Checklists change communication about key elements of patient care

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BACKGROUND: Combat casualty care is distributed across professions and echelons of care. Communication within it is fragmented, inconsistent, and prone to failure. Daily checklists used during intensive care unit (ICU) rounds have been shown to improve compliance with evidence-based practices, enhance communication, promote consistency of care, and improve outcomes. Checklists are criticized because it is difficult to establish a causal link between them and their effect on outcomes. We investigated how checklists used during ICU rounds affect communication.

METHODS: We conducted this project in two military ICUs (burn and surgical/trauma). Checklists contained up to 21 questions grouped according to patient population. We recorded which checklist items were discussed during rounds before and after implementation of a "must address" checklist and compared the frequency of discussing items before checklist prompting.

RESULTS: Patient discussions addressed more checklist items before prompting at the end of the 2-week evaluation compared with the 2-week preimplementation period (surgical trauma ICU, 36% vs. 77%, $p < 0.0001$; burn ICU, 47% vs. 72 %, $p < 0.001$). Most items were addressed more frequently in both ICUs after implementation. Key items such as central line removal, reduction of laboratory testing, medication reconciliation, medication interactions, bowel movements, sedation holidays, breathing trials, and lung protective ventilation showed significant improvements.

CONCLUSION: Checklists modify communication patterns. Improved communication facilitated by checklists may be one mechanism behind their effectiveness. Checklists are powerful tools that can rapidly alter patient care delivery. Implementing checklists could facilitate the rapid dissemination of clinical practice changes, improve communication between echelons of care and between individuals involved in patient care, and reduce missed information. (*J Trauma Acute Care Surg*. 2012;73: S75–S82. Copyright © 2012 by Lippincott Williams & Wilkins)

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Checklists are used routinely in nearly all professions. They are so ubiquitous that their presence is often overlooked by professionals who work with and around them. People use checklists for a variety of purposes. Frequently, we cite the airline industry and the profound effect that checklists have made on airline safety,[1] but other professions also use checklists readily, including construction,[2] manufacturing,[1] and the military. Indeed, many professionals use checklists to provide guidance and specific reminders during high-risk activities. Although numerous examples of checklists exist in medicine, including standard order sets, research protocols, and published guidelines, few physicians perceive these tools as "checklists." Unfortunately, checklists remain underused in the medical field.[3] The reasons for this underutilization are likely multifactorial. Concerns about the time it takes to complete checklists, the practicality of instituting a "boilerplate" checklist when every patient has individual needs, and sustaining the discipline necessary to routinely complete checklists hinder their acceptance. Furthermore, physician perceptions about becoming dependent on checklists may challenge professional identity and raise concerns about decision making in the absence of the right checklist.[1]

Recently, however, studies in the health care setting have demonstrated that using checklists can improve patient outcomes and may affect a variety of important aspects of quality health care delivery. In the intensive care unit (ICU) environment, checklists improve compliance with evidence-based practices, such as central line and mechanical ventilation bundles, and lead to decreased infection rates.[4–7] They have also been applied to the use of indwelling Foley catheters and resulted in decreased duration of use as well as related urinary tract infections.[8] In addition to improving patient care, checklists have been shown to enhance communication between nurses and physicians and to promote consistency of care. These changes have translated into shortened ICU stays.[9–11] Ultimately, the result of the application of checklists in clinical medicine has improved patient outcomes, including fewer surgical complications, lower mortality rates, and reduced length of stay.[12,13]

More recently, Dr Ely proposed that checklists may reduce diagnostic errors by providing assistance with a differential diagnosis and avoiding common causes of diagnostic errors,[14] and Dr Duff has suggested that checklists reduce complications in the field of obstetrics during cesarean deliveries.[15] Studies of medical error and handoffs suggest that

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Old STICU Checklist		
	Question	**Trigger**
Neuro	**If on continuous sedation, was a Spontaneous Awakening Trial done in the last 24 hrs? (Enter time in comment box)**	**SAT**
	Are day-night cycles being adhered to right now?	Day-Night
CV	If the patient is unable to c/o chest, pain was an ECG reviewed during rounds?	ECG
Pulmonary	Is the patient on a ventilator Right Now?	Vent
	Does the patient have a tracheostomy??	**Trach**
	If the patient is on a ventilator mode that is not CPAP alone and has a mean airway pressure less than 15, was a Spontaneous Breathing Trial performed in the last 24 hrs? if so, when and what were the results?	**SBT**
	Is the Head of the bed >30 degrees Right Now?	HOB
	Has the patient been appropriately mobilized in the last 24hrs?	Mobility
	Are there orders for the current ventilator settings?	**Vent Order**
	If on mechanical ventilation does pt have an order for Chlorhexadine oral care BID today.	CHG
Renal	The patient's goal I/O today is	IOs
GI	**When was the patient's last bowel movement? (in days)**	**BM**
Heme	If the patient received PRBCs in the last 24hrs, was there a clear indication (bleeding, ischemia, OR)? (Enter comment)	PRBCs
MS	Does pt have any skin integrity issues and/or pressure ulcers today?	Skin
T/L/D	Does the patient have a central line? (If yes, Day#)	CVC
	Can any central lines or other devices be removed? If so, which one(s)? CVC Arterial Line Foley Other	**Line Removal**
Prophylaxis	**Is the patient receiving medical DVT prophylaxis at the start of rounds? If no, is that appropriate and do they have SCDs or other indicated DVT prophylaxis?**	**DVT**
	Is the patient receiving appropriate PUD prophylaxis at start of rounds?	PUD
	Can any medications be discontinued today?	**Med Rec**
Miscellaneous	Does the patient require continued ICU level Care?	ICU
	Is the bedside nurse on rounds (present at start and end)?	RN
	If the patient is on a ventilator or has significant pulmonary issues, is RT present on rounds?	RT
	Has anyone STOPPED someone from touching the patient without cleaning their hands first? If so, record the offenders name:	Hand-washing
	Any Complications? VAP CLABSI Med Error Failure to Commo/Complete (Enter in comment box)	Comp-lications
	Is the patient a candidate for any current research protocols?	Research
	Enter the name of the attending running rounds for this patient:	Attending

New STICU Checklist		
	Question	**Trigger**
All Patients	**Can any medications be discontinued today?**	**Med Rec**
	Are there any important drug-drug interactions between the medications this patient is currently receiving?	Rx Interactions
	Does the laboratory evaluation need to be changed for this patient?	Labs
	Did the patient sleep for more than 4 hrs last night?	Sleep
	When was this patient's last bowel movement? (in days)	**BM**
	If this patient has a central line, can it be removed today?	**CVC**
	Is the patient receiving medical DVT prophylaxis at the start of rounds? If no, is that appropriate and do they have SCDs or other indicated DVT prophylaxis?	**DVT**
	How much of this patient's caloric goal did he/she intake in the past 24 hrs? (%)	Calories
	Were all team members' (RN, MD, RT, Pharm, Nutrition, etc.) concerns adequately addressed?	Concerns
Ventilator	What is the patient's Oxygenation Index?	Oxygenation
	If the patient is on a ventilator, what is the patient's tidal volume in cc/kg of ideal body weight?	Vt/kg
	If on continuous sedation, was an Awakening Trial performed in the last 24 hrs? If so, when?_____	**SAT**
	If the patient is on a ventilator mode that is not CPAP alone and has a mean airway pressure less than 15, was a Spontaneous Breathing Trial Performed in the last 24hrs? If so, when and what were the results?	**SBT**
	Is there an order for the patient's current ventilator settings right now?	**Vent Order**
	Does the patient have a tracheostomy?	**Trach**
TBI	Was the patient's Tmax less than 99.5 for the past 24 hours?	Tmax
	Was the patient's lowest CPP ever less than 60 in the past 24 hours?	CPP
	Was the patient's lowest blood sugar ever less than 80 in the past 24 hours?	Glucose
	Does the patient have any restriction to cerebral venous outflow?	Restriction
Sepsis	How often is the patient's lactate or ScvO2 being measured?	Lactate
	What is this patient's CVP goal?	CVP
	Has a source been identified and controlled?	Source

Figure 1. STICU checklists before and after implementation of a mandatory review checklist protocol. Items in bold appear on both checklists. Items on the old checklist were answered as ''Yes,'' ''No,'' or ''Not Applicable.'' Items on the new checklist were answered as ''Discussed before prompt'' or ''Discussed after checklist prompt.''

Old BICU Checklist

Group	Question
Neuro	Was the patient's RASS score and CAM-ICU score reported during rounds?
	Was the patient's pain control adequately addressed *during rounds*?
	If on continuous drip sedation, was a sedation holiday performed in the last 24 hours?
	Are day/night cycles adhered to Right Now?
CV	
Pulmonary	Is the patient on a ventilator Right Now?
	Was a Spontaneous Breathing Trial Performed in the last 24hrs?
	Is the Head of the bed >30 degrees Right Now?
	Is Oral Care being performed every four hours?
Renal	The patient's goal I/O today is
	Was nutrition addressed *during rounds*?
GI	Was a bowel regimen addressed *during rounds*?
	Is the patient receiving appropriate PUD prophylaxis at start of rounds?
Heme	Is the patient receiving appropriate DVT prophylaxis at start of rounds?
	Does the patient have a central line? (If yes, Day#)
ID	Can any central lines or other devices be removed? If so, which one(s)? CVC Arterial Line Foley Other
MS	Were wounds/injuries discussed/reviewed during rounds (including eyes and hands)?
	Was tube/drain output discussed during rounds?
	Are restraints ordered if needed?
Misc.	Are there orders for the current ventilator settings?
	Are there any medication changes? (if yes, see Essentris)
	Are the patient's/family's questions and concerns being addressed?

New BICU Checklist

Group	Question	Trigger
All Patients	We discussed the patient's CAM ICU?	CAM-ICU
	We discussed when the patient last had a bowel movement?	BM
	We discussed wound care orders and any hand/eye issues?	Wounds
	If a patient has a central line, we discussed removing it?	CVC
	We discussed what medications can be discontinued today?	Med Rec
	We discussed what labs can be discontinued today?	Labs
	We discussed when the patient or his/her family was last updated?	FQs
ID	If on antibiotics, we discussed duration of therapy for them?	ABX
Ventilator	We discussed our lung protective ventilation strategy?	LPV
	If on continuous sedation, we discussed when Awakening Trial was last performed?	SAT
	If the patient's mean airway pressure less than 15, we discussed his/her weaning parameters (RSBI, NIF, breathing trial tolerance)?	SBT
	Is there an order for the patient's current ventilator settings right now?	Vent Order
CRRT	We discussed the current filter life?	Filter
	We discussed the CRRT settings (indication, BFR, replacement fluid type, dose, UF)?	CRRT
	We discussed the volume goal for this patient?	I/O
Sepsis	We discussed how often the patient's lactate or ScvO2 are being measured?	Lactate
	We discussed the patient's CVP goal?	CVP
	We discussed source identification and/or control?	Source

Figure 2. BICU checklists before and after implementation of a mandatory review checklist protocol. Items in bold appear on both checklists. Items on the old checklist were answered as ''Yes,'' ''No,'' or ''Not Applicable.'' Items on the new checklist were answered as ''Discussed prior to prompt'' or ''Discussed after checklist prompt.'' Of note, the original BICU checklist did not have a ''trigger'' column.

structured communication and task completion are the foundation for patient care success.[16–19]

Although the benefits of checklists in clinical settings are apparent, many unanswered questions remain about their practicality, their effect on team dynamics and resident education, and the link between their use and actual work performed in the ICU.[20] In this project, we sought to study how checklists influence communication patterns between team members during multidisciplinary rounds (MDRs) in the ICU. We hypothesized that providers would discuss checklist items more frequently during rounds before checklist prompting after instituting a "must address" checklist. To our knowledge, this is the first study to directly measure how communication patterns change after implementing checklists.

PATIENTS AND METHODS

Our local institutional review board reviewed this project and determined that it was a process improvement project not consistent with a research study, and therefore it was exempted from further review. We conducted the project in a 20-bed surgical trauma ICU (STICU) and a 16-bed burn ICU (BICU) at a 450-bed academic military medical center. Before this project was initiated, both the STICU service and the BICU

TABLE 1. Evaluation Criteria for Designing Unit-Specific Daily Checklist

Patient Care Questions:
1) Is this question evidence based?
2) Does this question refer to a daily event for every patient? If not, is this question so important that it should NEVER be missed?
3) Does this question directly affect outcomes or complications or patient safety?
Process Improvement Questions:
1) Does this question directly relate to an ongoing process improvement project that your unit needs to collect this information on a daily basis?
2) Is this an issue that your unit feels is important that your service does not currently focus on?
3) Is the question a reportable item for accreditation/mandate that cannot be collected by other means?

service variably used unit-specific daily checklists to review a variety of patient care–related information during MDRs. MDRs in the STICU included residents from surgical, anesthesia, and emergency medicine programs, a staff physician board certified in critical care, one or two mid-level providers (nurse practitioners or physician assistants), and the patient's bedside nurse and variably included the unit charge nurse, a respiratory therapist, a nutritionist, and medical students. In addition to those providers on STICU MDR, BICU MDR always included the charge nurse, a nutritionist, a physical therapist, and a respiratory therapist and variably included a physical medicine and rehabilitation physician, a clinical nurse specialist, a burn surgeon, and medical students.

Before this project began, in the STICU, the unit-specific checklist was completed at the discretion of the attending provider during the MDR. Any team member may have completed the checklist (attending, resident, nurse, or mid-level provider). The individuals completing the checklist listened to rounds, completed checklist items during rounds, and were expected to inquire about checklist items that were not otherwise discussed or if they were unclear of an answer. If an item was discussed, the individual completing the checklist made the appropriate annotation to answer the checklist question (Fig. 1). Inquiries were typically made at the end of MDRs for a given patient before moving on to the next patient.

Before this project began, in the BICU, checklists were completed daily by the charge nurse during MDRs for all patients. The charge nurse listened to rounds, completed checklist items during rounds, and was expected to inquire about checklist items that were not otherwise discussed during rounds or if they were unclear of an answer. If an item was discussed, the charge nurse made the appropriate annotation to answer the checklist question (Fig. 2). Inquiries were typically made at the end of MDRs for a given patient before moving on to the next patient.

In this project, we created a new checklist for each ICU (Figs. 1 and 2). The new checklists remained unit specific and were evaluated according to the criteria in Table 1. Several items were present on both the new and the old checklists, and some we modified to promote a different connotation and response from team members (bold items in Figs. 1 and 2). To reduce the number of questions that needed review, we grouped items on the new checklists according to patient population, rather than by organ system.

We conducted the project in two phases (Table 2). During phase 1, a team member observed MDR and recorded what items on the new checklist were discussed during MDR. The observer did not participate in rounds, and the new checklist was not reviewed. In both units, the use of old checklists was allowed according to previous unit practice.

Phase 2 was conducted during the first 2 weeks after implementation of the new checklist and the "must address policy." We gave no specific education to the teams conducting MDR except to tell them that each applicable item (according to patient group) must be reviewed by either reading the entire question or the "trigger" for that question at the end of MDR for an individual patient. During this phase, a participating team member observed MDRs and recorded which checklist items the team discussed before the mandatory review. These items were recorded as being discussed before review. After rounds were completed for an individual patient, the observer reviewed each checklist item according to patient population by reading the checklist item or the corresponding "trigger" to

TABLE 2. Methodology: Standard Care and Project Actions Conducted Concurrently

Standard Care	Project Actions
Phase 1	
• Rounds conducted and patient care reviewed. Checklist items addressed at the discretion of the person filling out the checklist according to his or her perception of item applicability and adequacy of MDR discussion.	• Both units: project personnel observed rounds and completed new checklist according to whether new checklist items were discussed during rounds
• STICU: old checklists completed at the discretion of the attending by any member of the team during the MDR	• No prompting of new checklist items
• BICU: old checklists completed daily by the charge nurse during the MDR	
Phase 2	
• Rounds conducted	• Rounds observed and discussion of new checklist items were recorded as either "discussed before prompting" or "discussed after prompting"
• Patient care reviewed	• All checklist items reviewed by reading the "triggers" (see Figs. 1 and 2). In the STICU, this was performed by a project personnel and in the BICU by the charge nurse

TABLE 3. Results Comparing the Frequency of Discussing Checklist Items During MDRs in the ICU

STICU Frequencies, n (%)				BICU Frequencies, n (%)			
Trigger	**Phase 1**	**Phase 2**	***p***	**Trigger**	**Phase 1**	**Phase 2**	***p***
All items	534 (35.4)	416 (76.7)	<0.0001	All items	66 (47)	345 (72.2)	<0.0001
Medication reconciliation	59 (35.6)	35 (78.4)	<0.0001	CAM-ICU	—	14 (57)	NA
Medication interactions	58 (5.2)	37 (88.6)	<0.0001	Bowel movement	5 (80)	34 (88.2)	0.52
Laboratory frequency	60 (20.0)	37 (78.4)	<0.0001	Wound care	5 (80)	35 (94.3)	0.34
Sleep	48 (83.3)	36 (86.1)	0.77	Central line removal	5 (20)	34 (73.5)	0.034
Bowel movement	24 (12.5)	36 (69.4)	<0.0001	Medication reconciliation	5 (0)	34 (70.6)	0.005
Central line removal	53 (13.2)	36 (80.6)	<0.0001	Laboratory frequency	5 (20)	32 (53.1)	0.34
Deep vein thrombosis prophylaxis	53 (75.5)	37 (78.4)	0.8	Family questions	5 (0)	30 (50.0)	0.06
Calories	30 (43.3)	35 (62.9)	0.14	Antibiotics	4 (50)	21 (76.2)	0.55
Concerns	59 (35.6)	32 (71.9)	0.001	Lung-protective ventilation	5 (20)	21 (90.5)	0.005
Oxygenation index	10 (0.0)	14 (57.1)	0.006	Sedation holiday	5 (100)	17 (76.5)	0.54
Ventilation, Vt/kg	14 (28.6)	14 (35.7)	1	Breathing trial	5 (80)	15 (93.3)	0.45
Sedation holiday	14 (28.6)	14 (92.9)	0.001	Current ventilator orders	5 (0)	21 (47.6)	0.12
Breathing trial	14 (35.7)	14 (85.7)	0.02	Filter	1 (100)	5 (67)	1
Ventilation order	17 (88.2)	15 (93.3)	1	CRRT	1 (100)	6 (80)	1
Tracheostomy	17 (5.9)	14 (92.9)	<0.001	Volume goal	1 (100)	7 (57)	1
Temperature max	1 (0.0)	3 (66.7)	1	Lactate	2 (50)	4 (50)	1
Cerebral perfusion pressure	—	2 (50)	NA	Central venous pressure	3 (33)	6 (67)	0.52
Glucose	—	3 (67)	NA	Source	4 (100)	9 (78)	1
Lactate	1 (0)	—	NA				
Central venous pressure goal	1 (0)	1 (0)	1				
Source control	1 (0.0)	1 (100.0)	1				

Frequencies compare the percentage of time an item was discussed on MDRs at all during phase 1 and before prompting by a checklist during phase 2.
CAM-ICU, confusion assessment method for the ICU; CRRT, continuous renal replacement therapy.

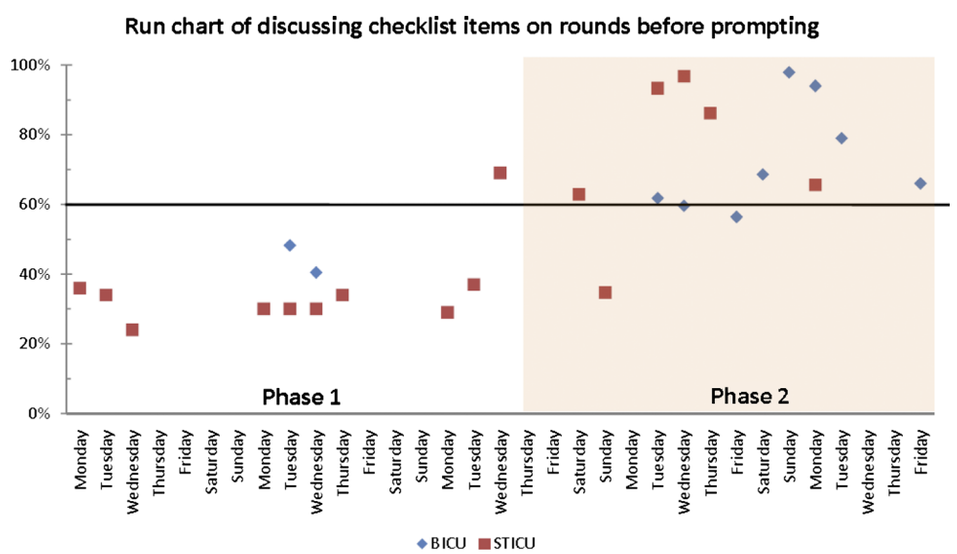

Figure 3. Run chart depicting the average frequency of all checklist items reviewed at any time during MDRs during phase 1 and before prompting by a checklist during phase 2. On average, the frequency of discussing all checklist items significantly improved for both the STICU and the BICU (STICU, 35.5% vs. 76.9%, $p < 0.0001$; BICU, 47% vs. 72.2%, $p < 0.0001$). MDRs trended to discuss checklist items before prompting more than half (60%) of the time during phase 2.

the rounding team. Items that were not previously discussed were then recorded as discussed after review.

All checklists in this project were on paper. One checklist was used per patient per day. No patient or provider information was collected during this observational project.

The primary outcome variable of this project was the percentage of time that the MDR team members discussed checklist items before prompting by a mandatory verbal review of checklist items. The frequency of discussion between phase 1 and phase 2 was compared using a Fisher's exact test.

RESULTS

During phase 1, MDRs were observed for 10 days in the STICU (534 observations) and 2 days in the BICU (66 observations). During phase 2, MDRs were observed for 6 days in the STICU (416 observations) and 8 days in the BICU (345 observations). The frequency of discussing all checklist items increased significantly in both ICUs (STICU, 36% vs. 77%, $p < 0.0001$; BICU, 47% vs. 72%, $p < 0.0001$). The frequency of discussing specific checklist items is shown in Table 3. In the STICU, three items could not be compared because there were no observations during phase 1 (traumatic brain injury: glycemic control and cerebral perfusion pressures) or during phase 2 (sepsis: lactate or venous oxygen saturation goal). In the BICU, one item could not be compared because there were no observations during phase 1 (all patients: confusion assessment method for the ICU). The number of observations for different items varied despite the expectation that all checklist items were to be reviewed verbally at the end of every case (Table 3). The frequency of discussing checklist items on MDRs before prompting occurred more than half the time (60%) during phase 2 of the project (Fig. 3).

DISCUSSION

Our project suggests that checklists used during MDR change communication patterns. Following the introduction of a mandatory review checklist, the frequency with which checklist items were discussed during rounds before the checklist was reviewed significantly increased in both the STICU and the BICU. Following implementation, all checklist items were reviewed by simply reading through the question "triggers" (Figs. 1 and 2) and by allowing any member of the group to interject if he or she felt that an additional comment was needed; thus, all applicable items were reviewed for every patient. Improvements in the frequency of communicating checklist items before prompting were most pronounced for items that our providers would rarely consider (e.g., medication interactions), easily forget (e.g., discontinuing labs), or may find difficult to discuss (e.g., medication reconciliation) before mandatory checklist implementation.

It is important to reiterate that this project did not assess the compliance with reviewing checklist items nor clinical outcomes; instead, it assessed providers' probability of addressing a checklist item without (before) checklist prompting. As such, this is the first report to clearly demonstrate that the use of a daily checklist not only ensures that clinicians address checklist items but also alters communication patterns between providers during MDR ICU rounds. Others have suggested that this phenomenon occurs but have not directly measured it.[13] We agree with Dr Weiss and colleagues that prompting by checklist changes ICU culture, in our case communication patterns, and is a key mechanism by which checklists exert their positive effects on patient outcomes.

During preimplementation, both ICUs studied used a daily checklist for all ICU patients, but checklist items were only reviewed at the discretion of the individual completing the checklist (e.g., if the person felt that an item was not addressed and should have been for a given patient). By removing individual subjectivity, the use of checklists becomes a forcing function[21] that changes behavior; checklists act as external influences on team dynamics. Our data suggest that behavioral change occurs when checklist review is mandated, not when checklists are made available. The items "Med Rec" (medication reconciliation), "Bowel Movement," "CVC Removal" (central venous catheter), "SBT" (spontaneous breathing trial), and "SAT" (spontaneous awakening trial) in the STICU and "CAM-ICU" (confusion assessment method for the ICU), "CVC Removal," "Med Rec," and "Family Questions" in the BICU were present on both unit checklists before and after implementation of mandatory review and were discussed significantly more after review was mandated. This conclusion is consistent with recently published data from Dr Weiss.[13]

We found great variability between reporting different checklist items before reminder. For example, medication reconciliation went from 0% reporting before checklist implementation to 71% in phase 2, yet the discussion of breathing trials only increased from 80% to 88%. This likely represents cultural attitudes that develop over time. Daily medication reconciliation had little emphasis in our critical care community, whereas breathing trials are a well-known, frequently discussed intervention. The cultural differences between these two questions and the remarkable change that occurred with discussing medication reconciliation further support our conclusion that checklists are a mechanism to rapidly change communication patterns. We suspect that these changes in communication patterns may also change cultural expectations over time. In other words, we suspect that providers will naturally start to consider and discuss more frequently daily medication reconciliation over time, even without a checklist review.

To our knowledge, our demonstration of a checklist's direct effect on team communication is novel and suggests a key mechanism by which checklists exert their positive effects. Other studies also support the role that checklists play in improving communication.[4,12,13,22] Team-oriented transfer of information using checklists was exemplified by Dr Catchpole and colleagues when they applied principles from the Formula 1 pit stop to transfers of patient care from the operating room to the ICU.[23] Furthermore, the short duration of this study identified a remarkable affect of checklists: their ability to change communication patterns and information exchange rapidly and with essentially no education or additional emphasis outside MDR. We have previously noted this phenomenon and its effect on hand hygiene compliance in an ICU.[24]

Our project has several limitations. As a process improvement project, it experienced lack of dedicated staff ensuring compliance with the planned methodology. Participants in this project were nurses, doctors, and other team members scheduled for regular duty, and there was limited instruction on how to complete the checklist other than "read all the triggers." Unfortunately, expectations were not met with respect to the number of observations in the BICU before mandatory review implementation (only 2 days were observed). Still, the data from both units clearly demonstrate overall trends toward increased discussion of checklist items. We also witnessed that despite instructions to review every applicable checklist item, individuals completing the checklist continued to exercise individual judgment on the applicability of individual items and tended not to read items they felt were not applicable to a patient's care. For example, in the STICU, there were 37 different patients for whom rounds were observed. Accordingly, there should have been 37 discussions of medication reconciliation, but only 35 observations of this discussion were made.

This lack of compliance strongly supports Dr Gawande's claim that medical professionals lack discipline toward standardizing practices that is prevalent in other professions like the airline industry.[2] Still, we must always appreciate the differences between medicine and aviation: We are not pilots, and patients are not planes. Physicians must regularly make decisions with less accurate and inconsistent information than that available to pilots and that which strict algorithms require. Furthermore, patients often react very differently to similar therapies. These differences require physicians to exercise judgment. The discipline that medical culture should adopt is the use of checklists as cognitive aids or reminders of what to think about and what not to think about; checklists should not be used to rigidly direct care.

This project also did not address the reasons that modification in communication occurred. On a basic, human level, it is our nature to excel at tasks and perform to standards of set expectations. By requiring checklist adherence, it is possible that team members incorporated checklist information into their presentations to improve other providers' perception of their presentation as being "good" or "complete." This may be especially true for trainees presenting to their supervisors. Checklists may serve to enhance memory by providing cues and a predictable communication structure so that important aspects of care delivery are not forgotten and are effectively conveyed to other team members.[2] Providers may feel that reviewing the checklist is punitive. To avoid a sense of punishment, they may incorporate checklist items during rounds discussions. Some providers may experience checklist review as "time wasting" and may incorporate checklist items into discussions to enhance the efficiency of MDRs. Finally, some providers may recognize checklist items as important to patient care and incorporate them into discussions in their effort to improve patient outcomes. To address the reason(s) that communication changed, however, one would need to ask presenters additional questions about why they incorporated checklist items into their presentations.

Our results may also reflect the well-known Hawthorne effect.[25] Simply put, this phenomenon describes modifications of human behavior because of that behavior being systematically observed or studied. By implementing mandatory reviewed checklists in our ICUs, we placed more emphasis on the information requested by the checklists than we would have otherwise. Nevertheless, emphasis changes culture, and checklists are a very effective method of altering emphasis.

Although the exact reason that checklists change communication patterns remains uncertain, it is clear that we altered communication in our project. Checklists, therefore, are powerful tools that can rapidly affect patient care by altering communication. As such, it is vital that appropriate consideration be placed on the development of checklist items so as not to distract a team's focus from relevant patient care–related topics. A poorly designed list can easily emphasize and prioritize care items that are unlikely to affect patient outcomes.

We fully recognize the continued need for well-trained physicians that can exercise good judgment. They must effectively modify therapeutic strategies through the recognition of the spectrum of diseases and the variability of patient response to therapies. We contend that the ever-growing complexity of medicine requires a more disciplined approach to the provision of medical care. Checklists offer the health care team an aide that enhances focus, improves information sharing, increases the application of new clinical knowledge, and increases patient safety by avoiding missed opportunities and providing redundancy to the complex act of patient care.[26] We recommend checklist use at all echelons of military medicine, and their use should be considered in all ICUs, especially during transfer of patient information and during decision-making processes.

AUTHORSHIP

M.K. performed the literature review for this study, which J.C.P., R.K., D.A.A., and K.K.C. designed. R.K. and D.A.A. collected data, which M.K., J.C.P., and K.K.C. analyzed. M.K. and J.C.P prepared the manuscript, which K.K.C. reviewed and approved.

DISCLOSURE

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Air Force, the Department of the Army, or the Department of Defense.

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