

Implementing computerized physician order entry in a public tertiary care hospital

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Abstract

It is reported that at least one medication error per day occurs in hospitalized patients. Medication errors are not only harmful but also expensive. Prescription review by pharmacists is the standard to reduce prescribing error; however, due to the manual process, pharmacists lack time to conduct prescription reviews. Computerized physician order entry (CPOE) allows clinicians to directly place medication orders electronically, transmitted directly to the pharmacy. Successfully implemented CPOE systems improve the prescribing process and result in fewer medication errors. However, regardless of its significance, implementation of CPOE is a very difficult task, particularly in a public-sector hospital. Lady Reading Hospital-Medical Teaching Institution has a manual system for indenting medication system; pharmacists could only ensure the current dispensing of medication, but lack time and information to conduct a review to ensure the appropriateness of prescription. The article entails the barriers and the process of implementation of e-prescribing.

Keywords

e-prescribing, public, hospital, Pakistan, informatics. CPOE, pharmacist

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Introduction

In 1999, the Institute of Medicine (IOM) reported that approximately 44,000 to 98,000 patients die per year due to preventable adverse events in hospitals. In this report, it was identified that errors relating to medications were responsible for 7000 deaths per year.¹ Medication-related errors that may harm the patient are termed medication errors. These errors not only have the potential to cause serious harm to patients but also cause high financial loss.² Hence, the IOM has strongly emphasized on implementation computerized physician order entry (CPOE) system as one way to reduce medication errors and patient harm.³ CPOE refers to any system in which clinicians directly place orders electronically, with the orders transmitted directly to the recipient.⁴ In the case of medication, the recipient is the pharmacy. Research has shown that implementation of CPOE allows standardization of the medication distribution process and applies evidence-based guidelines.⁵ Regardless of its significance, the adoption

rates of CPOE have shown to be improving over the years, over ever this improvement is much observed in by upper-middle and high-income countries, and the adoption rates are much lower in the lower-middle and low-income countries.⁶

Healthcare structure in Pakistan

Pakistan, a low-middle-income country, has a limited health-care structure where 60 % of patients are treated by public-sector hospitals. Pakistan has a very high medication

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Table 1. Steps taken for implementing CPOE.

Step	Action	Explanation of steps
Step 1	Identification of physician project lead	A physician with strong influence and enthusiasm for improvement was identified
Step 2	Identification of unit	ICU was close to the inpatient pharmacy. An isolated unit was identified where implementation of CPOE was feasible. Concerning our facility, we identified ICU as the unit for the pilot study as it has limited beds, nurses, and physicians. ICU was close to the inpatient pharmacy
Step 3	Develop a training lab	An informatics lab with a team of pharmacists and IT personnel was created. This informatics staff was responsible for training and providing resources and support to the unit staff. Different manuals and videos were developed for learning purposes ¹²
Step 4	A pilot study in the unit	Successful pilot study conducted in the unit and for removing system glitches: glitches such as linkage of medicine, updating of the system, and accessibility of the system
Step 5	Hospital adoption	After the successful implementation of CPOE in the pilot unit, collaboration with different unit heads regarding CPOE and emphasizing its significance was initiated. Ensuring all units have information system implementation and continuous training to all physicians—that included online, in-ward, or informatics lab, which ever feasible for the units
Step 6	Implementation of CPOE in the entire hospital	Special implementation was taken by the leadership for hospital adoption. A cut-off time for discontinuing manual indents was informed to all wards
Step 7	Declaration of implementation of CPOE	A declaration was emailed to leadership that CPOE has been implemented and the manual process for medication indenting will be discontinued

ICU: intensive care unit; CPOE: computerized physician order entry.

error rate; some studies have shown medication error rates ranging from 40% to 68%.⁷ It is identified that around 50% of the prescription order had irrational prescribing in Pakistani hospitals.⁸ Medication errors are a major concern. A research conducted in Pakistan reported that due to the lack of infrastructure and high cost of CPOE, its implementation is challenging, particularly in public-sector hospitals.⁹ A recent study conducted in Pakistan have shown that only 28% of physicians prefer CPOE over manual, thus lack of physicians' will remain a major hindrance in adopting the CPOE system.¹⁰

In this article, we have described the process of implementation of CPOE in tertiary care government-owned hospitals in Pakistan.

Study setting

Lady Reading Hospital-Medical Teaching Institution (LRH-MTI) is one of the largest tertiary hospitals in Khyber Pakhtunkhwa province of Pakistan.¹¹ This 1770-bed health facility is a public hospital serving a population of 2,273,000 inhabitants. The department of pharmacy services is one of the busiest units in this tertiary care hospital dispensing around 900,000 medications monthly.¹²

A manual system for indenting medication was established in the hospital. In this manual system a nurse write down the required medications on a book which is sent to the pharmacy. Most public-sector hospitals in Pakistan have this system. Similar to the result of this study, the lack of physicians' interest remains the major hindrance to the adoption of e-prescribing in LRH.

Implementation process

The Department of Pharmacy Services was responsible for implementing CPOE with the help of the information technology (IT) department. Table 1 provides details regarding the steps carried out for implementation of CPOE in the hospital.

Contributing factors for the project

The implementation process was full of hindrances and highly time-consuming. It took around 11 months for the complete adoption of CPOE. A major factor for successful implementation remains the commitment of leadership—including the medical director and hospital director who managed to resolve many conflicts during the adoption period, especially the hindrance from the physicians, thus making LRH the first government-owned hospital to successfully implement electronic prescribing and electronic health records. Inventory management and stock control have also improved in the wards.

Impact of CPOE on pharmacy practice

In December 2020, CPOE was fully implemented in LRH-MTI, allowing all medication to be prescribed electronically, and allowing pharmacists to review and dispense medications electronically:

1. Monitoring medication distribution: One of the major concerns with the manual process is the monitoring medication consumption, which was due to CPOE

having completely digitalized. Complete flow of medication from warehouse to patient data was now available. These data helped tremendously during the external audit.

2. Reduced medication floor stock: Due to the implementation of CPOE, the pharmacy was able to dispense medication patient-wise, thus tremendously reducing ward stock. Medication such as antibiotics, proton pump inhibitor, and chronic medications was only restricted on patient-wise request, no floor stock of these medications was maintained in any wards.¹²
3. Improved clinical pharmacy services: The manual process did not allow time for the pharmacist to provide pharmaceutical care services. The implementation of CPOE provided access to all relevant data, thus allowing pharmacist time and information to conduct clinical intervention (Table 1). As a result, the hospital was able to provide clinical pharmacy services for the first time in the province (Table 2).¹³

Table 2. Pharmacist interventions per year.¹⁴

Year	Number of interventions
2020	514
2021	959
2022	804

Major limitation of CPOE

Regardless of the significance of electronic prescription in improving patients' safety, it is less likely to be implemented in hospitals in developing countries. A major reason remains the cost of health information systems. The implementation of CPOE must also provide financial benefit to the institution. In the future, we aim to examine the cost-savings of pharmacist interventions due to the implementation of CPOE.

Conclusion

CPOE plays a vital role in patient safety; however, its implementation remains a daunting assignment in many hospitals, especially in public-sector hospitals in developing countries. It is observed that the Department of Pharmacy Services can play a major contributing role in the implementation of CPOE with the support of leadership. CPOE improves medication distribution systems and inventory management.¹⁵

Declarations

Ethics approval and consent to participate

The article reports the implementation of CPOE in the hospital. No animal or human studies were carried out. No secondary

analysis of data collected from humans was carried out. Therefore, ethics approval was not sought. There was no contact with the patients; only prescriptions were involved during data collection. Hence, the ethics committee waived the need for participant informed consent.

Consent for publication

Not applicable.

Author contribution(s)

Muhammad Amir: Conceptualization; Supervision; Writing—review & editing.

Azizullah Khan: Data curation; Project administration; Resources; Writing—original draft.

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Competing interests

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Availability of data and material

The data set generated and/or analyzed during the current study is available from the corresponding author upon reasonable request.

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