Electronically Mediated Time-Out Reduces the Incidence of Wrong Surgery: An Intervention Observation Study

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Introduction: Nearly half of surgical hool of Medicine, Nashville, TNnderbilt University School of Medicine, Nashville, TNng surgeriesof surgical hool of Medicine, Nashville, TNnderbilt University School of Medicine, Nashville, TN Wrong surgery often results in patient death and is devastating to the care team. Wrong surgery incidence estimates range from 1:112994[1] to as high as 1:5000[2] and may be on the rise. Checklist application[3,4] has reduced the frequency of complications previously resulting injury and death and has been a requirement by the Joint Commission since 2003. However, checklists must be performed reliably to be effective, which, in turn, requires the care team to consistently achieve optimal performance. This is a potential vulnerability.

To create a technological backstop to team performance, we used automated process monitoring & process control, as well as forced function concepts to implement an electronic timeout checklist to reduce the wrong surgery rate.

Methods: We created an electronic timeout checklist mediated via the intraoperative nursing documentation module of our Vanderbilt Perioperative Information Management System (VPIMS). The questions are sequentially displayed to the entire care team on a large in-room monitor, interposed as a required documentation step between the tpatient-in-OR" and "incision" events. System development costs were compared to the cost of a wrong surgery. Poisson approximation of the binomial probability was used to estimate the wrong surgery rate and compare this to wrong surgery rate estimates from observed performance reported in the literature. We used Clopper-Pearson (exact) 95% confidence interval for the observed wrong surgery rate.

Results: All 243,939 main campus OR cases between July 30, 2010 and April 7, 2015 were subject to the electronic time-out procedure. Total development costs were $34,000 and used existing hardware. In a *de novo* installation, the additional hardware cost would have been $2500 per OR.

The rate of time-out failure (where a time-out is either not performed or performed after procedure start) is between 1 per 140 (Bulka, et al, manuscript in prep) and 1 per 1250 (Vanderbilt University Medical Center, Center for Clinical Improvement, performance tracking

data) cases. There was an extremely low documentation failure rate; failures were due to either a planned, documented second time-out or an accidental mouse click. Since implementation there have been no wrong surgeries (0 in 243,939 cases) in the Vanderbilt ORs (Clopper-Pearson 95%CI: 0.0 ar2.17 x 10-5 wrong surgeries per case). The CI does not encompass the expected rate of wrong surgery based on current national performance (1 wrong surgery per 23,600 cases, or 4.24 x 10-5 wrong surgeries per case).

Conclusion: Technology can be used to support and enforce a thoughtfully developed perioperative systems design element. After implementation of an electronically mediated hard-stop timeout before incision, no wrong surgeries occurred, both during the observation period nor afterwards. Despite limitations, the study suggests that the system reduced wrong surgeries in our environment beyond that expected based on chance alone, and the most conservative time return on investment estimate is approximately 2 years.

References:

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