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Annual Review of Changes in Healthcare



Computerized Provider Order Entry

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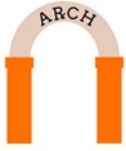
Computerized provider order entry (CPOE) is an electronic healthcare system that allows providers to enter and send treatment instructions via diverse computer applications instead of paper, fax, or phone.¹ These treatment instructions could include medications, labs, orders for procedures, or radiology orders. Although these systems may be disparate, health informatics individuals look to the interoperability of the electronic health record (EHR), CPOE, clinical decision support systems (CDSS), laboratory and radiology information technology to increase coordination of care.² Health informatics allows knowledge of the patient's diseases, therapies, medications, and associated administrative documentation to be more efficiently and easily shared, which contributes in minimizing medication errors and at the least preempt them to improve patient health and safety.²

Computerized orders can be transmitted in inpatient and ambulatory care settings.³ CPOE gives providers the ability to look up diagnosis and treatment related information in real time such as patient identification (patient name, date of birth, address, allergies, etc.), medication dosage recommendations, adverse drug-to-drug and disease interactions, patient allergies and treatment conflicts.² CPOE has helped improve efficiency and patient safety.¹ Informatics contributes to this by analyzing the data both in manual and electronic processes and uses it in a meaningful way to

improve the CPOE configuration process. Informatics also assists in the development of the best possible workflow, so that the process is efficient and complete for optimal decision support.⁴

To improve safety some CPOEs have a built-in drug-drug interaction (DDI) monitor. This can force the provider or healthcare professional entering the order to look at allergies, renal function, weight, and medication contraindications.³ Also, this system allows physicians to enter orders directly as opposed to them having an assistant enter them.⁵

Medication errors are one of the most common types of errors and also one of the most preventable.⁶ Illegibility and incompleteness of prescriptions are factors that may increase the risk of medication error and patient harm. CPOE helps reduce the need for handwritten orders. This helps decrease errors and increases patient safety by increasing legibility and by creating a template to ensure completeness.⁶ A study conducted in Saudi Arabia in 2014 compared 199 handwritten prescriptions with 199 electronic prescriptions for legibility and completeness.⁶ The study found that 35.8% of handwritten prescriptions at King Khalid University Hospital contained some form of error while only 2.5% of electronic prescriptions had an error.⁶ This study supports the idea that CPOE can help reduce medication errors and improve patient safety.⁶



The system also improves efficiency by allowing doctors' orders to reach pharmacy, radiology, and laboratories faster.⁷ This allows a reduction in turnaround time, and ultimately decreases time to care delivery.⁷ A study titled "Efficiency Gains with Computerized Provider Order Entry" measured pre- and post-CPOE turnaround times (TaT's) for orders placed for laboratory, radiology, and pharmacy.⁷ The study found that "TATs were statistically significantly lower in all three departments: laboratory TATs decreased 54.5 percent, from 142 to 65 minutes; radiology TATs decreased 61.5 percent, from 31.0 to 11.9 hours; pharmacy TATs decreased 83.4 percent, from 44.0 to 7.3 minutes".⁷ These results support a major benefit of CPOE systems: improved efficiency.

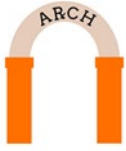
Pharmacists are the medication experts and are heavily relied on by other healthcare professionals for medication and dosing recommendations.⁸ They also have a major role in identifying drug interactions and patient specific contraindications/allergies to medications.⁸ Pharmacists are generally the last line or final checkpoint for medication verification before it reaches the patient. Thus, pharmacists play a major role in identifying medication errors. CPOE systems have been shown to decrease errors, which can help aid pharmacists during the medication verification processes.¹ This system helps provide a double check for the physician and pharmacist with prompts and alerts for certain medications. For example, a study in

Australia found that CPOE improved renal dosing in aminoglycosides.⁹

Aminoglycosides are antibiotics that may increase risk of damage to the kidneys for some patients. These medications must be used with caution or at adjusted doses in patients with renal dysfunction. The medication may not be cleared by the body as efficiently if the patient has renal dysfunction. If the system did not prompt the physician to check renal function or no CPOE system was in place, a health care provider may not recall that aminoglycosides need renal adjustment or that the patient has some form of renal dysfunction. If another health care provider did not catch this potential dosing error, the patient's kidneys could be further damaged, or they may experience other adverse effects from the medication such as ototoxicity or neurotoxicity.

CPOE increases the efficiency of the prescribing cascade and reduces errors in interpreting prescriptions.¹ The system ensures prescription completeness, which reduces the number of phone calls from the pharmacy to providers to clarify prescriptions.¹ CPOE can increase legibility, thus reducing possible medication errors and delays in patient care. If a prescription is illegible or incomplete, the pharmacist must call the prescriber's office to get the necessary information in order to fill the prescription. These phone calls take time, forcing the patient to wait longer for their medication.

While CPOE has many benefits, there are limitations in any system. Many of



these limitations are due to poor designs of CPOE systems. These include displaying pharmacy formulary availability rather than appropriate default dosing options and “alert fatigue”.⁵ Alert fatigue refers to being exposed to numerous alerts consistently, and eventually becoming desensitized to them. This can lead to accidentally ignoring an important alert. Another limitation to CPOE systems due to poor design choice includes one healthcare provider essentially being “locked out” of a patient’s profile while another provider is editing it (for example, a physician being locked out of a patient’s profile while the pharmacist is verifying orders).⁵ Another example of a limitation is if orders are placed before information is updated in the system, any drug/disease interaction check will not be able to evaluate the new information or medications.¹⁰

An informatics team is beneficial to both aid in the implementation process and throughout the lifecycle of the CPOE system. Data from CPOE reporting may be utilized to track alerts, alert overrides, provide detailed tracking of medication dispensing, medication errors, drug interactions and more. Informaticists utilize the data to identify trends in drug therapies administered and note repetitive errors to determine and help minimize or eliminate their causes. Other uses of the data may point to the need for process improvement, reorganization of workflows, and identification of staffing and productivity concerns.

Patient safety is enhanced when CPOEs are utilized in concert with CDSS and EHRs to give a more complete picture

of the patient’s history in real-time for some health IT systems.¹ There is more to CPOE than meets the eye, yet it is not a panacea that eliminates the need for careful scrutiny and sound clinical practice by its users. Redundancies built in via the observations of the nursing staff and pharmacy will be necessary as even the most robust CPOE systems will require ongoing review and modification of current workflows to prevent patient harm, wasted staff effort, and process gaps.¹⁰ The effectiveness of CPOE remains linked to the skill of the clinical and pharmacy staff who use it. Information must be accurately entered into the CPOE system which may not always identify an incorrect dosage or form of the drug and may not alert the prescriber that they have selected the wrong patient.¹¹



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