

4- Computerized Physician Order Entry (CPOE)

- Done by: Moayad hamed, ibrahim alasoos, Abdullah Almunyif, khaled sharahly
- Team leader: Moaid alyousef
- Revised by: basel almeflh
- References: 436 Doctor's Slides and notes , E.H. Shortliffe and Marsden

Objectives

- Definition and context
- Why CPOE?
- Advantages of CPOE
- Disadvantages of CPOE
- Outcome measures and examples
- Same system other outcome



This slide from doctor's slides



This slide from the book

Color index

- Doctor's notes
- Extra information and further explanation
- Important
- Main titles
- Subtitles

What is CPOE?



- Computerized physician order entry (CPOE) is a solution to a current human system problems, that focuses on achieving improved quality and safety for all patients.

Computerized physician order entry (CPOE) is :

- the process where a medical professional **entering** orders or instructions electronically
- a process of electronic entry of medical practitioner instructions for the treatment of patients
- Computerized provider order entry or Computerized Provider Order Management (CPOM)
(Don't confuse computerized physician order entry (CPOE) with computerized provider order entry)
- the process of capturing a physician's instructions for a patient's care electronically to improve the efficiency of care delivery.

❖ What is Computerized Physician Order Entry (CPOE)?

- Ordering of tests, medications, and treatments for patient care using computers
- Involves electronic communication of the orders
- Often use rules-based methods for checking appropriateness of care

(The system won't allow you to order any medication to anybody. for example: Allergic patients or pregnant patient)

Definitions

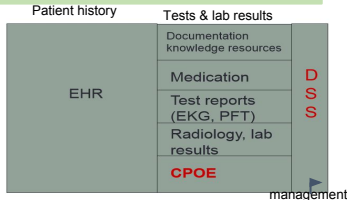


- Information system can be defined as: an arrangement and integration of:
 - Data
 - Processes
 - People
 - Technology
- which interact to collect, process, store, and provide as output the information/task needed to support the organization.
- **EMR (Electronic Medical Record)** – the set of databases (lab, pharmacy, radiology, clinical notes, etc.) that contains the health information for patients within a given institution or organization
- **CDS (Clinical Decision Support) component** - software that makes relevant information available for clinical decision-making (clinical data, references, clinical guidelines, situation-specific advice)
- **CPOE (Computerized Physician Order Entry) component** – enables clinicians to enter orders (tests, meds, dietary, etc.)
- **CCR (Computerized Clinical Reminder)** – just-in-time reminders at the point of care that reflect evidence-based medicine guidelines
- **Technical Infrastructure:**
 - EHR (Electronic health records)
 - Drug information database
 - **DSS** (decision support system)
 - Others
- ◆ **Advantages**
 - Improve communications
 - Make knowledge more readily accessible
 - Assist with calculations
 - Perform checks in real time
 - Assist with monitoring
 - Provide decision support
 - Require key pieces of information (dose, eg)

CPOE, EHR and DSS



- Example DSS in CPOE –medication prescription:
 - Allergy
 - Age (check drug name and dose)
 - Duplicate drugs on active orders, not one-time
 - Severe drug interactions
 - Drug-drug, drug-food
 - Dose maximum
 - Drugs with opposite actions



(You need EHR, DSS and CPOE so that the system can run in a full scale.)

◆ What is it?

- CPOE is a computer solution that accepts physician orders:
 - Meds
 - Laboratory Tests
 - Diagnostic Studies
 - Ancillary Support
 - Nursing Orders
 - Consults


Why now?

- November 1999: Report from the Institute of Medicine To Err is Human: Building a Safer Health System
- 44,000-98,000 patient deaths/year in U.S. hospitals due to medical errors
- Increased focus on **patient safety** and on **quality of care**
- CPOE is viewed as an important tool to improve **patient safety** and **quality of care** delivered

Patient safety

- Institute of Medicine Report on medical errors released 1999
- Estimated that between 44,000 and 98,000 hospital deaths/year are due to medical errors
- Some question the accuracy of the estimates but has raised public awareness and concern

Top 10 Causes of Death 1998



1.	Heart Disease	724,269
2.	Cancer	538,947
3.	Stroke	158,060
4.	Lung Disease	114,381
5.	Medical Errors	98,000*
6.	Pneumonia	94,828
7.	Diabetes	64,574
8.	Motor Vehicle	41,826
9.	Suicide	29,264
10.	Kidney Disease	26,295

* Estimated

Reasons for CPOE

- **Order Communication**
 - Clarity of Orders
 - Ease of Identifying the Ordering Physician
- **Standardization of Care**
 - Clinically validated order sets
 - Clinical diagnoses
 - Procedures
 - Situations (post-op order sets)
- **Alerts and Reminders (Real Time Decision Support)**
 - Drug Safety Database (Conflict Checking)
 - Clinically validated rules



- Medication errors resulting in preventable ADEs most commonly occur at the prescribing stage
- Out of 1111 prescribing errors were identified (6.2% errors), most occurring on admission (64%). Of these, 30.8% were rated clinically significant and were most frequently related to;
 - 1)anti-infective medication orders
 - 2)incorrect dose
 - 3)medication knowledge deficiency
- **64.4% were rated as likely to be prevented with CPOE**
- **13.2% unlikely to be prevented with CPOE**
- **22.4% possibly prevented with CPOE depending on specific CPOE system characteristics**
- Adverse drug events (ADEs) are the most common cause of injury to hospitalized patients and are often preventable.
(clinical decision support)
- A CPOE with an advanced level of CDS is needed to prevent many of the prescribing errors with the greatest potential to lead to patient harm.
 - Basic = drug-allergy, drug-drug interaction & duplicate therapy checking, basic dosing guidance, formulary decision support
 - **Advanced = dosing for renal insufficiency** and geriatric patients, guidance for medication-related lab testing, drug-pregnancy and drug disease contraindication checking

Adverse Drug Reactions (ADRs)



- Several studies have found a serious medication error in 3.4%5.3% of inpatients
- The cost of a single preventable ADE is \$4,685
- \$1.3 million annually for an average 300 bed hospital

Bates et al. JAMA 1997;277:307-311 Bates et al. JAMA 1998;280:1311-1316 Bates et al. J Am Med Informat Assoc 1999;6:313-321 Lesar et al. Arch Intern Med 1997;157:1569-1576

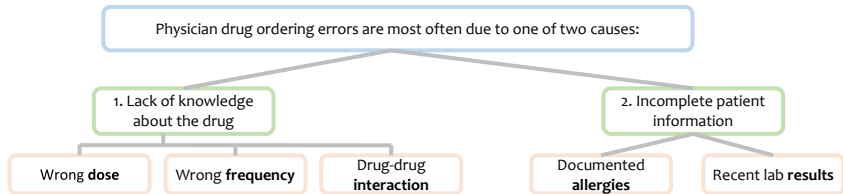
Medication Errors

- Two Harvard studies found that physician ordering errors accounted for 56%-78% of all preventable Adverse Drug Events

Bates et al. JAMA 1997;277:307-311 Kaushal et al. JAMA 2001;285:2114-2120

◆ Pharmacist Safety & Quality Responsibilities

- *I will apply my knowledge, experience, and skills to the best of my ability to assure optimal drug therapy outcomes for the patients I serve.*
(Oath of a Pharmacist)
- Drug/Drug Interactions
- Drug/disease interactions: • Renal dosing • Hepatic dosing • Heart failure • Asthma
- Pediatric/Neonatal weight based dosing : Weight verification (Kg vs. lb.)
- Medication Reconciliation



CPOE Can Help Reduce Errors

- Brigham and Women's Hospital launched its first CPOE in 1993
- Since then, they have documented a **54%** reduction in serious medication errors
- Resulted in **62%** reduction in preventable ADEs



◆ Improved Quality

- CPOE allows for physician reminders of best practice or evidence-based guidelines
- Indiana University study :
 - Pneumococcal vaccine in eligible patients 0.8% → 36.0%
 - Heparin prophylaxis 18.9% → 32%

◆ Improved Efficiency

- Maimonides Medical Center (Bronx, NY)
- 700 bed teaching hospital
- After CPOE, found substantial reduction in order processing time:
 - Physician order to receipt by pharmacy: 3.4 hours → 0.5 hours
 - Physician order to Delivery to Patient Care Area: 4.6 hours → 1.4 hours
 - Estimate of 12% ↓ in LOS following CPOE



- In 2005, only 4% of hospitals are in full compliance with CPOE; 17% have made good progress.
- Government and larger teaching hospitals are more likely to have implemented CPOE.

Source: Cutler EM, Feldman NE, Hurwitz JR. US Adoption of Computerized Physician Order Entry Systems. Health Affairs 2005 Nov/Dec;24(6):1654 - 1655.

Example CPOE improves adherence to guideline

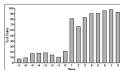


Figure 3. Change in use of tickboxes as a percentage of all non-charge-order orders after the computer observation and structural change.

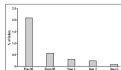
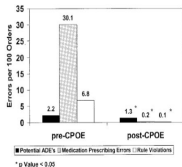


Figure 5. Percentage of medication orders with ADEs exceeding the recommended maximum.

Teich JM et al. Arch Intern Med. 2000 Oct 9;160(18):2713-4.

Example CPOE reduce errors

- Potts studied ADE rates in 13,828 medication orders before/after CPOE implementation at Vanderbilt Children's PICU:
- Effective in reducing the rate of serious medication errors.
- Reduction in antibiotic-related ADEs after implementation of decision support for these drug.
- Length of stay at Wishard Memorial Hospital in Indianapolis fell by 0.9 days, and hospital charges decreased by 13% after implementation of CPOE.
- A study at Ohio State University also identified substantial reductions in pharmacy, radiology and laboratory turnaround times, and there was a reduction in length of stay in one of the two hospitals studied.
- Research estimates that implementation of CPOE systems at all non-rural U.S. hospitals could prevent three million adverse drug events each year.



Potts AL, Barr FE, et al. Pediatrics. 2004 Jan;113(1 Pt 1):59-63.

Disadvantages of CPOE



◆ Example CPOE introduces errors

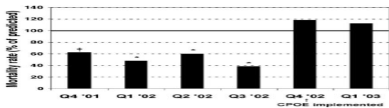
- Brigham and Women's Hospital, Boston introduced a CPOE ----->
- After implementation, **the rate of intercepted Adverse Drug Events (ADE) doubled!**
- Reason: The system allowed to easily order much too large doses of potassium chloride without clear indicating that it should be given in divided doses.

	pre	period1	period2	period3
Potential ADEs/1000 pt-days	15.8	31.3	59.4	0.5

Bates et al The impact of computerized physician order entry on medication error prevention. JAMIA 1999, 6(4), 313-21.

◆ Example CPOE introduces errors

- Association with increased PICU mortality: - **2.8%** 14 months before CPOE implementation
(Sometimes the reason for that could be learning time, training time, changing management, customization, or trying to modify the system to accommodate the needs of the hospital.)



◆ Example CPOE reduce costs

- Brigham and Women's Experience: Cost-Effective
- \$3.7 million implementation
- \$ 600,000 to \$1.1 million operational costs
- Results:**
- Decreased drug costs
- ADE cost is approximately \$4,700
- The return on initial investment has been \$5 to \$10 million in annual savings.



- Full implementation of computerized physician order entry and medication related quality outcomes: a study of 3364 hospitals in 2013:
Only 8% of US hospitals have fully implemented CPOE systems.

Challenges



- The upfront **cost** of implementing CPOE is one major obstacle for hospitals. At Brigham and Women's Hospital, the cost of developing and implementing CPOE was approximately \$1.9 million, with \$500,000 maintenance costs per year since.
- **Installation** of even “off the shelf” CPOE packages requires a significant amount of **customization** for each hospital and can be very expensive.
- Integration with other systems, cost, time, technical.
- **Cultural** obstacles to CPOE implementation. For example, some physicians resist utilizing computerized decision-support tools, relying instead on practice experience.

CPOE: Lessons From Other Institutions

1. Leadership

- Physicians need to lead the effort as the primary users
- However, CPOE is an interdisciplinary project that requires input and coordination with all clinical groups (nursing, PT/OT, Case Management, Pharmacy, Lab, Radiology, etc.) and I.T.

2. Commitment

- CPOE affects the workflow and process of all caregivers and ancillary departments, not just physicians
- Success requires commitment to change at all levels

3. Support

- Responsiveness and Flexibility are the key
- Must be ongoing, not just at rollout

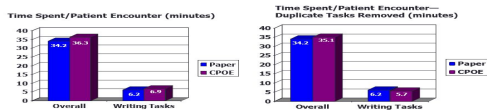
The Need for CPOE



- Improved patient safety
- Improved quality
- Improved efficiency
- Reducing operating costs

Does CPOE Take More Time?

- Physicians are concerned that CPOE will take too much time.
- Evidence shows that CPOE adds less than one minute to the time physicians spent writing orders and overall only added 1-2 minutes per patient encounter. As physicians gained experience with the system, the time for orders actually **decreased**. (Overhage JM, et al J Am Med Informatics Associ 2001;8:361-371)



- The clinical benefits for improved patient care clearly outweigh the perceived concerns.

What Is Needed For Success?



◆ Clinicians

- End-users (clinicians) must be willing to champion the implementation of CPOE
- Clinicians must be involved in design and implementation of the system
- Clinicians must be flexible and willing to change workflow processes

◆ Information Technology (I.T. Department)

- Ensure fast, reliable, and easily accessible system
- Provide ongoing support
- Train, educate users

◆ Institution

- Commitment to workflow changes



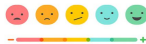
What CPOE Does?

1. Provides Decision Support
2. Warns of Drug Interactions (Drug-Drug / Drug-Allergy / Drug-Food)
3. Checks Dosing
4. Reduces Transcription Error
5. Reduces number of lost orders
6. Reduces duplicative diagnostic testing
7. Recommends therapeutic alternatives
8. Cost effective.

Summary

- CPOE is a key component to improve Patient Safety and Quality of Care.
- The focus needs to be on workflow and process of care changes that are necessary for optimal patient care, Not on implementing a new computer system.
- Commitment from clinicians to help with process design and implementation is critical for success.
- **CPOE is a clinical based process development to improve patient care, not an I.T. project.**

يتمنى لكم فريق العمل كل التوفيق و النجاح.
في الاسفل رابط التقييم للعمل ساعدنا لتطوير العمل و ايضا التقييم يعتمد
عليه في اختيار افضل فريق .



Your Opinion
Matter 15