

Electronic Checklist in the Operating Room Increases Surgical Team Compliance with Pre-incision Safety Practices

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Context

- The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) established the Universal Protocol that requires organizations to perform a time out immediately prior to procedure start to reduce wrong site, wrong procedure, and wrong person surgeries [1].
- The time out involves a sequenced protocol that uses a checklist format to verify patient identity, confirm the surgical plan, encourage team members to voice concerns, and plans for unanticipated problems.
- The benefits of the time out procedure with respect to patient morbidity, mortality, and complication rates have been well documented [2,3]; however, it is estimated that over half of the complications following surgery are still preventable [4], likely due to poor compliance with this procedure.
- In July 2010, as part of a broader initiative to improve team communication and patient safety [5,6], Vanderbilt University Medical Center (VUMC) implemented an interactive and expanded time out checklist on the OR electronic whiteboards. This intervention was accompanied by mandatory online training for all perioperative clinicians.

Objective

- Create and implement an electronic checklist intervention to facilitate surgical team compliance with known pre-incision patient safety practices in the operating room at VUMC.
- Measure surgical team compliance with the pre-procedural time out protocol at VUMC both before and after implementation of this electronic checklist system (ECS).

Methods

- Direct observational analyses of pre-procedural time outs were performed on 80 cases before and 80 cases after implementation of the ECS.
- Every operating room electronic whiteboard was equipped with a checklist visible from every area of the operating room so that everyone sees the same information at the designated time of the time out procedure (See Figure 1). This electronic checklist system is also automated and interactive, providing feedback on checklist items in real time.
- The time outs were performed by the surgical team which included: surgical and anesthesia residents, fellows, and attendings; nursing staff including CRNAs, scrub nurses, and circulating nurses; and OR technicians.
- For each case, the observers recorded a compliance score (yes=1; No=0) for each element of the time out. An element was scored as compliant if it was clearly verbalized by the surgical team. (See Figure 2)
- The pre- and post-observations were conducted by three students who achieved high inter-rater reliability during pre-study training. ($\kappa = 0.83$)
- Observational data collection for each phase spanned six weeks, with pre-intervention data collection ending one month before implementation and post-intervention data collection commencing one month after implementation.
- A de-identified 8-item survey was also administered to all perioperative clinicians two weeks after ECS implementation to assess their attitudes about the protocol and tool.

Intervention



Figure 1. The electronic checklist features a list of questions (about the patient's identity and surgical plan) that were created based on feedback from physicians and nurses. This list of questions is the same for every operation to ensure standardization and consistency of time out procedures across Vanderbilt University Medical Center.

Observation Tool

| | | | |
|---|--------------------|------------------|-----------------------|
| Observer Code: | | | |
| Surgical Suite: VOR MCE | | | |
| Type of Surgery: | | | |
| Was an announcement made to announce the time-out was starting? YES NO | | | |
| Total time spent on time out (in seconds): | | | |
| Was the whiteboard functional (working) during the time-out? YES NO | | | |
| Were the following items verbally communicated during the pre-incision timeout procedure? (Note: not whether the tasks were actually completed) | | | |
| Pre-incision Time Out Procedure | | Yes | No |
| Time-out before incision/procedure? | | | |
| Did the Circulating Nurse perform the time-out? | | | |
| Presence of required members of the procedural team | | | |
| Presence of person who marked the patient | | | |
| Patient identity (Name, MRN) | | | |
| Surgical site and side marking | | | |
| Procedure to be performed | | | |
| Relevant diagnostic or radiological studies (images) | | | |
| Availability of necessary blood products, implants, devices, an/or equipment required for procedure. | | | |
| Allergies | | | |
| Start of antibiotics | | | |
| Discussion of any special considerations relevant to procedure | | | |
| Was the time-out completed without interruption? YES NO If no, was it resumed? YES NO | | | |
| Did any member of the procedural team STOP the Time-out due to safety concerns? YES NO | | | |
| Were these operating room members actively distracted (i.e. involved in conversation unrelated to the time out, or involved in an activity concerning a non-life threatening issue)? | | | |
| Anesthesia Y or N | Surgeons Y or N | Nurses Y or N | Scrub Techs Y or N |
| Comments on overall Time Out procedure: | | | |
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Figure 2. Using the checklist, the observer recorded which components were verbally communicated to the OR staff during the Pre-Incision Time Out by checking YES, NO, or NOT INDICATED. A score of "Yes" does not necessarily mean that the verbalized items were actually completed by the surgical team.

Results

Table 1. Percentage of Time-out Items Observed

| Checklist Item Noted or Verbalized | Pre-Intervention % Observed (N=80) | Post-Intervention % Observed (N=79) | Significance (p-value) |
|---|------------------------------------|-------------------------------------|------------------------|
| Time-out before incision/procedure | 97.5% | 100% | 0.368 |
| Presence of required members of procedure team | 2.5% | 77.2% | <0.0001 |
| Presence of person who marked patient | 22.5% | 86.1% | <0.0001 |
| Patient identity (name and MRN) | 53.8% | 83.5% | <0.0001 |
| Surgical site and side marking | 61.3% | 91.1% | <0.0001 |
| Procedure to be performed | 93.8% | 98.7% | 0.099 |
| Relevant images | 18.8% | 83.5% | <0.0001 |
| Availability of necessary blood products, implants, devices | 50% | 81% | <0.0001 |
| Allergies | 85% | 97.5% | 0.006 |
| Start of antibiotics | 61.3% | 98.7% | <0.0001 |
| Discussion of relevant special considerations | 6.3% | 51.9% | <0.0001 |

Composite score of all items:

Pre-Intervention: Mean = 50.8% ± 13.3 (Min = 0%, Max = 82%)

Post-Intervention: Mean = 86.3% ± 13.0 (Min = 36%, Max = 100%)

There is a highly significant difference (p<0.0001) between mean composite scores in the pre- and post-intervention observations.

Mean duration of time-out:

Pre-Intervention: Mean = 28.3 seconds ± 8.7 (Min = 0, Max = 64)

Post-Intervention: Mean = 35.2 seconds ± 11.8 (Min = 14, Max = 70)

There is a significant difference (p=0.001) between mean time-out durations in the pre- and post-intervention observations.

Lessons Learned

- Implementation of a standardized, interactive electronic checklist system can dramatically increase compliance with pre-procedural time outs in the OR, an important and necessary step in improving surgical safety.
- While training and technology can facilitate better safety practices among surgical staff, changing attitudes is imperative and can be more difficult. This is something that needs to happen over time, and something that may be best addressed from a top-down model.
- "Secret Shopping" is a validated observation method which reduces bias.

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