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Brief Report

Developing a user-friendly report for electronically assisted surveillance of catheter-associated urinary tract infection

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Catheter-associated urinary tract infection (CAUTI) surveillance is labor intensive, generally involving manual medical record review. We developed a prototype automated report through iterative design. Surveys and qualitative interviews were administered to key stakeholders to assess the report design. We found that different provider types expressed different needs regarding report content and format. Therefore, determining the primary audience for reporting data on CAUTI a priori is critical to developing useful reports, particularly as this process becomes standardized and automated.

Manual surveillance and reporting approaches for urinary catheters and catheter-associated urinary tract infections (CAUTIs) are burdensome and often inaccurate.[1-4] We conducted a project using natural language processing to extract information from the Department of Veterans Affairs electronic records and to generate automated reports for CAUTI surveillance.[5] In this work, we noted that gaps in knowledge exist about the best way to deliver data, including the format, presentation, and ideal audience. We therefore sought to develop a report format for automated surveillance data that would be useful, trustworthy, and acceptable to end users.

METHODS

The current process of CAUTI tracking and reporting was identified on acute and long-term care units in one medical center through interviews with personnel involved in the process. Once a month, data on the number of catheters were given to infection preventionists, who entered the information into the national Inpatient Evaluation Center database. To detect and report a CAUTI, the infection preventionists combined the catheter information with clinical data (positive urine cultures, patient symptoms, and presence of a urinary catheter) obtained via chart review.

An iterative design process, the Rapid Iterative Testing and Evaluation method,[6] was used to develop a report to facilitate CAUTI tracking and reporting. It consisted of (1) developing a prototype, (2) soliciting user feedback, and (3) revising the prototype in accordance with users' feedback. We purposefully selected infection preventionists, staff and resident physicians, physician assistants, nurse practitioners, nurses (including ward nurses, unit nurse managers, and CAUTI prevention champions), and quality managers because each of these groups plays a different role in CAUTI prevention or monitoring and therefore had different perspective on our prototype report.[7] Participants were instructed to take as much time as they needed to review the report and were timed to assess how long it took to assimilate the information presented. Participants were then queried on 4 domains of the report, using a Likert

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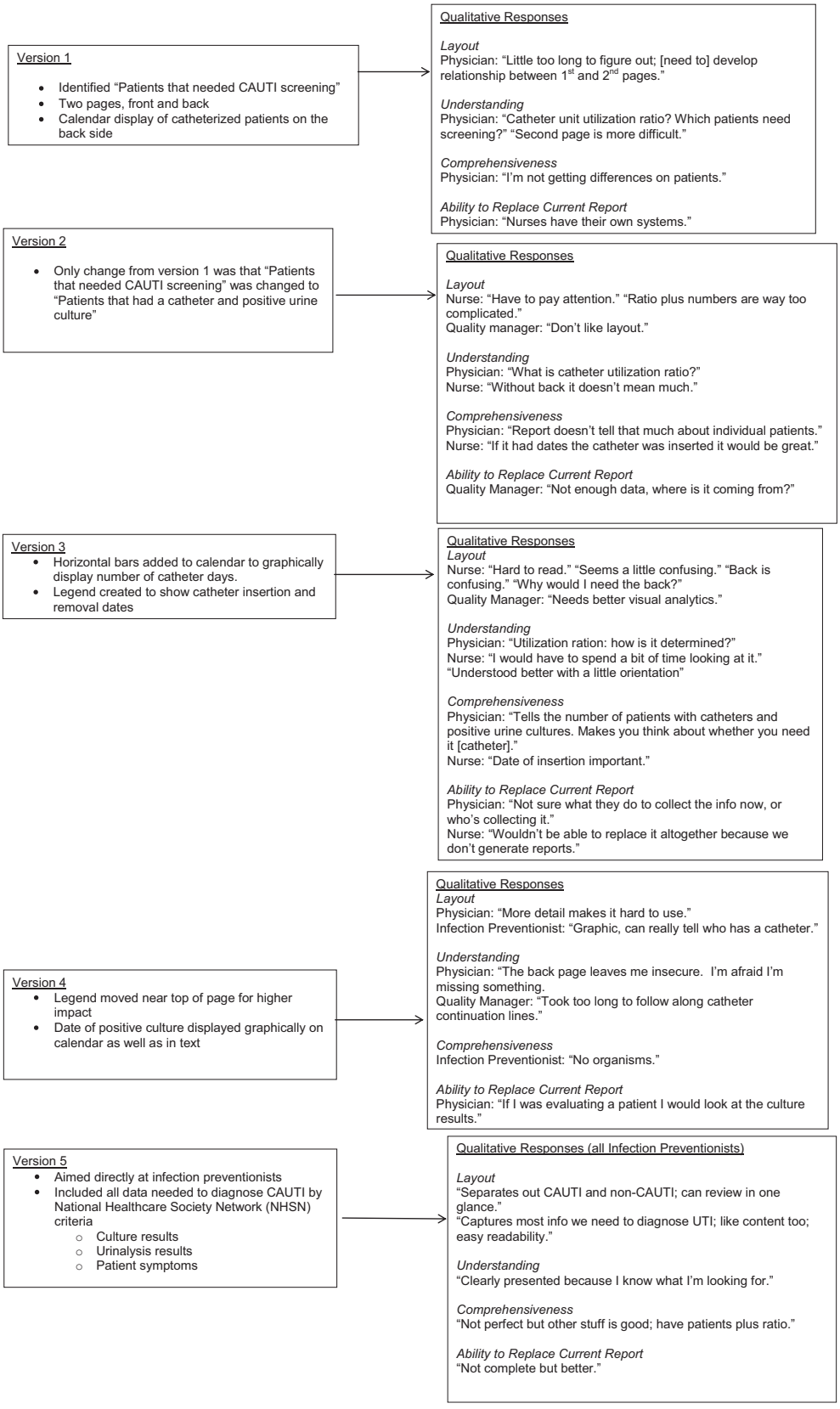

Fig 1. Qualitative responses from surveys about report formats. The distinguishing features of each version of the report appear in bullet points, and the arrow links to the providers' impression of this version of the report. Representative responses are included. *CAUTI*, catheter-associated urinary tract infection; *UTI*, urinary tract infection.

scale (where 1 was strongly disagree and 5 was strongly agree): (1) did you like the layout of the report? (2) did you understand the content of the report? (3) was the report comprehensive in the information you needed to know about urinary catheters on your unit?; and (4) could this report replace the current reporting method? Participants were also asked to provide written comments about each domain.

After each round of interviews, several members of the research team reviewed the data and met to discuss and develop preliminary themes, using a consensus-based approach. The report format was redesigned based on those themes, followed by another round of review and feedback by various stakeholder groups. Themes identified by the Rapid Iterative Testing and Evaluation process were later confirmed by the human factors psychologist on the team, who used a grounded theory approach to code and document the qualitative responses.[8] With each iteration and subsequent feedback, our report format was refined. This project was approved by the IRB at Baylor College of Medicine and the Research & Development Committee of the Michael E. DeBakey Veteran Affairs Medical Center.

RESULTS

We conducted 45 interviews over 5 rounds, including 12 physicians, physician assistants, or nurse practitioners; 21 ward nurses or nurse managers; 4 quality managers; and 8 infection preventionists. The average time spent looking at the report by participants was 35, 34, 46, 67, and 41 seconds for versions 1-5, respectively. Although participant scores for understanding were all ≥4, the scores for layout, comprehensiveness, and ability to replace current reporting method varied.

Changes to each report version in response to needs identified are shown in Figure 1. Clinicians (ie, physicians, physician assistants, nurse practitioners) generally wanted more patient-specific information. These clinicians were unaware of existing CAUTI surveillance processes and so had limited insights about the capacity for replacing the current report format with the redesigned format. Nurses also could not comment on whether the redesigned report might replace the current reporting method because CAUTI surveillance was not their primary responsibility unless they were CAUTI champions. Quality mangers generally disliked both the layout and content of the various versions of the report.

Version 5 focused specifically on providing information needed by infection preventionists. For example, version 5 included specific information about urine cultures as needed to meet CAUTI surveillance definitions (eg, organism, colony forming units). The possible CAUTI cases were clearly delineated. Comments on version 5, which catered to infection preventionists and underwent review only by them, were generally favorable across domains.

DISCUSSION

We identified substantial variability in data needs among different provider types in keeping track of urinary catheters and CAUTIs. Physicians, nurse practitioners, and physician assistants did not have a role in urinary catheter or CAUTI tracking and therefore had limited interest in CAUTI summary reports. Likewise, few bedside nurses were involved in CAUTI reporting activities, and they preferred information specific to their roles of documenting urinary catheter insertion and performing catheter maintenance. These disparate needs and the roles of different providers with respect to catheter use and CAUTI can be useful to guide infection preventionists in how they communicate with other stakeholders about CAUTI prevention. Our findings may also be relevant to efforts to standardize and automate urinary catheter and CAUTI reporting outside the Veterans Administration, by highlighting data elements most critical to infection preventionists.

Our study has several limitations. First, this was a single-site study, thereby limiting generalizability. Second, small group sizes prevented us from having sufficient power to detect potential differences in our quantitative assessment of key domains (eg, layout, comprehension) across the 5 versions of the report. However, making frequent and small changes in accordance with both quantitative and qualitative feedback from end users is consistent with the iterative design process, as planned up front for this project.

Acceptance of technologic advances in the health care workplace depends in part on the perceived usefulness of the advance and job relevance.[9] Our study contributes value by demonstrating how the information needs of different provider types vary, therefore helping to determine what data elements should be captured, reported, and eventually fed back to key stakeholders to further CAUTI prevention efforts.

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