clinical situation, albeit in a pediatric setting.

Suggested Strategies
A number of strategies could be implemented to mitigate the communication barriers identified in this study. Technologies could be applied to help to bring clinicians together so that they can communicate face-to-face during rounds. Notifying a nurse via a wearable communication device that rounds on his or her
patient will be starting in 5 minutes may give that nurse enough time to finish the current task without undue disruption of the nurse’s workflow.

An organizational strategy to provide structure for discussion topics during rounds could also be helpful, such as a synchronous or asynchronous checklist. Synchronous “daily goal” checklists in the intensive care unit have met with some success. A daily goal checklist could be enhanced by including information on catheter presence and a goal to assess the ongoing need for a catheter. Alternatively, a checklist could be adapted for asynchronous communication purposes, in the form of a paper taped to the door or through the use of a display such as an electronic whiteboard.

To mitigate professional hierarchies, a promising strategy is to empower nurses to remove urinary catheters that no longer meet prespecified criteria without requiring an additional physician order. However, despite having a nurse empowerment protocol in place at the time of this study, our results showed that nurses did not feel comfortable removing catheters without at least notifying the physician. This finding is consistent with other reports that the success of a nurse empowerment strategy depended on nurse and physician engagement in initiatives to reduce catheter-associated urinary tract infections.

Study Limitations

This study has some limitations. The communication barriers that we identified could be unique to the single site in which the study was conducted, and thus our findings may lack generalizability. For example, an atypical characteristic of this unit was that advanced practice providers had more interactions with nurses than residents did. However, the workflow characteristics of nurses and physicians, such as rounding patterns and use of the EMR, may be similar across academic medical centers. Also, Pirnejad’s communication space framework may apply to other sites even if some of the specific barriers identified here were unique to our context.

Summary

We identified several barriers to communication between physicians and nurses that contribute to inappropriate use and lack of timely removal of indwelling urinary and vascular catheters. These barriers occur in the contexts of the organizational, cognitive, and social complexity of the health care setting. Communication is contextual, and improving physician-nurse communication about appropriate catheter use may require innovations that address these contextual barriers.

ACKNOWLEDGMENTS

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FINANCIAL DISCLOSURES

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SEE ALSO

For more about communication among clinicians, visit the Critical Care Nurse website, www.ccnonline.org, and read the article by Rachwal et al, “Navigating Communication Challenges in Clinical Practice: A New Approach to Team Education” (December 2018).

REFERENCES

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This article has been designated for CE contact hour(s). The evaluation demonstrates your knowledge of the following objectives:

1. Describe how organizational complexity creates barriers to communication between nurses and physicians.
2. Summarize communication barriers between physicians and nurses that may be caused by the social complexity in hospital settings.
3. Identify 2 strategies to overcome communication-related barriers associated with use and removal of urinary and vascular catheters.

To complete the evaluation for CE contact hour(s) for this article #A1928042, visit www.ajcconline.org and click the “CE Articles” button. No CE evaluation fee for AACN members. This expires on July 1, 2022.

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