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The impact of a daily "medication time out" in the Intensive Care Unit☆,☆☆

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ABSTRACT

Objective: Medical errors play a large role in preventable harms within our health care system. Medications administered in the ICU can be numerous, complex and subject to daily changes. We describe a method to identify medication errors with the potential to improve patient safety.
Design: A quality improvement intervention featuring a daily medication time out for each patient was performed during rounds.
Setting: A 12-bed Cardiac Surgical ICU at a single academic institution with approximately 180 beds.
Intervention: After each patient encounter, the current medication list for the patient was read aloud from the electronic medical record, and the team would determine if any were erroneous or missing. Medication changes were recorded and graded post-hoc according to perceived significance.
Results: This intervention resulted in 285 medication changes in 347 patient encounters. 179 of the 347 encounters (51.6%) resulted in at least one change. Of the changes observed, 40.4% were categorized as trivial, 50.5% as minor and 9.1% were considered to have significant potential impact on patient care. The average time spent per patient for this intervention was 1.24 (SD 0.65) minutes.
Conclusions: A daily medication time out should be considered as an additional mechanism for patient safety in the ICU.

1. Introduction

Since the Institute of Medicine's seminal report in 1999, medical errors have garnered significant attention [1], and more recently medical errors have been cited as the third leading cause of death in the US [2]. While the exact figures have been called into question [3], it is undeniable that medication errors play an important role in preventable harms within our health care system. Many different mechanisms contribute to errors, but cognitive omission or oversight may be particularly amenable to a "time out" approach.

Structured checklists have become standard practice in many settings, most famously in the aviation industry, but also in medicine [4]. A time out prior to surgical procedures is now required in most settings [5], and indeed surgical safety checklists have demonstrated improved mortality [6].

The Intensive Care Unit (ICU) is a complex care environment requiring particularly careful attention. Patients often have multiple concomitant life-threatening issues, and teams are responsible for the management of many critically ill patients simultaneously. Additionally, academic institutions may have large cadres of rotating service providers from different specialties, with various levels of experience. This creates an environment particularly susceptible to medication errors, and ideal for methods to create standardization and decrease errors. Although recommended by various sources [7], daily medication review of each patient every day is currently not standard practice in all hospitals, and its effect has not been quantified in the ICU setting.

We hypothesized that a standardized, team-based approach to checking medications each day ("medication time out") during morning

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rounds would detect medication errors and thereby improve patient safety.

2. Methods

A quality improvement intervention was created to perform daily medication time outs on each patient during morning rounds. This occurred between November 2015 and February 2016, in the 12 bed Cardiac Surgical Intensive Care Unit of an academic tertiary care center. After review, additional data were collected Feb-March 2017, including the time involved to perform the time out intervention. The ICU team consists of an attending physician intensivist, critical care fellow, residents, medical students, nurses, pharmacists, and respiratory therapists. For advanced heart failure patients, a specialized cardiologist is present at rounds. Cardiac surgical attendings occasionally join rounds for their patients. Rounds were conducted as per usual practice, and the structure of patient plan discussions were not altered by this intervention. At the conclusion of each patient encounter, the pharmacist or other team member would recite the medications currently ordered for each patient from the electronic medical record, (Epic Systems Corporation, Madison, WI), using the, Medication Administration Record (MAR), accessed by an online mobile computer on wheels during rounds to reflect the currently ordered medications. This was not a part of standard practice at our institution prior to this intervention. The team would then determine if any medications were erroneous or missing. Medication changes (discontinuation, initiation, dose change, etc.) made during this "time out" were recorded on a data sheet, then later transferred to a spreadsheet and graded according to perceived significance. This was judged post hoc by two independent critical care physicians. Disagreements were discussed and reconciled by a third clinician, if needed (there were none). No patient identifying information was recorded.

Medications changes were categorized into 3 classes: Trivial (e.g. discontinuation of an obsolete order), Minor (e.g. starting pharmacological DVT prophylaxis), or Major (e.g. stopping a medication due to a potential deleterious effect) (see Table 1).

Medication changes were also classified by the type of change: dose adjustment, starting a new medication, stopping a medication, or changing the route of administration. Additionally, medications were classified into the following groups: analgesic, anticoagulation, antiemetic, antimicrobial, anticonvulsant, cardiovascular, electrolytes, endocrine, diuretic, gastrointestinal, immunosuppression, IV fluids, pulmonary, sedative/antipsychotic, or other.

The study protocol was submitted to the Institutional IRB and was, according to the Code of Federal Regulations Title 45, part 46 and UCSD Standard Operating Policies and Procedures classified as not qualifying as research involving human participants. This study therefore did not require other formal IRB review as the project was deemed consistent with quality improvement as determined by the UCSD IRB director.

3. Results

Overall, the daily medication time out resulted in 285 medication changes in 347 patient encounters (0.82 changes per encounter). One hundred seventy-nine of the 347 encounters (51.6%) resulted in at least one change. Of the encounters with at least one change, there was an average of 1.6 changes per patient. These data were similar between the initial observation period (11/15–2/16 showed 121 changes in 237 encounters, 51.1%) and the second observation period (2/17–3/17 showed 58 changes in 110 encounters, 52.73%).

One hundred fifteen of 285 changes (40.4%) were categorized as trivial, 144 (50.5%) were considered to have minor potential effect, and 26 (9.1%) were considered to have significant potential impact on patient care.

Thirty-eight medication changes were dose adjustments (13.3%). Medications were stopped 112 times (39.3%), and a new medication was started 47 times (16.5%). Changes involved only the route of administration 15 times (5.3%) (see Table 2).

The most common types of medications changed were: cardiovascular (81, 28.4%), analgesic (47, 16.5%), and sedative/antipsychotic (39, 13.7%) medications (see Table 3, Fig. 1).

Furthermore, 18.4% of cases prompted additional discussion without a medication change. The average time spent in total during the medication time out was 1.24 min (SD 0.65) per patient, based on a subset of 103 encounters for which these data were available.

During the study period, individual patient data was not collected. However, overall within the initial study period in our ICU, the average ICU length of stay was 4.3 days (median 2, IQR 2–4). Three percent of patients died. There was a 19.5% incidence of Acute Kidney Injury, and 6.1% needed renal replacement therapy. The average number of days on mechanical ventilation was 2.61 (median 1 day).

4. Discussion

Our study found that a standardized daily medication time out during rounds in the ICU resulted in a large number of medication changes. The time out occurred after the conclusion of rounds for each patient, so it can be assumed that these changes would not have occurred without this intervention. Several changes were thought to impact patient safety and the intervention therefore likely prevented potential harm. Even though not specifically recorded, changes occasionally occurred in subsequent days on the same individual emphasizing the need for implementing daily medication time outs. Additionally, a second data set collected nearly one year later showed durability of this effect. This intervention is simple, brief, inexpensive, and did not require the presence of additional personnel on rounds.

While the concept of checking or reconciling medications in the ICU is not new, (and is the current practice of many critical care physicians), it is not universal, and not standard practice to perform on every patient each day. To our knowledge, the magnitude of the effect of a daily medication time out incorporated into the rounding process has not been described.

The task force on models of critical care describes process improvement as "the backbone of achieving high quality ICU outcomes." [8] A recent review on evidence-informed practices for patient care rounds in the ICU concludes that there is significant evidence for using checklists during rounds [9]. Specifically, a structured approach to patient care in the ICU has been shown to improve compliance with evidence-based Intensive Care Unit practices [10], and daily "quality

Table 1
Significance of medication changes.

Grade	Definition	Example
Trivial	No perceived effect to the patient	Discontinuing an obsolete propofol order after patient was already extubated
Minor	Minor or potential effect to the patient	Starting GI prophylaxis medication
Major	Significant potential effect on the patient	Changing Coumadin dose when it was realized that patient was started on a fluoroquinolone

Table 2
Medication changes.

Category	Number	Percent	Per encounter
Trivial	115	40.4%	0.33
Minor	144	50.5%	0.41
Major	26	9.1%	0.07
Dose adjustment	38	13.3%	0.11
Start medication	47	16.5%	0.14
Stop medication	112	39.3%	0.32
Change route	15	5.3%	0.04

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