Crit Care Nurs Q
Vol. 34, No. 2, pp. 142–149

Hospital Checklists

Transforming Evidence-Based Care and Patient Safety Protocols Into Routine Practice

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Hospital checklists are gaining momentum, particularly since the World Health Organization's Safe Surgery Saves Lives Program published results of its study in 2009, indicating that a safety checklist significantly improved surgical outcomes in hospitals across the world. The South Carolina Hospital Association, in partnership with Dr Atul Gawande, has launched a program to implement the World Health Organization Surgical Safety Checklist in every operating room in the state over the next few years. Governments, in such places as France and the Canadian province of Ontario, are also stepping in to make surgical checklists mandatory in their hospitals. Drawing on research, recent initiatives, and the company's experience in high-acuity units, this article explores the implications and challenges of implementing checklists in today's hospitals. If a checklist is to succeed as a mechanism for transforming evidence-based care and safety protocols into best and actual practice, it needs to be used consistently and durably; to achieve this, hospitals need to foster a supportive environment as well as acquire a system to monitor, measure, and manage a culture that effectively embraces checklists. **Key words:** *checklists*, *evidence-based care*, *operating room*, *patient safety*, *WHO surgical safety checklist*

"IN A COMPLEX ENVIRONMENT, experts are up against too many difficulties. The first is the fallibility of human memory and attention, especially when it comes to mundane, routine matters that are easily overlooked under the strain of more pressing events . . . A further difficulty, just as insidious, is that people can mold themselves into skipping steps even when they remember them," writes Atul Gawande in *The Checklist Manifesto,* a *New York Times* best seller in 2010.[1(p33)] Gawande is making a case for hospital implementation of checklists, a mechanism that the aviation industry has used for years to make adherence to safety standards a routine part of operations in a complex, dynamic environment. High-acuity areas like the operating room, intensive care unit (ICU), and other critical care units, where the interventions and associated technology are sophisticated and specialization among caregivers has become the norm, are no less complex and dynamic. And the complexity promises to increase on every level—clinical roles, knowledge base, and technology.

The Checklist Manifesto follows on the heels of the World Health Organization's (WHO's) Safe Surgery Saves Lives program. Drawing worldwide attention early in 2009, results of the WHO study, led by Gawande, indicated that implementing "a 19-item surgical safety checklist" was associated with a substantial reduction in morbidity and mortality; postsurgical complications in high-income countries decreased from 9.3 to 6.6%, among other findings. Since then, results from two other significant studies have further confirmed the effectiveness of checklists in reducing surgical complications.[2] In November 2010, the *New England Journal of Medicine*

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DOI: 10.1097/CNQ.0b013e31820f7467

published the results of a Netherlands study, which concluded that the total number of complications per 100 patients decreased from 27.3 to 16.7, for an absolute risk reduction of 10.6, in hospitals with a high standard of care.[3] A month earlier, published results from a Veterans Health Administration (VHA) study showed an 18% reduction in annual mortality rate among participating facilities in the training program, compared with a 7% decrease among the control group (nonparticipating facilities).[4]

Checklists provide an ideal way to comply with standards of evidence-based care and promote good communication among caregivers. As apparent from the title of the VHA study, "Association Between Implementation of a Medical Team Training Program and Surgical Mortality," good checklists are the tool, not the goal, in the scheme of improving outcomes. The study's objective was to assess the impact of team-oriented training by measuring operating room briefing and debriefing procedures on surgical outcomes; checklists were integral to these procedures. Peter Pronovost, the early pioneer of hospital checklists, describes checklists as "the vehicle for delivery" and "culture change and measurement" as the essential elements that fueled the success of his "translating research into practice" model for the surgical intensive care unit.[5(p51)] Pronovost outlines a checklist discovery process, wherein the checklist flows from eliciting clinical knowledge from caregivers. Some of the first questions asked would be the following: What is our objective? Fewer central catheter infections? Reduced surgical infections? What do the data show? Where are the problem areas? Are we working effectively as a team? Can we do better? At that point, the unit might then ask: How can we do better? Would a checklist help?

In addition to distilling clinical knowledge into a meaningful checklist, what has become clear (particularly highlighted in the case of the VHA study, which implemented extensive training and ongoing coaching for a year following implementation) is that if checklists are to be a viable tool for routine care, the environment must be supportive. Although the Surgical Safety Checklist is meant to encourage teamwork, by the same token, the effectiveness of the checklist depends on the level of collaboration that currently exists in a given environment—in other words, whether its culture supports teamwork. Without appropriate support from hospital leadership, the checklist can end up as little more than a bureaucratic interference, with items checked off by rote by one person, often as an afterthought rather than an active part of caregiving. So, how much success can we expect checklists to achieve over the long term in today's hospitals, which tend toward a hierarchical rather collaborative culture? The VHA study's senior author, former VA patient safety director, Dr James Bagian said, "I've heard surgeons say to nurses, 'Do you have an MD after your name? I didn't think so. So when you get one, I'll listen to you but until then, shut up.'"[6] Although this is perhaps an extreme example, it does point to what Pronovost refers to in *Safe Patients, Smart Hospitals (*another *New York Times* Best Seller in 2010) as the "toxic hospital culture, something that is endemic to the entire health care system"[5(p35)]; it is the very antithesis of what is required for successful checklist processes.

Although the WHO authors point out that "further study is needed to determine the precise mechanism and durability of the effect in specific settings," the prima facie evidence of measurable benefit indicates that the deployment of checklists is inevitable. The public has become insistent on the right of patients to safe outcomes, and there is a cost dimension that cannot be dismissed. Since the Institute of Medicine's "To Err is Human: Building a Safer Health System" came out in 1999, a slew of studies on the financial impact of errors and hospital-acquired infections has been done. Last October, results of a Michigan Surgical Quality Collaborative study indicated that reducing ventilator-associated pneumonia alone among 300 000 surgical patients (the goal of one of Pronovost's early

ICU checklists), could save $13 million a year.[7] The WHO program's 2.7% reduction in overall surgical complications represents $481 460 of lost annual profits for the average US hospital.[8] Costs aside, public outrage in face of inexcusable errors, such as a wrong-site surgery, and the sincere desire on the part of hospitals to eradicate adverse events, combined with the positive publicity checklists are receiving, are strong forces driving their acceptance. Checklists are making their way into hospitals, and on a broad scale at that. Since 2005, as part of the Rhode Island ICU Collaborative, all acute care hospitals in the state have signed up for a safety program that includes central-line checklists.[9] In Canada, the Ontario government will require use of and compliance with a surgical checklist as of 2011. France made a Surgical Safety Checklist mandatory for all 8000 hospitals in the country in 2010. This past fall, the South Carolina Hospital Association, in partnership with Gawande, announced a new program to implement the WHO Surgical Safety Checklist in every operating room in the state over the next few years. LiveData is collaborating with Gawande both in this initiative and in further work to expand the baseline WHO checklist into a broader and deeper set of electronic checklists, covering a variety of special situations.

As more and more hospitals and governments embrace safety checklists for the surgical suite and ICU, and checklists expand in scope and trickle down to other hospital units, another set of questions is bound to come to the fore. How do we set the stage for teamwork as a foundation for successful checklist processes? How do we fit checklists into workflow so that they can become a routine part of care? How do we ensure that checklists are being used, and used consistently? How do we ensure that they are doing what they are supposed to do, that they are effective? How do we measure success? How do we identify weaknesses in the checklist process? And how do we manage large volumes of checklists and keep them up to date?

TEAMWORK: A CULTURAL FOUNDATION FOR EFFECTIVE AND DURABLE CHECKLISTS

These kinds of questions, focused on creating an effective and durable process, are familiar to us because our hospital partners tend to be trailblazers in the field of patient safety. Using real-time data integration and display technology, LiveData patient-safety systems capture, synchronize, and display computerized information from disparate sources in step with team workflow. Our customers have tackled the challenges related to creating an environment that supports teamwork and eliminating the sort of disjointed communication that leads to adverse events. Every hospital we have collaborated with is sharply focused on "changing the culture and associated broken systems to remove any barriers," as Pronovost describes one of the chief elements for ensuring effective checklists.[5(p51)] In the operating room, LiveData operating room (OR)-Dashboard (Figure 1) is considered a crucial adjunct for helping teams improve communication, achieve a high level of situational awareness, and systematize quality processes; checklists have always played an integral role in the LiveData system simply because they are the most logical format for assisting the OR team with specific quality processes like the Time Out and Debriefing. Memorial Sloan-Kettering Cancer Center, under the leadership of the hospital's then Vice President of the Department of Surgery, David Jaques, and Director of Perioperative Nursing, Aileen Killen, deployed OR-Dashboard in all 21 rooms of its new operating suite in 2006, and over the past 4 years, the system has been refined and expanded to other operating rooms. "We work as teams that value respect, cooperation, and communication," Killen listed among the objectives for their operating suites. Other objectives included "maximize knowledge and skill to achieve exceptional and innovative care"; anticipate and prepare for possibilities"; and "provide an efficient, proficient, professional and safe environment of care."[10]

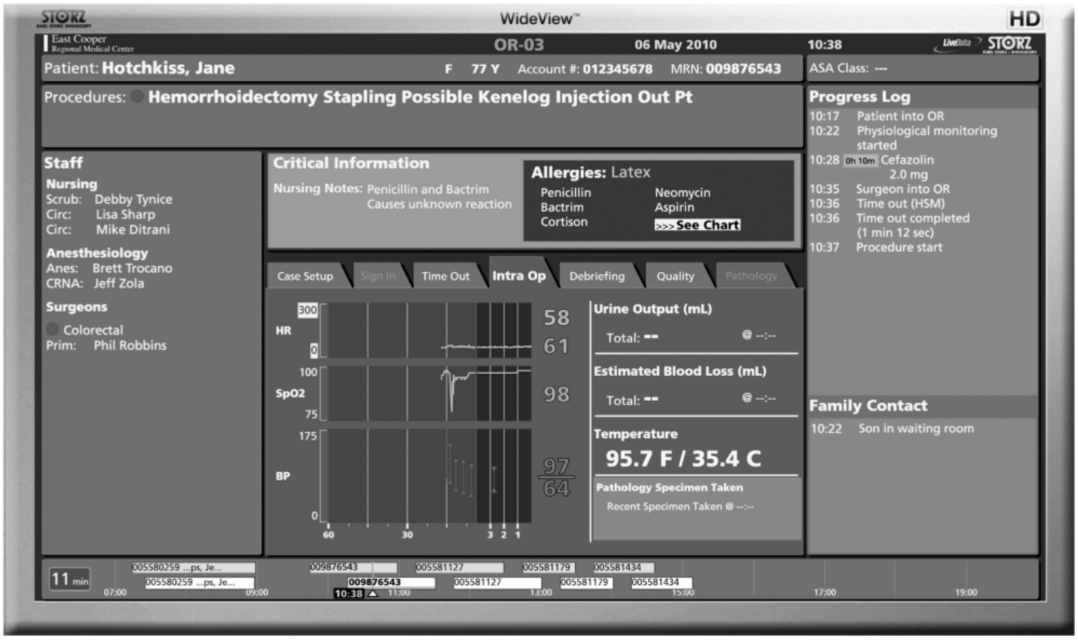

Figure 1. LiveData OR-Dashboard: the display as it appears during the intraoperative phase of the surgical case. Copyright, LiveData.

Interestingly, initial feedback from Killen's staff indicated that displaying the names and roles of everyone in the operating room was among the most appreciated features of OR-Dashboard. This feedback provides insight into why the WHO Surgical Safety Checklist includes introduction of team members to one another and sheds light on one of the greatest impediments to collaboration in the OR. Surgical social/political structure is complex largely because of the wide range of clinicians participating in a case, who often do not know each other's names and who often also wear masks, which further obscures identity. Furthermore, while traditional hospital culture is characterized as hierarchical in general, the operating room has a reputation for being extreme in this regard. Typically, nurses know surgeons' names but surgeons do not know nurses' names. "I have worked for twenty years with him, I have bent over backward to make this place work and his life better, and he does not even know my name," a distressed nurse was once heard to remark.[5(p83)] On the other hand, we know of several surgeons who, attempting to loosen barriers and promote collaboration, have been frustrated by the reluctance of nurses to call them by their first names. The elements of teamwork—shared vision, effective coordination of effort, and good communication—have been shown to have the greatest impact on patient care during surgery.[11] The WHO Surgical Safety Checklist item for team introductions is designed to "give people a chance to say something at the start [because this seems] to activate their sense of participation and responsibility and their willingness to speak up" throughout the rest of the case."[1(p78)]

MONITORING AND MEASUREMENT: ACCOUNTABILITY IS KEY TO SUCCESSFUL CHECKLISTS

East Cooper Medical Center in South Carolina is another hospital ahead of the curve when it comes to patient safety, teamwork, and checklists. The hospital is covering

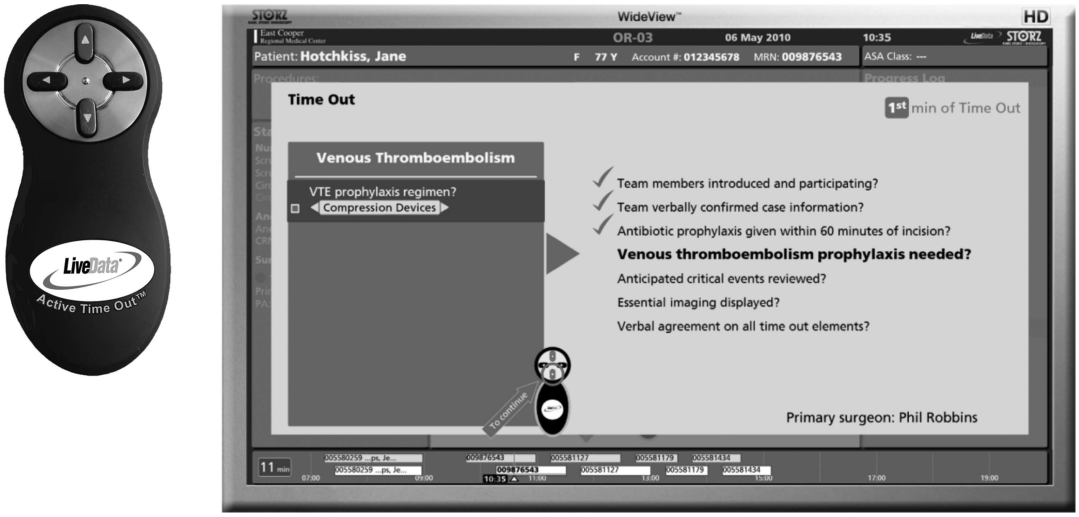

Figure 2. The Active Time Out display and the clicker (left). The Time Out checklist is displayed sequentially to ensure no items are skipped over or omitted.

all angles related to effective, consistent, and durable checklist processes: ease and convenience,[12–15] performance monitoring and feedback,[16] measurement, and managing change control. In collaboration with our development partner KARL STORZ Endoscopy-America, East Cooper implemented OR-Dashboard with Active Time Out in all its operating rooms in 2010. Active Time Out (Figure 2) is an electronic checklist method that systematizes the checklist process so that it can achieve consistency and durability—or in other words, become a routine part of care. Automated to align with surgical workflow, Active Time Out displays standardized Surgical Safety Checklist checklists (WHO, Joint Commission, for example) and ensures that the process itself conforms to protocols, such as the Joint Commission mandate for participation by the entire OR team. Importantly, through its design for ease and convenience, Active Time Out includes all relevant patient and case-specific information with each checklist item, and comes with an interactive clicker. These features enable the circulating nurse to review items and document responses at the point of care, alongside the rest of the team and without the interruptions that come from having to search for information that is missing or located elsewhere.

Because it is electronic and functions in real time, the LiveData system provides an arsenal of accurate information for not only tracking overall compliance, but also for pinpointing problem areas and monitoring the quality of the checklist process. Pronovost lists "measuring results [to gauge] the checklist's efficacy and provide feedback to make whatever changes necessary to improve it" as an essential ingredient to success.[5(p51)] As Manoj Jain, infectious disease specialist, succinctly put it, "We can improve only what we measure."[17] Yet, without technology, ongoing data collection is difficult, and comprehensive monitoring of the process itself is virtually impossible for most hospitals, unless they can afford to constantly deploy personnel for observation. Even if a hospital can afford some degree of manual labor for this monitoring function, results can be misleading. In the WHO study, the authors question the potential impact the Hawthorne effect can have on performance: "an improvement in performance due to subjects' knowledge of being observed."[2] How can a hospital know that checklists are being consistently employed as intended, once the observer is no longer in the room?

A database of comprehensive information, including timestamps of when checklist items were confirmed and when checklists occurred for all cases, can provide this information. The system uses the data to track whether checklist responses stem from a team effort, when items were reviewed, and whether they were actively reviewed or checked off by rote. Integral to OR-Dashboard is its repository of real-time data from the surgical case, which include Time Out checklist responses along with all other displayed case information, such as the names and roles of everyone in the room at each point in time. Data have a great advantage over observation in that it is impersonal, which is one of the principles behind using the LiveData system as a team adjunct. If, as Gawande said, "the checklist forces a real flattening of the hierarchy,"[18] data can be considered the great equalizer. Display of real-time information on OR-Dashboard, for example, allows a nurse to point to a warning that administration of prophylactic antibiotic has not been documented and ask the anesthesiologist whether it has in fact been administered. Similarly, archived data allow administrators to eliminate the blame factor associated with observing and singling out noncompliant staff. At East Cooper, in the spirit of collaboration, the OR manager can simply provide feedback on performance to the entire team by presenting a simple graph with compliance by the circulating nurse (Figure 3). She can then augment the feedback by showing hospital reimbursement benefits resulting from compliance. Communication therefore remains tied to the theme of teamwork and personal accountability rather than "Big Brother."

MANAGING CHANGE IN A DYNAMIC ENVIRONMENT: UP-TO-DATE CHECKLISTS

If a process is to become part of routine care, it has to be poised to handle modifications. Hospital care is inherently dynamic, not only in the sense of day-to-day activity, but with regard to its continuously improving base of knowledge and technology. We can expect that checklists will follow suit. Ideally, the most time-consuming tasks for hospital staff involve determining the elements of their checklist and working on improvements, not belaboring their implementation. During installation of OR-Dashboard at East Cooper, the hospital decided it wished to add glucose data to its Time Out checklist. This was accomplished within 15 minutes.

The need for flexibility is particularly true of checklists encapsulating standards for evidence-based care, which continue to expand and improve. Checklists for central catheter procedures to prevent bloodstream infections, which Pronovost helped implement in hospitals across Michigan and Rhode Island, can be considered what the aviation industry calls "normal" checklists, as they are mainly "used to confirm key steps after completion of memorized normal procedures."[21] Aviation has another set of checklists, termed "nonnormal," that is mostly used to guide the crew in real time through nonmemorized procedures, "such as a hydraulic system failure, or

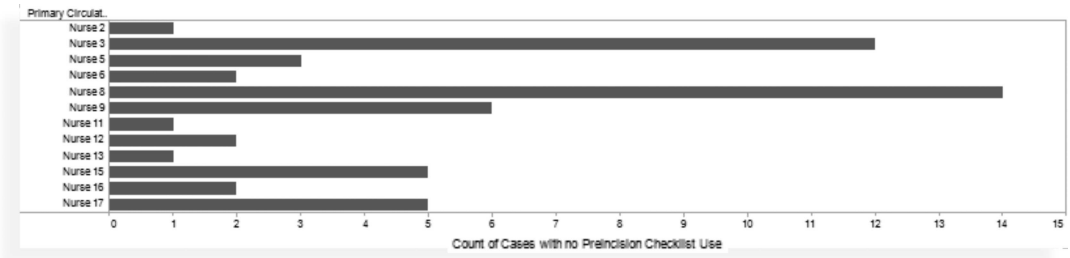

Figure 3. A graph showing Time Out compliance by primary circulating nurse.

nonnormal operating contexts, such as ditching the airplane at sea."[19] A similar set of checklists to meet a growing knowledge base is conceivable for high-acuity units like the OR, ICU, and emergency department. However, it is difficult to imagine groups of organizational checklists, conceivably requiring regular updates, without the advantages of technology. Boeing issues more than 100 new or revised checklists each year.[1(p85)] In the cockpit, pilots typically use electronic checklists displayed on the center console.[19] Convenience aside, results of a Boeing study indicate that electronic checklists eliminated the chief hazards, skipping or omitting an item, associated with using paper checklists.[19] LiveData's system brings this same convenience, updates, and accuracy to the hospital.

CONCLUSION

Technology available today takes the checklist process to an entirely new level. Electronic checklists help eliminate disjointed communication in hospitals by playing the role of coordinator, drawing together information from the various independent activities of clinicians and departments; and technology makes checklists easy to perform, monitor, measure, and update. Although critics have been swift to point out that the operating room is not a cockpit, that clinicians are taking care of patients (with all the ambiguity that entails) not machines, a look at the vast array of sophisticated technology used in today's operating rooms and intensive care units gives one pause for thought. Our hospitals have become one of those environments described by Gawande in which the "volume and complexity of what we know have exceeded our ability to deliver its benefits correctly, safely, or reliably."[1(p19)] Studies have now clearly shown that in the complex, dynamic environment of the hospital, notably high-acuity units like the OR and the ICU, checklists can reduce errors and save lives. With the right set of factors in place—a culture supportive of collaboration, well-identified objectives, and the capacity to monitor/measure success and handle change—checklists are an ideal mechanism for incorporating safety interventions into the daily routine of caregiving.

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