
Brief Communication

User-centered design of discharge warnings tool for colorectal surgery patients

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ABSTRACT

Objectives: Readmission following colorectal surgery, typically due to surgery-related complications, is common. Patient-centered discharge warnings may guide recognition of early complication signs after colorectal surgery.

Materials and Methods: User-centered design of a discharge warnings tool consisted of iterative health literacy review and a heuristic evaluation with human factors and clinical experts as well as patient end users to establish content validity and usability.

Results: Literacy evaluation of the prototype suggested >12th-grade reading level. Subsequent revisions reduced reading level to 8th grade or below. Contents were formatted during heuristic evaluation into 3 action-oriented zones (green, yellow, and red) with relevant warning lexicons. Usability testing demonstrated comprehension of this 3-level lexicon and recognition of appropriate patient actions to take for each level.

Discussion: We developed a discharge warnings tool for colorectal surgery using staged user-centered design. The lexicon of surgical discharge warnings could structure communication among patients, caregivers, and clinicians to improve post-discharge care.

Key words: readmissions, colorectal surgery, usability testing, health literacy, discharge instructions

INTRODUCTION

Hospitals face increased financial responsibility for 30-day readmissions. Published interventions focus largely on reducing readmissions for medical patients.^{1,2} The discharge needs of surgical patients are often distinct, requiring specific engagement. The majority of surgical patients are readmitted for common complications related to the surgical procedure itself.^{3–7} This predictability offers

the opportunity to provide postoperative patients with targeted discharge warnings aimed at recognizing common post-discharge complications.^{8,9}

Among surgical procedures, colorectal surgery has one of the highest unplanned 30-day readmission rates.^{4,6} Common causes of readmission include ileus or bowel obstruction, surgical site infection, and dehydration.^{4,6} Prompt attention to warning signs for

these common complications is critical for health care systems to have the opportunity to intervene early to avoid readmission.⁹ Patients play a critical role by identifying and communicating early problems. As recommended by the Institute of Medicine, patients need discharge instructions with tailored information that empowers them to participate in their post-discharge care.^{8,10}

We previously developed discharge instructions to address the specific needs of colorectal surgery patients following discharge.^{6,9} In the prototype, the discharge instructions included a set of specific, actionable warnings, consisting of a lexicon for complications following colorectal surgery that activates patients to communicate with their health care providers. This discharge warnings lexicon was developed through a systematic review of the literature⁶ and a Delphi expert consensus panel with a national sample of colorectal surgeons.⁹

The current study presents our effort to transform physician-centered discharge warnings into an understandable, usable warnings lexicon for patients using health literacy and usability heuristics standards and cognitive interviews with patients during the postoperative period. Finally, we provide a discussion of how these discharge warnings can be effectively integrated within a clinical team structure that includes patients and their caregivers.

METHODS

A multiphase, user-centered design process was used to design and test the discharge warnings prototype.¹¹ A design thinking approach¹¹ was used to synthesize → ideate → prototype and then iteratively revise the warning signs and symptoms tool for colorectal surgery patients. The synthesis process included a previously conducted meta-analysis of conditions associated with readmission following colorectal surgery.⁶ Data synthesis moved to concept ideation using a Delphi expert panel of surgical experts, who developed an initial prototype with a physician-centric lexicon for discharge warnings.⁹ The current study begins from this initial prototype and moves through testing and prototype revisions.

Procedures

Phase 1: Health literacy review

We conducted a literacy evaluation of the discharge warnings prototype,⁹ led by a health literacy expert (MPO), using the Flesch-Kincaid Readability Test, the revised Dale-Chall method, and the Lexile Framework to make substantial revisions to our patient-facing content.¹² The goal of the literacy evaluation was to reduce the required reading level to that of an 8th-grade education or below in order to be consistent with the average reading level of the local patient population we were interested in observing.¹³

Phase 2: Heuristics evaluation with experts and end users

To ensure that the discharge warnings lexicon was presented succinctly and uniformly, we conducted a series of heuristic evaluations. First, a human factors psychologist (BC) conducted an initial heuristics review using a subset of nationally recognized usability heuristics published by the National Institutes of Health and available at: <http://www.usability.gov>.¹⁴ The goal of the heuristics evaluations was to ensure that the discharge warnings conformed to known human limitations and research-based guidelines for page layout; headings, titles, and labels; text and color appearance; lists; content organization; and usability.¹⁴ Second, 2 additional investigators, a clinician (AN) and a non-clinician (LH), reviewed the

preliminary list of findings and identified additional concerns. The human factors expert then compiled these findings into an adapted prototype for usability testing by patient end users.

Patients were recruited for cognitive interviews to determine usability during their first postoperative clinic appointment following colorectal surgery at the surgical oncology clinic of the Michael E. DeBakey VA Medical Center. The first postoperative clinic appointment was typically within 2 weeks of hospital discharge. Patients who underwent elective colon or rectal surgery and had a scheduled appointment were eligible to participate. Eligible patients were identified and approached by members of the surgical care team during their clinic appointment. Patients interested in participating gave informed consent at the appointment and were provided with a color copy of the colorectal discharge warnings and everyday care instructions. A 30-min telephone interview was scheduled with each patient for the following week. Patients were asked to read over and review the warning signs and symptoms at home during the intervening time between their postoperative clinic visit and the scheduled interview. Interviews continued until thematic saturation was achieved regarding usability guidelines, defined as no new themes being uncovered in 2 subsequent interviews.

All interviews were audio recorded and transcribed verbatim. Interviews were conducted by research staff who had no role in the care of the patients. Interviews followed a semistructured interview guide (see [Table 1](#) for questions). Six multidisciplinary research personnel (surgery, gerontology, hospital medicine, human factors psychology, and organizational psychology) then performed a thematic analysis of interview transcripts using a card-sorting procedure to identify content that patients found most salient.^{15,16} A single-linkage cluster analysis of the card-sorting data was performed using the Jaccard index as a metric of distance. Patient response themes were derived from the “clusters” of patient responses (using a 0.33 distance threshold).

RESULTS

Phase 1

Results of the iterative design process and literacy evaluation revealed that the initial discharge warnings, using language adopted directly from the expert panel, required a literacy level consistent with >12th-grade education ([Figure 1](#)). Subsequent revisions to the content of the discharge warnings, in consultation with our health literacy expert, reduced the required reading level to ≤8th grade ([Figure 2](#)).

Phase 2

A comprehensive heuristics evaluation revealed several inconsistencies regarding the presentation and readability of the information provided by the discharge warnings. As shown in [Figure 2](#), the discharge warnings had low-contrast colorized text, an inconsistent grouping scheme, inconsistent use of bold text, unclear calls to action, and a mix of passive and active voice. The human factors expert integrated the consensus findings of the heuristics evaluation into a revised version of the discharge warnings lexicon page using a simpler language base and a more consistent design ([Figure 3](#)).

Patient interviews

Thematic saturation for usability was achieved after 7 post-colorectal surgery patients completed cognitive interviews. All the participants were male, ranging in age from 49 to 73 years. One completed only primary school, 2 had high school diplomas, and the rest had at least

Table 1. Thematic analysis of phase 2 qualitative responses

Page	Question	Response Theme(s)
Warning Signs	When looking at this page, what is the first thing that stands out to you?	Colors and formatting Nothing Warning signs Heading
Warning Signs	What is the green zone telling you?	“Everything is going well” Bowel movements
Warning Signs	What is the yellow zone telling you?	“Things you need to look out for” “Something could be wrong” “Something’s wrong with you” Warning signs Keep vigilant
Warning Signs	What is the red zone telling you?	“Go see a doctor” Needs action
Everyday Care	When looking at this page, what is the first thing that stands out to you?	Instructions Heading Nothing Information
Everyday Care	In your own words, can you describe the information on this page?	Get moving What to do/not do “You have to keep up with it”
Both Pages	Do you have any other suggestions for how we could improve the usefulness of these instructions?	Ostomy care Additional instructions Font size Nothing

Note: Phrases in quotation marks are representative quotes from that theme.

Problems You Should Look For After Surgery

	Warning sign	What to Look For	What to Do	
<i>Wound</i>	<i>Wound drainage</i>	Liquid coming out of wound	Call your Doctor	
	<i>Wound disruption</i>	Opening of the wound bigger than a Q-tip		
	<i>Wound erythema</i>	Skin around the wound changes color		
<i>Abdomen</i>	<i>Abdominal pain</i>	Abdominal pain that you cannot tolerate even after taking your pain medication		
	<i>Abdominal swelling</i>	Abdomen balloons up and becomes harder and larger		
<i>Eating/ Bowel Function</i>	<i>Vomiting</i>	Vomiting more than once		
	<i>Unable to tolerate anything by mouth</i>	Inability to eat or drink anything for more than 24 hours		
<i>Ostomy</i>	<i>Increase ostomy output</i>	More drainage coming out of the ostomy than usual		
	<i>No bowel movement</i>	No gas or stool from the ostomy for over 24 hours		
<i>Other Problems</i>	<i>Fever</i>	Temperature over 101.5°F or 38.6°C		Go to the Emergency Room
	<i>Shortness of breath</i>	Difficulty breathing		
	<i>Chestpain</i>	Chestpain		

Words to Know
Ostomy: a surgically created opening on your abdomen that discharges stool
Wound: cuts made by a surgeon to perform a surgery

Figure 1. Initial version of the warning signs page developed for discharge instructions incorporating the 12 warning signs identified by the Delphi panel.

some college. The patient interviews and thematic analysis indicated that these patients understood the information provided and approved of the manner in which warning signs and symptoms were presented (Table 1). Patients demonstrated comprehension of the 3-level heuristic for warnings (ie, the green, yellow, and red zones) and recognized appropriate patient actions. Patients further suggested edits to the design, readability, and formatting of certain pages.

Discharge warnings

Patients first noticed the colors, discharge warnings, and heading. Patients understood that the green zone indicated that “everything is

I will call my doctor at (xxx) xxx-xxxx

- If my surgical wound is:
 - Red
 - Leaking liquid, blood, or pus
 - Opening up or getting worse
- If my belly is:
 - Swelling up and feels very firm
 - Hurting and the pain medicines don't help
- If my ostomy is:
 - Putting out more stool than usual
 - Not putting out anything for 24 hours
- If eating and drinking make me vomit
- If I can't eat or drink anything for 24 hours
- If I have no bowel movement or I do not pass any gas for 24 hours
- If I have a fever over 100.4°F

I will go to the emergency room if my chest hurts or I have a hard time breathing

Figure 2. Second major iteration of the warning signs tool developed for the discharge instructions.

going well,” the yellow zone indicated “things you need to look out for,” and the red zone indicated that the patient needed to see a doctor right away. Patients rated the clarity of information on this page from 1 (lower) to 5 (higher), for an average of 4.7 (standard deviation = 0.5).

Everyday care instructions

The thematic analysis of responses to our open-ended questions about the everyday care instructions revealed that patients first noticed the instructions and heading. Patients understood that the information indicated that they needed to “get moving” and to “keep

A

Colorectal Surgery Warning Signs

<p>Green Zone: This is your green zone. Being in this zone means that your symptoms are under control.</p>	<ul style="list-style-type: none"> ❖ Your wound is healing well. ❖ You do not have a fever. ❖ You are eating and drinking well. ❖ You are having normal bowel movements and passing gas. ❖ You are getting out of bed and walking around.
<p>Yellow Zone: This is your warning zone. If you have any of these problems you should contact your medical team at:</p> <p>Mon – Fri (8a-4:30p): 713-791-1414 x23314</p> <p>Nights & Weekends: 1-800-639-5137</p>	<ul style="list-style-type: none"> ❖ Your surgical wound is: <ul style="list-style-type: none"> <input type="checkbox"/> Red. <input type="checkbox"/> Leaking liquid, blood, or pus. <input type="checkbox"/> Opening up or getting worse. ❖ Your belly is: <ul style="list-style-type: none"> <input type="checkbox"/> Swelling up and feels very firm. <input type="checkbox"/> Hurting and the pain medicines don't help. ❖ Your ostomy is: <ul style="list-style-type: none"> <input type="checkbox"/> Putting out more stool than usual. <input type="checkbox"/> Not putting out anything for 24 hours.
<p>Red Zone: This is your emergency zone. Seek help immediately!</p>	<ul style="list-style-type: none"> ❖ Go directly to your local emergency room, or call 911, if: <ul style="list-style-type: none"> <input type="checkbox"/> You are having trouble breathing, or <input type="checkbox"/> You are having chest pains.

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B

Colorectal Surgery Everyday Care

<ul style="list-style-type: none"> ❖ Keep in mind the following while at home: <ul style="list-style-type: none"> <input type="checkbox"/> Get out of your bed or chair as much as possible. <input type="checkbox"/> Walk at least 30 minutes per day. You can walk around your house or outside. <input type="checkbox"/> Do NOT lift more than 15 pounds for the next 6 weeks. <input type="checkbox"/> Use the incentive spirometer that was given to you at the hospital for one week after discharge while you are at home (10 deep breaths every 1-2 hours). 	<ul style="list-style-type: none"> ❖ Colorectal cancer is a disease of the colon and/or rectum. <ul style="list-style-type: none"> <input type="checkbox"/> Surgery is the main treatment for your cancer. <input type="checkbox"/> But, you may need more treatment. This will be discussed at your follow up appointments. ❖ Please go to all follow up appointments: <ul style="list-style-type: none"> <input type="checkbox"/> To make sure you recover well after surgery. <input type="checkbox"/> To make sure the cancer has not returned. <input type="checkbox"/> To arrange any more treatment you may need.
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Figure 3. Final iteration of the (A) discharge warning signs and (B) everyday care pages developed for patients receiving colorectal surgery as part of cancer therapy.

up with it.” Patients rated the clarity of the information on this page from 1 (lower) to 5 (higher), for an average of 5.0.

DISCUSSION

We describe a user-centered “design thinking” process culminating in a set of discharge warnings that are usable and understandable

for patients who have recently undergone colorectal surgery.^{17,18} The current study began from a prototype consisting of a surgeon-defined lexicon of signs and symptoms for common complications of colorectal surgery that most often result in hospital readmission.^{6,9} Two consecutive adaptations of the instructions arose from structured revisions drawn from the health literacy (Figure 2) and human factors (Figure 3) literature and under the supervision of ex-

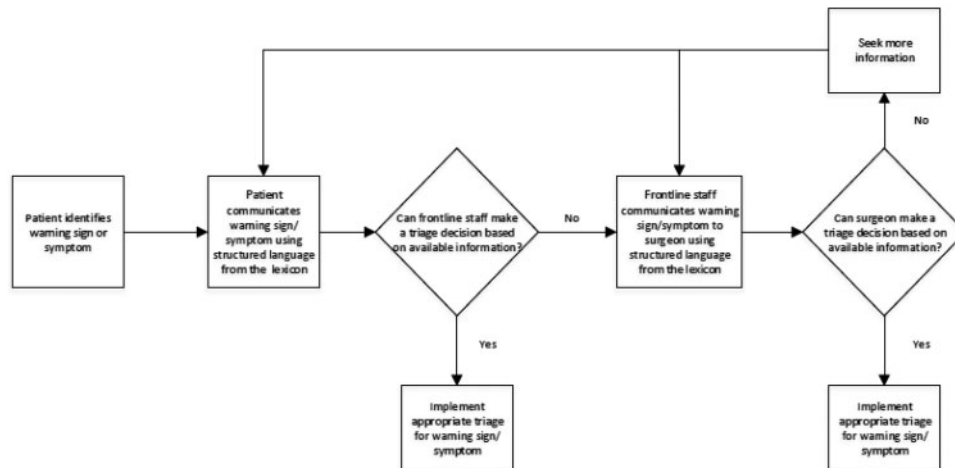


Figure 4. Postoperative triage using the colorectal surgery warning signs lexicon.

perts. The structure and content of this patient-centered version was then evaluated for usability by patients who recently underwent elective colorectal surgery. Cognitive interviews demonstrated that our discharge instructions were clear and usable for patients during the critical first month following surgery. The usefulness of these discharge instructions lies in their potential to trigger awareness and facilitate communication between patients and their clinicians to potentially mitigate common post-surgical complications.

Theoretical foundation

Our discharge instructions rely on a lexicon (ie, simple terms used to communicate complex phenomena) to inform communication between patients and their clinical teams. The findings of this study suggest that patients and caregivers can make sense of the meaning and clinical usefulness of simple terms that describe warning signs and symptoms signaling a potential postoperative complication.¹⁹ Furthermore, patients grasped that different terms signified different levels of urgency for action (ie, an urgency heuristic using commonly understood green, yellow, and red signals). This sense-making lexicon was easily understood as a “warning signs” framework that provides clear instructions to patients on when to act.¹⁹ Breakdowns in communication between patients and providers are commonly associated with preventable readmissions.²⁰ In qualitative studies, patients and caregivers often express frustration with their attempts to obtain appropriate medical triage for post-discharge problems;^{21,22} however, the available literature has not addressed ways to improve communication between patients and the health care system after discharge.⁸ The lexicon developed in this study offers an important step forward by providing patients with an understandable list of clinical prompts that are patient-centered and actionable, and clearly communicate medical problems that have meaning for patients and clinicians that can potentially extend beyond colorectal surgery.¹⁹

The design of these warning signs is grounded in the naturalistic decision-making processes of experts.²³ This literature finds that experts (eg, surgical nurse practitioners) often act intuitively using a recognition model that takes into account the specific environment (follow-up after colorectal surgery), relevant cues (wound is red and patient has a fever), expectations about what those cues mean (likely surgical site infection), and a course of action to address the issue (schedule immediate appointment). To make appropriate postoperative triage decisions, front-line clinicians (eg, nurses working at a 24 h

nursing help line) and surgical experts must first obtain information from patients to identify the environment and relevant cues (Figure 4). Insufficient information transfer between patients and providers may lead to significant delays in medical care as additional information is sought. Delays impact the health care system’s ability to intervene in postoperative problems in the outpatient setting. Patients and their caregivers can be activated regarding the concerns that expert surgeons use to triage postoperative care with only modest training at the time of discharge, using tools integrated into patient health portals, such as our discharge warnings, to reinforce this training. Clear communication is an important skill for effective teams, and improving team communication features prominently in successful training programs in health care.^{24,25}

The current study has limitations. Usability testing was performed with a small number of veteran patients drawn from a single health system whose perspectives may not apply to other settings. While this important subpopulation (older, comorbid men) is often linked to readmission following colorectal surgery,⁶ additional validation studies with a broader sample (gender, race, socioeconomic and insurance status, etc.) are needed to confirm the usability of this warning signs lexicon and its effectiveness in reducing readmissions.

Clinical implications

The findings of this study suggest that patient-centered discharge instructions can be easily understood and integrated into a warning signs lexicon for patients following elective colorectal surgery. The structure and content of discharge warnings are critical in activating patients to monitor their health and communicate with clinicians whenever warning signs of complications are present. Patients can be given these warning signs as part of discharge instructions generated from electronic medical records and trained on how to report them to their clinicians. Future studies should measure differences in patient understanding, frequency of communication using the specific language of the discharge warnings, and ultimately changes in emergency room or hospital admissions among those receiving instructions with and without this specific warning signs lexicon.

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DISCLAIMER

The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs, the United States government, or other affiliated institutions.

COMPETING INTEREST

The authors have no competing interests to declare.

CONTRIBUTIONS

ADN: obtaining funding; data acquisition, analysis, interpretation; drafting work; final approval; agreement to be accountable for all aspects of the work. MJH: data analysis and interpretation, drafting work, final approval, and agreement to be accountable for the work. LTL: data analysis and interpretation, revising work for important intellectual content, final approval, and agreement to be accountable for the work. MKP-O: data analysis and interpretation, revising work for important intellectual content, final approval, and agreement to be accountable for the work. BC: data acquisition, analysis and interpretation; revising work for important intellectual content; final approval; and agreement to be accountable for the work. WLM: data analysis and interpretation, revising work for important intellectual content, final approval, and agreement to be accountable for the work. LIH: data acquisition, analysis and interpretation; revising work for important intellectual content; final approval; and agreement to be accountable for the work. DAA: data interpretation, revising work for important intellectual content, final approval, agreement to be accountable for the work. BWT: data analysis and interpretation, revising work for important intellectual content, final approval, and agreement to be accountable for the work. DHB: obtaining funding, data interpretation, revising work for important intellectual content, final approval, and agreement to be accountable for the work.

REFERENCES

1. Jack BW, Chetty VK, Anthony D, *et al.* A reengineered hospital discharge program to decrease rehospitalization: a randomized trial. *Ann Int Med.* 2009;150(3):178–87.
2. Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. *Arch Intern Med.* 2006;166(17):1822–8.
3. Dharmarajan K, Hsieh AF, Lin Z, *et al.* Diagnoses and timing of 30-day readmissions after hospitalization for heart failure, acute myocardial infarction, or pneumonia. *JAMA.* 2013;309(4):355–63.
4. Merkow RP, Ju MH, Chung JW, *et al.* Underlying reasons associated with hospital readmission following surgery in the United States. *JAMA.* 2015;313(5):483–95.
5. Hinami K, Bilimoria KY, Kallas PG, Simons YM, Christensen NP, Williams MV. Patient experiences after hospitalizations for elective surgery. *Am J Surg.* 2014;207(6):855–62.
6. Li LT, Mills WL, White DL, *et al.* Causes and prevalence of unplanned readmissions after colorectal surgery: a systematic review and meta-analysis. *J Am Geriatr Soc.* 2013;61(7):1175–81.
7. Kable A, Gibberd R, Spigelman A. Complications after discharge for surgical patients. *ANZ J Surg.* 2004;74(3):92–97.
8. Horstman MJ, Stewart DE, Naik AD. Improving patients' post-discharge communication: making every word count. *Circulation.* 2014;130(13):1091–94.
9. Li LT, Mills WL, Gutierrez AM, Herman LI, Berger DH, Naik AD. A patient-centered early warning system to prevent readmission after colorectal surgery: a national consensus using the Delphi method. *J Am College Surgeons.* 2013;216(2):210–16.
10. Roundtable on Health Literacy. Facilitating Patient Understanding of Discharge Instructions: Workshop Summary. Washington, DC: National Academies Press; 2014.
11. Brown T. Design thinking. *Harv Bus Rev.* 2008;86(6):84–92, 141.
12. Paasche-Orlow MK, Taylor HA, Brancati FL. Readability standards for informed-consent forms as compared with actual readability. *New Engl J Med.* 2003;348(8):721–26.
13. Kelly PA, Haidet P. Physician overestimation of patient literacy: a potential source of health care disparities. *Patient Educ Couns.* 2007;66(1):119–22.
14. US Department of Health and Human Services. *Research-Based Web Design & Usability Guidelines, enlarged/expanded edition.* Washington, DC: US Government Printing Office; 2006.
15. Spencer D. *Card Sorting: Designing Usable Categories.* Brooklyn, NY: Rosenfield Media; 2009.
16. Wood J, Wood L. Card sorting: current practices and beyond. *J Usability Stud.* 2008;4(1):1–6.
17. Gosbee JW, Gosbee LL. *Using human factors engineering to improve patient safety.* Oakbrook Terrace, IL: Joint Commission Resources; 2005.
18. Corry MD, Frick TW, Hansen L. User-centered design and usability testing of a web site: An illustrative case study. *Educ Technol Res Dev.* 1997;45(4):65–76.
19. Klein G, Moon B, Hoffman RR. Making sense of sense-making 2: a macrocognitive model. *IEEE Intell Syst.* 2006;21(5):88–92.
20. Auerbach AD, Kripalani S, Vasilevskis EE, *et al.* Preventability and Causes of Readmissions in a National Cohort of General Medicine Patients. *JAMA Intern Med.* 2016;176(4):484–93.
21. Cain CH, Neuwirth E, Bellows J, Zuber C, Green J. Patient experiences of transitioning from hospital to home: an ethnographic quality improvement project. *J Hosp Med.* 2012;7(5):382–87.
22. Kangovi S, Barg FK, Carter T, *et al.* Challenges faced by patients with low socioeconomic status during the post-hospital transition. *J Gen Intern Med.* 2014;29(2):283–89.
23. Klein G. Naturalistic decision making. *Hum Factors.* 2008;50(3):456–60.
24. Baker DP, Salas E, King H, Battles J, Barach P. The role of teamwork in the professional education of physicians: current status and assessment recommendations. *Jt Comm J Qual Patient Saf.* 2005;31(4):185–202.
25. Weaver SJ, Dy SM, Rosen MA. Team-training in healthcare: a narrative synthesis of the literature. *BMJ Qual Saf.* 2014;23(5):359–72.