Commentary

Pharmacotherapeutic friendly fire in the intensive care unit: high stakes seeking high calibre

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See related review by Moyen *et al*., http://ccforum.com/content/12/2/208

Abstract

Increasing numbers of patients are surviving the intensive care unit. Concordant with our shifting focus to minimizing intensive care unit-acquired morbidity, in the present issue of *Critical Care* Moyen, Camire, and Stelfox describe the importance of quality pharmacotherapy. They describe challenges and potential solutions to this source of iatrogenic injury in our vulnerable patients. Their article reminds us not to understate the importance of medication error, to avoid overstating the benefits of incompletely proven methods to prevent medication error, and to distinguish harmful medication errors from other types of medication error.

Medication error is the most commonly observed threat to patient safety in the intensive care unit (ICU). In the present issue of *Critical Care*, Moyen, Camire, and Stelfox describe the importance of quality pharmacotherapy [1]. Their narrative review provides insight into medication errors in this complex, imperfect, multistakeholder process. They discuss vulnerability, error definition and measurement, and methods to improve the process and outcomes of pharmacotherapy in the ICU.

The ICU represents the meeting of the high-risk patient, polypharmacy, physiologic complexity, and an interventional environment that provides many opportunities for error [2]. Medication error is common [3-7]. Rothchild's direct observational, single-centre study in an adult ICU found a serious medication error occurred once every 8 patient-days. A harmful medication error occurred every 78 patient-days, a life-threatening medication error occurred every 300 patient-days, and a fatal medication error occurred once every 750 patient-days (95% confidence interval, 207 to 7,450) [4]. In a 20-bed ICU this conservatively translates to one preventable death due to a medication error every 6 to 8 weeks.

While sobering, these data remind us that all medication errors are not equal. Definitions are important. These definitions underscore our thinking and influence how measures are used. Moyen and colleagues define a medication error as 'any error in the medication process, whether there are adverse consequences or not' [8]. This definition includes both errors of commission and errors of omission. Errors involving omission of or delayed initiation of therapy may be difficult to detect but are clinically important. This definition includes near-miss errors and other errors that do not reach patients. This is consistent with a process-of-care approach to medication errors. An alternate, patient-centred philosophy defines a medication error as 'a failure in the medication process that results in a patient failing to receive the appropriate drug or drug dose' [9]. This definition excludes a near-miss error, and reflects our understanding of medication safety systems: drugs that are not administered cannot cause patient harm, and detecting and intercepting an error signals a functional safety system. The confusing heterogeneity introduced by use of these two valid definitions emphasizes the need for clarity when discussing medication errors, and the benefits of a standard, accepted nomenclature.

Clinical surveillance, like other forms of medication error research, can be used to improve future care. The benefits to the patient affected and to the providers involved in the error are less clear [10,11]. Underreporting with voluntary methods is routine [6]. Our culture of silence may be understandable in environments where the one ubiquitous defence is frontline vigilance. Underreporting is unlikely to change while professional accountability is mediated through the administrators contributing to the implicated system-level errors.

ICU = intensive care unit.

Voluntary reporting is at best a qualitative tool to identify problems in a given system, and is suited to the inclusion of near-miss events as suggested by Moyen and colleagues [8]. The vigour of surveillance data collection should balance the workload, the merits of the collected data, and system-responsiveness to emerging signals [12]. Quantification of the effectiveness of error-reducing interventions requires more robust methods [6]. To date, only pharmacists attending multidisciplinary ICU ward rounds have been shown to reduce harmful medication errors [13].

Medication safety begins well before the ICU. Prelicensing evaluation, drug regulation practices, and drug manufacturers provide incomplete safety, dosing, and effectiveness data, that should be complimented by relevant clinical trials and postmarketing surveillance [14]. Drug preparation before ICU admission and within the ICU produces errors in up to 65% of prepared infusions [15]. Fatigue, practice, and the stock solutions produced by drug manufacturers are all contributors [16]. A preparation-associated error is more frequent than other types of medication error. The cascading effects of licensing an unsafe drug, making a diagnostic error leading to multiple erroneous therapies, or making a prescription error that is repeatedly administered, however, may be far greater than a preparation-associated error and might underscore the need for a standard, clinically relevant metric for assessing medication safety across these dimensions.

Reducing error is different to reducing harm. Moyen and colleagues [1] describe computerized physician order entry, bar-coding, smart infusion pumps, and infusion concentration standardization as methods to reduce medication error. As pointed out by Moyen and colleagues, none of these activities have been shown to reduce harmful medication errors [1]. In fact, new harmful errors may be uncovered and worse outcomes have been reported with computerized physician order entry in the ICU [17]. Improvement should mean fewer harmful errors or less risk-adjusted morbidity or mortality. Whichever metric is used, demonstration of improved patient outcomes should be a minimum requirement before implementation of any expensive system-level intervention.

Moyen and colleagues [1] remind us that pharmacotherapy in the ICU is a large-calibre weapon. Patients may be harmed by optimal pharmacotherapy. Attribution of harm is difficult; however, large epidemiologic studies suggest that up to one-half of adverse drug events in hospitalized patients are preventable, and 10% of medication errors in ICU patients result in harm [4]. This issue should not be understated. Quality pharmacotherapy is a core component of high-calibre ICU care. Thanks go to Moyen and colleagues for their insightful synthesis and for promoting ongoing discussion of this multifaceted, challenging and fundamental aspect of the practice of critical care medicine.

Competing interests

The author declares that they have no competing interests.

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