

# Reducing Error in the Emergency Department: A Call for Standardization of the Sign-out Process

Kapil R. Dhingra, MD, MBA, Andrew Elms, MD, Cheri Hobgood, MD

From the University of California, Davis School of Medicine, Department of Emergency Medicine, Sacramento, CA (Dhingra, Elms); and the University of North Carolina School of Medicine, Department of Emergency Medicine, Chapel Hill, NC (Hobgood).

0196-0644/\$-see front matter

Copyright © 2010 by the American College of Emergency Physicians.

doi:10.1016/j.annemergmed.2010.02.004

[Ann Emerg Med. 2010;56:637-642.]

## INTRODUCTION

Since the increased recognition of medical error in the late 1990s, the medical profession has made significant efforts to eliminate both systemic and human error.<sup>1</sup> As a result, many strategies have been implemented to reduce and eliminate error. These include national recommendations to limit resident work hours<sup>2</sup> and encourage clear communication between providers, especially concerning the handoff of care.<sup>3</sup> The transition of care has become a focus of error reduction because The Joint Commission (TJC) has found that 70% of all sentinel medical error events arise from communication breakdowns and 50% of these errors occur during the handoff of care.<sup>4</sup> The emergency department (ED) is no exception. The simultaneous management of multiple ill patients, practitioner shift work, limited knowledge of patients' preexisting medical conditions, high levels of diagnostic uncertainty, and high decision density<sup>5</sup> make ED transfer of care especially vulnerable to error. Initial research and intervention efforts have focused on the transfer of care to the inpatient setting, with 29% of respondents in one study reporting adverse events occurring after transfer of patients from the ED to inpatient units.<sup>6</sup>

There has been increasing focus on the sign-out or transfer of care among emergency medicine providers because the American College of Emergency Physicians Section of Quality Improvement and Patient Safety has recently published a position article emphasizing the hazards involved in the sign-out process.<sup>7</sup> Improvements in the sign-out process have the possibility of providing substantial advances in patient care and mitigating medicolegal risk. Standardization of this sign-out process provides a means for ensuring consistent high-quality sign-out.

TJC has published specific recommendations on physician sign-out, including the need for standardization as part of the 2008 National Patient Safety Goals.<sup>8</sup> Specifically, requirement (NPSG.02.05.01) addresses the handoff of patient care by recommending that a standardized process involving certain elements be implemented.<sup>9</sup> Standardization of the sign-out process involves 2-way, open, and concise communication, teamwork, and additional strategies to avoid error. This

standardized process and the elements to be included have been the subject of discussion and research by inpatient medical disciplines within resident training and nursing;<sup>10-13</sup> however, implementation in the ED setting has not yet been investigated to formulate best practices.<sup>14</sup>

Standardized sign-out procedures have been effective at reducing error in other high-risk arenas, including aviation, military, and the Coast Guard as part of crew resource management.<sup>15,16</sup> Crew resource management, as defined by the Federal Aviation Administration, involves the use of all human, informational, and equipment resources toward the goal of safe and efficient flight. Implementation of such a standardized sign-out would provide a foundation for new research endeavors and change the culture of sign-out, which would in turn spur reduction in human and system error.<sup>17</sup>

To implement standardization of sign-out, emergency medicine must focus education and research on this topic. Resident physicians are an important focus of this change because they likely play a key role with any initiative to produce behavioral and cultural change within the specialty. The importance of sign-out is not a new idea in resident education, but current training is highly variable. Sinha et al<sup>17</sup> surveyed a variety of emergency medicine residency programs to assess current sign-out practices. This survey of emergency medicine residency programs demonstrated that 75% had no formal didactic training and 89.5% had no written policy about sign-out.<sup>17</sup> The need for change as evidenced by these findings is echoed by both residency programs and policymakers.<sup>9,17</sup>

Given the importance of error reduction, a unique standardized procedure needs to be developed for both practicing physicians and trainees within emergency medicine residency programs.<sup>18</sup> In this article, we outline the elements, content, and methods needed to ensure a complete sign-out process for practicing physicians and highlight the importance of education and widespread implementation of effective sign-out methods within emergency medicine residency programs.

## ELEMENTS OF A STANDARDIZED ED SIGN-OUT

TJC's recommendations act as a starting point by including elements that can be applied to a sign-out process that focus on (1) content of sign-out, (2) communication techniques, (3)

**Table.** Elements of a standardized ED sign-out.

Content of Sign-out	Introduction of a Checklist
Communication techniques	SBAR, repeat-back, adaptation of current electronic formats
Environmental controls	Reduction in interruptions through communication with nursing and other ancillary staff
Team-based training	Team training exercises based on the MedTeams Project
Education	Didactic teaching and team-building exercises

team-based recommendations, and (4) patient reassessment (Table). Currently, the application of these elements is informal and not consistent between shifts, physicians, or departments. The net result is a process that is highly variable in its content and effectiveness of information transfer because of individual preferences, unique practice styles, and individual opinions about operational standards.<sup>6,14</sup> Adams and Bohan<sup>19</sup> observed that ED systems have not been designed to systemically eliminate error. Redesign of these systems components, such as creating a standardized sign-out, must focus on the multifactorial nature of error and acknowledge human factors, operational procedures, team coordination, and care delivery systems to be an effective error reduction strategy.

## CONTENT OF SIGN-OUT

Sign-out should include the patient's relevant medical and surgical history, patient course with current condition, studies obtained or pending that will affect patient care, suspected diagnosis, and anticipated disposition. The content should include expectations of the near future, managing potential deviation from the plan, and current reliability of the current working diagnosis or other information.<sup>20</sup> Although current sign-out includes some or all of these elements, there needs to be an emphasis on the standardization of this process that will serve as a checklist so that content omissions are less likely to occur.<sup>3</sup> Residents and staff should be educated about this process, and tools should be designed to ensure that this process occurs in the same manner with each sign-out. To facilitate this, a process map can be designed that takes into account the data points to be standardized, as well as the unique needs of the setting and the organization to ensure that all key elements are systematically included.<sup>10</sup> Care should also be taken not to impede the incoming clinician with a litany of information that can overwhelm or obscure the important facts and information. As in ICU settings, handoffs in the ED should adhere to Grice's maxims of quality, quantity, relevance, and clarity.<sup>21</sup> Given that, to our knowledge, no studies exist in the ED that specifically assess content of sign-out and its effect on error, research needs to be conducted to evaluate specific interventions to assess effectiveness of each element.

## COMMUNICATION TECHNIQUES

Communication techniques should include formats on how to ensure that information has been reliably exchanged without

misunderstanding. Situation, background, assessment, recommendation (SBAR) and repeat-back techniques are designed to communicate content for other occupations.<sup>22</sup> Initially developed as a communication tool to reduce communication errors, SBAR provides one structure to communicate sign-out. The situation and background correspond to the history of present illness and relevant history, respectively, whereas the assessment and recommendation correspond to the working diagnosis, pending studies, plan, and disposition. One study assessed this technique and its implementation in the ED<sup>23</sup> and showed that implementation was possible but did not assess its effect on error reduction.

Repeat-back techniques provide a checkpoint to ensure that the information received by the incoming provider is accurate. In this technique, the accepting provider repeats back the plan of care to the outgoing provider, who confirms its accuracy. TJC specifically references both communication techniques and their effectiveness in improved communication and enhanced patient safety, with improvement in all areas of communication.<sup>24,25</sup> These techniques have proven effective in other arenas outside of medicine, such as the military.<sup>26</sup> These techniques also provide an opportunity for the incoming physician to ask questions and clarify content, providing a key aspect of effective communication techniques. The importance of avoiding unidirectional flow of information is key. Communication should always be bidirectional, as echoed by Behara et al.<sup>20</sup> Few residents and emergency physicians are probably familiar with these official terms and techniques, which outline important features of effective communication.

Although these techniques focus on verbal communication, written or electronic formats of communication are equally important for transfer of information. TJC also requires that written or electronic information be included in the sign-out process, which allows the incoming physician to have documentation of plans, pertinent history, physical examination findings, and laboratory and imaging data while taking over the care of multiple patients. The written or electronic format also acts as a central repository of information, allowing all staff access to the most recent information. The introduction of this element in the ED is an evolving process, especially with the introduction of electronic medical records.<sup>27</sup> The Coast Guard uses computerized summary sheets at sign-out that are rapidly scanned to provide a structured overview.<sup>28</sup> This format of automated logs of up-to-date information is present throughout handoff strategies in settings with high consequence of failure, such as space shuttle mission control, nuclear power plants, railroad dispatch, and ambulance dispatch services.<sup>29</sup> This method has proven effective and could be advantageous in the ED. Although limited, some literature examining ED transfer of patient care to the inpatient setting supports mitigation of risk and reduction of adverse events through electronic or written sign-out.<sup>6</sup> In the inpatient setting, the role of computerized sign-out has been correlated with a decrease in adverse events and improved patient outcomes.<sup>30</sup> At a minimum,

documentation of patient encounters during the previous shift should be up to date and available to the incoming providers before sign-out.

Checklists of sign-out components may be another form of communication with utility in the ED setting. Gawande<sup>31</sup> and Pronovost et al<sup>32</sup> demonstrated in the Keystone Initiative that use of structured checklists as a core intervention in the ICU helped reduce catheter-related bloodstream infections by up to 66%. A study by Haynes et al<sup>33</sup> in the surgical setting showed that implementation of checklists was responsible for a 46.7% relative risk reduction in mortality in 3,955 patients. Similarly, given the complexity of practice in the ED, a sign-out checklist would ensure communication of all of the necessary information and may lead to reduction in morbidity and mortality.

Three dominant schools of thought exist about sign-out of care. Some believe that a structured paper or computerized format is essential to counteracting the vulnerability of verbal formats, whereas the second believes that the loosely structured interactive verbal handoff is superior. The third focuses on systems that enhance error detection.<sup>34</sup> Given the complexities of providing care in the ED, a combination of these strategies is ultimately needed to address error during sign-out.

Although sign-out can introduce error or allow an error to propagate, sign-out is also an opportunity to correct and catch errors. As demonstrated in many other fields, specific handoff strategies have been developed to catch and correct errors.<sup>29</sup> During National Aeronautics and Space Administration shift changes between mechanical systems personnel, more than 10% of the questions asked were specifically to detect errors.<sup>35</sup>

As for all of the above interventions, research within the ED is needed to directly judge their effectiveness, including specific methods of communication and the content needed in electronic communications. Quality improvement projects must be in place to identify recurrent themes and communication errors that result in adverse outcomes. These may be identified through malpractice claims or hospital event reporting, and the underlying cause should be specifically built into communication checklists or methods to prevent recurrence.

## ENVIRONMENT

High patient acuity, crowding, and frequent interruptions are pervasive in the ED's clinical environment. Interruptions in the ED are conservatively estimated to be as frequent as every 9 minutes for attending physicians and every 14 minutes for resident physicians.<sup>36</sup> Sign-out requires clear and open presentation of information in a succinct manner such that the frequency of interruptions does not hinder knowledge transmission. Risk increases when multitasking emergency physicians attempt to balance knowledge transmission during sign-out with other tasks. For these situations, environmental controls need to be in place to reduce distractions and prevent information gaps.

One possible strategy for dealing with some of the environmental challenges was proposed by Singer and Dean,<sup>14</sup> which includes a fixed location that ensures confidentiality and

private transfer of sensitive information free of distraction, yet accessible to nursing staff. Steps to reduce interruptions include the use of private areas, alerting ancillary staff of sign-out times, message systems to prevent interruptions, and delay of noncritical patient care and communications until after sign-out. Though patients may not be present for official sign-out, complex patients and their families should be involved in the transfer of care so that they are made aware of the plans. All too frequently, incoming staff members are surprised later in their shift by patients who are not aware of their care plan at disposition or treatment.

Other elements of an optimal environment include the presence of nursing staff, discussed below as part of the team-based approach. Nurses often have the most up-to-date information and will ultimately be carrying out much of the care plan. In addition, as observed in space shuttle mission control and emergency medical services dispatch, operators overhearing others' sign-out helps identify discrepancies, anticipate problems, and correct problems.<sup>29</sup> Given that environmental factors such as patient flow, acuity, and department layout are not easily modified, enhanced awareness of when and how the environment will contribute to error may increase physician mindfulness and facilitate the development of safeguards to reduce error.

## TEAM-BASED APPROACH

The role of teamwork and, specifically, teamwork training has been documented in multiple disciplines, including the military, aviation, and medical settings.<sup>37</sup> Although teamwork is still evolving, few would dispute the role that it plays in error reduction. This is echoed in a retrospective study of ED malpractice, which identified 54 cases of error that could have been avoided through better teamwork. On average, 8.8 teamwork failures occurred per case.<sup>38</sup> How sign-out played a role in these cases is not known. However, it does point to the need for improved teamwork because communication between team members provides a system of checks and balances to prevent errors. Physicians alone cannot be responsible for all reassessments of patients and the most up-to-date patient information. A team-based approach should emphasize interactions between all physicians, nurses, ancillary staff, and consultants, with an attempt to include all individuals needed for the most complete and up-to-date assessment of the patient at sign-out. Enhancing the capacity of physicians to function in teams by facilitating standardization of the communication process should translate to improved patient care and the ability of all team members to recognize and alert the team to errors.

Team coordination has been shown to be an effective strategy to reduce error in other fields.<sup>15,16,26</sup> This has been demonstrated in both the aviation industry, with cockpit resource management, and in the Coast Guard, with team coordination training. After implementation of teamwork training in the Coast Guard, vessel mishaps were reduced by 65%.<sup>27</sup> In the ED, teamwork failures account for a high percentage of closed claim cases and thus support the need for

improved team-based approaches in the ED.<sup>38</sup> The MedTeams Project<sup>38</sup> was implemented to develop a specific teamwork system for the ED according to the aviation industry's model to improve delivery of care and reduce error. It recommended multiple actions, including established protocols, cross-monitoring, and communication. Techniques developed here and in other teamwork studies demonstrate important constructs useful during sign-out, including mutual performance monitoring, backup behaviors, collective orientation, and closed-loop communication techniques.<sup>38</sup> Many of these constructs have already been discussed through SBAR and repeat-back techniques. Also important is the ability to monitor the effectiveness of this training and receive feedback and allow for perceived or real barriers to be addressed.<sup>37</sup> Ultimately, team training and team building produce a strong culture of safety through social engineering, whereby members of the team are able to voice their concerns about potential patient safety issues without fear of repercussion. This culture of speaking out about observed patient safety issues has been successful in the surgical setting as well,<sup>39</sup> which suggests that sign-out as a team-based process, rather than a process between 2 individuals, should reduce error and provide more complete information. We are not aware of other studies, including any in the nursing literature, that specifically examine team-based approaches in the ED.

## EDUCATION AND IMPLEMENTATION

### Need for Formal Education

The *Model of the Clinical Practice of Emergency Medicine*, published by the EM Residency Review Committee, serves as the basis for residency education.<sup>40</sup> The *Model of the Clinical Practice of Emergency Medicine* includes references to communicating "patient care information in a concise manner that facilitates quality care" and managing teams by having the ability to "interact, coordinate, educate, and supervise all members of the patient management team." The Accreditation Committee for General Medical Education, in its Outcomes Project, has defined universal medical competencies. The effective transfer of care would fall within the scope of at least 2 of these competencies: interpersonal and communication skills and systems-based practice.<sup>41</sup> Residency programs and practicing emergency physicians should therefore embrace sign-out as a formal aspect of training, continuing education, and daily practice. As described by Sinha et al,<sup>17</sup> this is not currently part of training and not echoed in current practices of most emergency medicine practitioners.

Formal resident education on sign-out might facilitate cultural change within the specialty by focusing efforts on future emergency physicians. However, efforts to seek change must engage experienced practitioners because they are leaders and educators within the specialty. Data from other highly reliable organizations such as aviation and the Coast Guard have demonstrated reduction in error through standardized sign-out.<sup>28,41</sup> We argue that formal residency training in

standardized sign-out procedures would be warranted and worthy of the attention of emergency medicine educators.

### Feasibility of Implementation

The numerous variables present at the transfer of care, including content, communication, environment, information technologies, and team interactions, are difficult to address.<sup>6</sup> For current practicing emergency physicians, there are certainly limitations to formal didactics on standardized sign-outs. Simulated scenarios and role play highlighting the pitfalls of poor sign-out would serve as a useful adjunct. Much of the educational experience must come from clinical experience in a well-designed system of structured sign-out and by observing the example of established practitioners. Therefore, the efforts and willingness of established emergency physicians to change cannot be overstated on a successful implementation of structured sign-out.

One important limitation involves ED staffing by nonemergency medicine residents who may not receive the appropriate amount of training about sign-out. There is likely to be a high degree of variability in didactics about effective sign-out. Residency education on sign-out would serve to advance the goals set forth by the *Model of the Clinical Practice of Emergency Medicine*, as well as reduce error. The leading professional organizations must step forward to provide a framework for the elements and methods of the new "standard of care" sign-out to be used for training residents. Finally, internal quality improvement projects, mortality and morbidity conferences, and research must be used to highlight the current issues and barriers in each institution and emphasize the importance of sign-out for patient safety.

Although not a perfect solution, a standardized format offers a platform to address system errors as they arise.<sup>42</sup> For example, if it was found that the omission of presenting patient medication allergies at sign-out had led to errors in medication administration, then the format of sign-out could be specifically addressed to include allergies as a specific component of sign-out. Without standardization, there is no framework to introduce systematic change or assess responses to change. In the ED, several difficulties arise with TJC's requirement of written and electronic documentation during sign-out. Creation of this documentation is time consuming, thus eliminating the feasibility of some techniques applied in inpatient settings. TJC does not clearly outline the information to be communicated in a written or electronic format. Thus, the scope of what needs to be included in the ED is open to interpretation and will require analysis to help guide the specific content of this documentation. Automated computerized sign-out summary sheets may be effective tools to address this requirement, similar to round reports available for inpatient teams. There are current programs that can access multiple components of the medical record to create a compilation of useful ED information, including vital signs, laboratory results, medication, allergies, medical history, and nursing documentation.

Although there are multiple advantages to the team-based approach, including improved communication, patient reassessment, and input from all caregivers, obstacles remain. Limitations from constrained resources, crowding, and acuity of care act as barriers that could pull team members away from sign-out to care for more acute needs. To be successful, all health care providers will need specific training to address how error plays a role in their sign-out and how individual functions affect patient care within the team. Effective models, such as the MedTeams Project, which are integrative programs involving all team members, may serve as useful templates to implement within the ED.

## CONCLUSION

There is evidence that the handoff of care within medicine is a significant source of error. Most emergency physicians are well aware of the risks of sign-out among emergency practitioners, but data about its contribution to error and patient safety are lacking. TJC, inpatient research, and data from other fields<sup>15,16,26</sup> have identified elements that, if included in a standardized sign-out process, could lead to a meaningful reduction in error in the ED. Standardizing sign-out would also allow for focused research on these critical transitions. A standardized system taught during emergency medicine residency would help residents focus on the development of best practices in this area, act as a model for current emergency physicians to use, and reduce variability during the sign-out process. In turn, this would lead to the goal of more efficient and error-free care for our patients.

doi:10.1016/j.annemergmed.2010.02.004

## REFERENCES

- Institute of Medicine. *To Err Is Human*. Washington, DC: National Academy Press; 2000.
- Gaba DM, Howard SK. Patient safety: fatigue among clinicians and the safety of patients. *N Engl J Med*. 2002;347:1249-1255.
- Arora V, Johnson J, Lovinger D, et al. Communication failures in patient sign-out and suggestions for improvement: a critical incident analysis. *Qual Saf Health Care*. 2005;14:401-407.
- Joint Commission on Accreditation of Health Care Organizations. Sentinel event statistics [announcement]. March 31, 2003. Joint Commission on Accreditation of Health Care Organizations Web site. Available at: <http://www.jointcommission.org/SentinelEvents/Statistics>. Accessed August 7, 2006.
- Croskerry P, Sinclair D. Emergency medicine: a practice prone to error. *CJEM*. 2001;3:271-276.
- Horwitz LI, Meredith T, Schurr JD, et al. Dropping the baton: a qualitative analysis of failures during the transition from emergency department to inpatient care. *Ann Emerg Med*. 2009;53:701-710.
- Cheung DS, Kelly JJ, Beach C, et al. Improving handoffs in the emergency department. *Ann Emerg Med*. 2010;55:171-180.
- Joint Commission on Accreditation of Health Care Organizations. 2008. National Patient Safety Goals. Joint Commission on Accreditation of Health Care Organizations Web site. Available at: [http://www.jointcommission.org/NR/rdonlyres/31666E86-E7F4-423E-9BE8-F05BD1CB0AA8/0/HAP\\_NPSG.pdf](http://www.jointcommission.org/NR/rdonlyres/31666E86-E7F4-423E-9BE8-F05BD1CB0AA8/0/HAP_NPSG.pdf). Accessed March 3, 2010.
- Joint Commission Resources. Hand-off Communication. National Patient Safety Goal. [http://www.jointcommission.org/AccreditationPrograms/HomeCare/Standards/09\\_FAQs/NPSG/Communication/NPSG.02.05.01/hand\\_off\\_communications.htm](http://www.jointcommission.org/AccreditationPrograms/HomeCare/Standards/09_FAQs/NPSG/Communication/NPSG.02.05.01/hand_off_communications.htm). Accessed March 2, 2010.
- Van Eaton EG, Horvath KD, Lober WB, et al. A randomized, controlled trial evaluating the impact of a computerized rounding and sign-out system on continuity of care and resident work hours. *J Am Coll Surg*. 2005;200:538-545.
- Arora V, Johnson J. A model for building a standardized hand-off protocol [review]. *Jt Comm J Qual Patient Saf*. 2006;32:646-655.
- McFetridge B, Gillespie M, Goode D, et al. An exploration of the handover process of critically ill patients between nursing staff from the emergency department and the intensive care unit. *Nurs Crit Care*. 2007;12:261-269.
- Sullivan EE. Hand-off communication. *J Perianesth Nurs*. 2007;22:275-279.
- Singer JI, Dean J. Emergency physician intershift handovers: an analysis of our transitional care. *Pediatr Emerg Care*. 2006;22:751-754.
- Helmreich RL, Merritt AC, Wilhelm JA. The evolution of crew resource management training in commercial aviation. *Int J Aviat Psychol*. 1999;9:19-32.
- Gaba DM. Simulation-based training in anesthesia crisis resource management (ACRM): a decade of experience. *Simulation Gaming*. 2001;32:175-193.
- Sinha M, Shriki J, Salness R, et al. Need for standardized sign-out in the emergency department: a survey of emergency medicine residency and pediatric emergency medicine fellowship program directors. *Acad Emerg Med*. 2007;14:192-196.
- Volpp KG, Grande D. Resident's suggestions for reducing error in teaching hospitals. *N Engl J Med*. 2003;348:851-855.
- Adams JG, Bohan JS. System contributions to error. *Acad Emerg Med*. 2000;7:1189-1193.
- Behara R, Wears RL, Perry SJ, et al. Conceptual framework for the safety of handovers. In: Henriksen K, ed. *Advances in Patient Safety*. Rockville, MD: Agency for Healthcare Research and Quality/Department of Defense; 2005:309-321.
- Brandwilt M, Nemeth C, O'Connor M, et al. Distributing cognition: ICU handoffs conform to Grice's maxims. Available at: <http://www.ctlab.org/documents/SCCMPPoster1.27.03.pdf>. Accessed March 2, 2010.
- Berwick DM. SBAR technique for communication: a situation-briefing model. Institute of Health Care Improvement Web site. Available at: <http://www.ihc.org/IHI/Topics/PatientSafety/SafetyGeneral/Tools/SBARTechniqueforCommunicationASituationalBriefingModel.htm>. Accessed January 23, 2009.
- Woodhall L, Vertacnik L, McLaughlin M. Implementation of SBAR communication technique in a tertiary center. *J Emerg Nurs*. 2008;34:314-317.
- Marini V, ed. The SBAR technique: improves communication, enhances patient safety. *Jt Comm Perspect Patient Saf*. 2005;5:1-2, 8.
- SBAR initiative to improve staff communication. *Healthcare Benchmarks Qual Improv*. 2005;12:40-41.
- Salas E, Bowers CA, Cannon-Bowers JA. Military team research: 10 years of progress. *Mil Psychol*. 1995;7:55-75.
- Hu SC, Yen DH, Kao WF. The feasibility of full computerization in the ED. *Am J Emerg Med*. 2002;20:118-121.
- Henkind SJ, Sinnett JC. Patient care, square-rigger sailing, and safety. *JAMA*. 2008;300:1691-1693.
- Patterson ES, Roth EM, Woods DD, et al. Handoff strategies in settings with high consequences for failure: lessons for health care operations. *Int J Qual Health Care*. 2004;16:125-132.

30. Petersen LA, Orav EJ, Teich JM, et al. Using computerized sign-out program to improve continuity of inpatient care and prevent adverse events. *Jt Comm J Qual Improv.* 1998;24:77-87.
31. Gawande A. The checklist. *New Yorker.* December 10, 2007. 2007;10:86-101.
32. Pronovost P, Needham D, Berenholtz S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med.* 2006;355:2725-2732.
33. Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med.* 2009;360:491-499.
34. Philibert I, Leach DC. Re-framing continuity of care for this century. *Qual Saf Health Care.* 2005;14:394-396.
35. Patterson ES, Woods DD. Shift changes, updates, and the on-call model in space shuttle mission control. Computer supported cooperative work. *J Collab Comput.* 2001;10:317-346.
36. Laxmisan A, Hakimzada F, Sayan OR. The multitasking clinician: decision-making and cognitive demand during and after team handoffs in emergency care. *Int J Med Inform.* 2007;76:801-811.
37. Baker DP, Salas E, King H, et al. The role of teamwork in the professional education of physicians: current status and assessment recommendations. *Jt Comm J Qual Patient Saf.* 2005;31:185-202.
38. Risser DT, Rice MM, Salisbury ML, et al. The potential for improved teamwork to reduce medical errors in the emergency department. The MedTeams Research Consortium. *Ann Emerg Med.* 1999;34:373-383.
39. Spencer FC. Human error in hospitals and industrial accidents: current concepts. *J Am Coll Surg.* 2000;191:410-418.
40. EM Model Review Task Force. *The Model of the Clinical Practice of Emergency Medicine.* East Lansing, MI: EM Residency Review Committee; 2007.
41. Accreditation Council for Graduate Medical Education. Common program requirements: general competencies. Accreditation Council for Graduate Medical Education Web site. Available at: <http://www.acgme.org/outcome/comp/GeneralCompetenciesStandards21307.pdf>. Accessed January 23, 2009.
42. Patterson ES. Structuring flexibility: the potential good, bad, and ugly in standardization of handovers. *Qual Saf Health Care.* 2008; 17:4-5.

**Did you know?**

You can personalize the new *Annals of Emergency Medicine* Web site to meet your individual needs.

Visit [www.annemergmed.com](http://www.annemergmed.com) today to see what else is new online!