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MEDICATION ERRORS IN CRITICAL CARE UNIT

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Abstract:

Background: Preterm infant is a live born infant delivered before 37 completed weeks of Medication errors in critical care are frequent, serious, and predictable. Critically ill patients are prescribed twice as many medications as patients outside of the intensive care unit (ICU) and nearly all will suffer a potentially life-threatening error at some point during their stay. The aim of this article is to provide a basic review of medication errors in the ICU, identify risk factors for medication errors, and suggest strategies to prevent errors and manage their consequences.

Keywords: Medication, Error, Reporting, Improve Patient Safety, Computerize Physician Order Entry Medication Process**.**

Introduction:

Health care delivery is not infallible. Errors are common in most health care systems and are reported to be the seventh most common cause of death overall [1]. The 1999 Institute of Medicine (IOM) report, To Err is Human: Building a Safer Health System, drew public attention to the importance of patient safety [2]. This was followed with considerable interest by the medical community [3]. However, to date, there is little evidence that patient safety has improved [4]. In the intensive care unit (ICU), on average, patients experience 1.7 errors per day [5] and nearly all suffer a potentially life-threatening error at some point during their stay [6]. Medication errors account for 78% of serious medical errors in the ICU [7]. The aim of this article is to provide a basic review of medication errors in the ICU as well as strategies to prevent errors and manage their consequences.

2. What is a medication error?

Providing a single hospitalized patient with a single dose of a single medication requires correctly executing 80 to 200 individual steps [8]. This hospital medication use process can be categorized into five broad stages: prescription, transcription, preparation, dispensation, and administration [9]. An error can occur at any point in this process. A medication error is any error in the medication process, whether there are adverse consequences or not [10]. Most errors occur during the administration stage (median of 53% of all errors), followed by prescription (17%), preparation (14%), and transcription (11%) [11]. The earlier in the medication process an error occurs, the more likely it is to be intercepted [12]. Administration appears to be particularly vulnerable to error because of a paucity of system checks as most medications are administered by a single nurse [13]. Nurses and pharmacists intercept up to 70% of prescription errors [14]. Preparation errors occur when there is a difference between the ordered amount or concentration of a medication and what is actually prepared and administered. The industry standard for pharmaceutical preparations is a concentration difference of less than 10% [15]. However, approximately two thirds of infusions prepared by nurses are outside industry-

accepted standards and 6% contain a greater than twofold concentration error [16]. Transcription errors are usually attributed to handwriting, abbreviation use, unit misinterpretation ('mg' for 'mcg'), and mistakes in reading.

3. How are medication errors classified?

James Reason developed a well-recognized system for human error classification based on observations from industries that have become highly reliable such as aviation and nuclear power [17]. He states that errors arise for two reasons: active failures and latent conditions.

Active failures are unsafe acts committed by people who are in direct contact with the patient. They take a variety of forms: slips, lapses, and mistakes. Slips and lapses are skill-based behavior errors, when a routine behavior is misdirected or omitted. The person has the right idea but performs the wrong execution. For example, forgetting to restart an infusion of heparin postoperatively is a lapse. Restarting the heparin infusion but entering an incorrect infusion rate despite knowing the correct rate is a slip. Mistakes are knowledge-based errors (perception, judgment, inference, and interpretation) and occur due to incorrect thought processes or analyses. For example, prescribing heparin in a patient diagnosed with heparin-induced thrombocytopenia is a mistake. Situational factors (fatigue, drugs, alcohol, stress, and multiple activities) can divert attention and increase the risk of active failures.

Latent conditions are resident pathogens within the system. They can affect the rate at which employees execute active failures and the risks associated with active failures. Latent failures occur when individuals make decisions that have unintended consequences in the future [17]. Prevention requires an ongoing tenacious search and corrective actions once latent conditions are identified. For example, institutions that use staffing models that depend on providers to routinely perform clinical duties above and beyond their regular responsibilities paradoxically risk introducing time pressures, fatigue, and low morale into their work force.

Errors can alternatively be classified as errors of omission or errors of commission. Errors of omission are defined as failure to perform an appropriate action [6]. On average, patients receive only half of the recommended care they should receive [18]. Errors of commission are defined as performing an inappropriate action [6]. Most studies in the patient safety literature focus on errors of commission such as wrong drug or wrong dose. Problems with effectiveness and access to drug therapy have been studied much less frequently[19].

4. How common are medication errors?

The reported incidence of medication errors varies widely between clinical settings and patient populations and between studies. Errors appear to occur in approximately 6% of hospital medication use episodes [11]. Among critically ill adults, the rate of medication errors ranges from 1.2 to 947 errors per 1,000 patient ICU days with a median of 106 errors per 1,000 patient ICU days [20]. In children, 100 to 400 prescribing errors have been reported per 1,000 patients [21]. Several factors account for this large variation in reported medication errors. First, the definition of medication error, including both the numerator and denominator selected for rate calculations, is critical. For example, medication errors and adverse drug events (ADEs) are frequently reported as individual events, as a numerator, but with no denominator [6]. Furthermore, selecting an appropriate denominator that reflects exposure to risk can be difficult [6]. Should medication errors be reported per patient, patient day, medication day, or dose administered?

Second, the process node (prescription, transcription, and so on) under investigation will influence incidence estimates [20]. Third, the method of reporting medication errors influences rate estimates [8]. Spontaneous reporting of medication errors may under-report events [11, 4]. Review of the medical records is considered by many experts the benchmark for estimating the extent of errors and adverse events in hospitals but is dependent on accurate documentation [22]. Automation of medical record reviews with computers can be used to improve efficiency and allow for prospective reviews [1]. Direct patient monitoring may be the ultimate reference standard but is dependent on observer expertise and is very labor-intensive [5]. Fourth, the culture of individual ICUs, the number of ICUs participating in error reporting, and the technologies employed can significantly influence error reporting. Medication error trends over time using the same standardized measurement tools are more likely to provide valuable information than periodic cross-sectional surveys.

5. What are the consequences of medication errors?

Medication errors are an important cause of patient morbidity and mortality [9]. Although only 10% of medication errors result in an ADE, these errors have profound implications for patients, families, and health care providers [13]. The IOM report highlights that 44,000 to 98,000 patients die each year as a result of medical errors, a large portion of these being medication-related [2]. Approximately one fifth (19%) of medication errors in the ICU are life-threatening and almost half (42%) are of sufficient clinical importance to warrant additional life-sustaining treatments [20]. However, deaths are only the tip of the iceberg. The human and societal burden is even greater with many patients experiencing costly and prolonged hospital stays and some patients never fully recovering to their premorbid status [23]. Bates and colleagues [30] estimated that in American hospitals the annual cost of serious medication errors in 1995 was $2.9 million per hospital and that a 17% decrease in incidence would result in $480,000 savings per hospital. Finally, the psychological impact of errors should not be ignored [4]. Errors erode patient, family, and public confidence in health care organizations [13]. Memories of error can haunt providers for many years [20].

Nurses play a particularly important role in patient safety because they are the health care providers with whom patients are likely to spend the greatest amount of time. This has two important implications. One, decreasing nurse-to-patient staffing ratios may be associated with an increased risk of medical errors [24]. Nurse-to-patient ratios of 1:1 or 1:2 appear to be safest in the ICU [9]. Second, nursing experience may have an important influence on patient safety. Experienced nurses are more likely to intercept errors compared with less experienced nurses[10].

7. Conclusion

Patient safety is an important health care issue because of the consequences of iatrogenic injuries. Medication errors in critical care are frequent, serious, and predictable. Human factor research in nonmedical settings suggests that demanding greater vigilance from providers of medical care may not result in meaningful safety improvement. Instead, the approach of identifying failures and redesigning faulty systems appears to be a more promising way to reduce human error.

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