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Computerized physician order entry in critical care

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Computerized physician order entry means prescribing of medication and ordering laboratory tests or radiology examinations in an electronic way instead of using paper forms. In itself, it offers advantages such as legible orders, faster order completion, inventory management and automatic billing. If combined with clinical decision support, the real benefits of CPOE become apparent in the first place by prevention of medication errors and adverse drug events. On the contrary, if CPOE configuration is not done carefully, adverse drug events can be facilitated. Therefore, and for reasons of end-user acceptance, implementation is challenging. CPOE has the potential for significant economic saving. However, the initial implementation cost is high.

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Introduction

Computerized Physician Order Entry (CPOE) refers to the entry process of physician instructions in an electronic way, and in that way replaces verbal or written paper-based orders. Besides the term Computerized Physician Order Entry, the terms Computerized Provider Order Entry or Computerized Prescriber Order Entry are sometimes used, because physicians are not the only ones to order on CPOE. Nurse practitioners and physician assistants order on CPOE as well.

Using information and communication technology (ICT) for entry of medical orders offers theoretically many advantages: less delay in order completion, reduced errors related to handwriting, transcription or verbal communication, potential to do the order entry at the point-of-care and even off-site, possibility of error checking, inventory management support, potential for automatic billing and decision support at the moment of electronic order entry.

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CPOE refers to a variety of orders including medication orders, laboratory and radiology orders. The most important area with the highest possible benefits involves the medication prescription process and this is also the focus of this review. According to the important report “To Err is Human” by the Institute of Medicine, 7000 deaths occur annually in the United States due to medication errors (MEs).¹ This report suggests widespread implementation of hospital-based CPOE to improve the safety and quality of healthcare delivery. CPOE is also one out of three safety initiatives with the greatest potential to reduce deaths due to medical errors, recommended by the Leapfrog Group, a large consortium of private and public purchasers.² For various reasons, especially the ICU is a high risk environment, where patients experience, on average, 1.7 errors per day³, and suffer during their ICU stay at least one potential life-threatening error. Most errors are not due to individual mistakes and the best prevention strategies therefore target systems by optimizing work processes, and this is where CPOE comes in.⁴

It is important to realize that not all CPOE systems have the same features. Standard CPOE only allows for standardized order entry, which means that only electronic orders are accepted in a standard and complete format, thereby also ensuring legibility. Nowadays, almost all CPOE systems include facilities for “Clinical Decision Support (CDS)” of varying sophistication. Basic CDS may include suggestions or default values for drug doses, routes, and frequencies. More sophisticated CDS can perform drug-allergy checks, drug-laboratory value checks, drug-drug interaction checks, in addition to providing reminders about corollary orders (e.g. prompting the user to order glucose checks after ordering insulin or prompting osmolality checks after ordering mannitol). The most advanced CDS includes the integration of guidelines to assist the physician at the time of drug prescription.⁵ These more sophisticated systems provide physicians with an environment that is more appropriate for the complexities of today’s medicine than a paper-based setting⁶ (See Table 1).

Especially the critical care patient is vulnerable to safety challenges and particulary MEs, and in that way finds himself in the most perfect environment to benefit from the potential advantages of CPOE.

Table 1

Advantages of CPOE systems.

Advantages of CPOE Systems in Comparison with the Paper-Based Setting

CPOE without CDS

- Faster to the pharmacy resulting in less delay in order completion
- Free of handwriting identification problems
- Possibility to do the order at the point-of-care or even off-site
- Support for inventory management
- Potential for automatic billing
- Potential to identify the prescribing physician

CPOE with basic CDS

- Default values for drug doses, routes and frequencies
- Less subject to error associated with similar drug names
- Able to avoid specification errors, such as trailing zeros

CPOE with advanced CDS

- Drug allergy checks
- Drug-laboratory value checks
- Drug-drug interaction checks
- Able to generate reminders for corollary orders
- Able to integrate with drug guidelines
- Able to avoid incorrect drug choices f.e. for antibiotic therapy
- Able to suggest dose adaptations according to evolutions in renal function
- Potential for significant economic savings
 - Suggest enteral route over parenteral route
 - Reduce overprescribing
 - Suggest more cost-effective alternatives
 - Suggest appropriate duration of drug therapies

CPOE = computerized physician order entry.

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