



Medication Errors in the ED –  
Suggestions for Improvement in Critical  
Access Hospitals

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Culture

Dosing

Storage

Medication  
Reconciliation



**ERROR RATE IN EDS PER ORDERS**

9.68 – 30.98 %

Median = 18.04%



**ERROR RATE IN ED'S PER 100 PATIENTS**

**4.2 – 64.1**

Median = 22.3



## ERROR TYPES IN ED (PHARM DAVERTED)

- Underdose(16.8 %)
- Overdose(12.5 %)
- Drug omission (10.5%)
- Wrong frequency, wrong schedule(12.8%)
- Duplicate drug or drug class (4.5%)
- Failure to monitor (inc. lab test results) (4.5%)
- Wrong route, wrong strength, wrong dosage form (10%)
- Contraindication, wrong drug(9.3%),
- Other (12.4%)

Rotschild et al: J Ann EmergMed (2009)



## ED ERRORS

- Wrong Dose
  - ⌘ Heparin 810 units/hr ordered. Pump set at 810mL/hr instead of 8.1mL.
  - ⌘ Weight was recorded as 27kg instead in 27lbs during triage. MD ordered Rocephin and Tylenol doses based on wrong weight.
  - ⌘ Cefepime 2g IV ordered, 4g iv given. Primary nurse was unaware that another RN had already administered dose.
  
- In Literature:
  - ⌘ Heparin protocol for VTE (loading dose 80 units/kg and maintenance 18 units/kg/h) for patient with ACS (60 units/kg and 12 units/kg/h)
  - ⌘ 1,400 mg acetylcysteine to treat a 100kg patient with an acetaminophen overdose (instead of 14,000 mg)
  - ⌘ Heparin infusion rate at 500 units/h transcribed as 500 units/kg/h



## ED ERRORS

- Wrong Patient
  - ⌘ Ordered Reglan on wrong patient. Was supposed to be on the patient next door with migraine. No adverse reaction, resolved patients symptoms.
  - ⌘ Patient next door was supposed to receive Zofran. Checked MAR and realized wrong medication given. Used only room number as identifier.
  - ⌘ Timentin ordered for patient. Antibiotic hung. MD discovered he wrote order on wrong patient. Nurse informed. Antibiotic stopped.



## ED ERRORS

- Omissions

- ⌘ Lantus 45 units ordered by ED physician. After transfer to ADTU, RN noted med not given by ED RN.
- ⌘ Order for stat abxCefepime, Zithromax, and Solumedrol iv in ED. Med not given. Omission discovered in BICU.
- ⌘ Patient in ER since yesterday and had not received any of his routine medications to include Keppra. Patient had seizure that afternoon.

- Literature

- ⌘ Calcium gluconate, sodium polystyrene sulfonate (Kayexalate), and insulin for patient with severe hyperkalemia ordered. BG at 100 mg/dL – should receive intravenous dextrose 50.



## ED ERRORS

- Wrong/Contraindicated Drug
  - ⌘ Lasix 80mg IV ordered. Given Haldol 10mg IV by accident – drugs in same drawer with similar bottle.
  - ⌘ RN removed D10W from Omnicell and administered to 4y/o instead of NS. RN not sure how she made the error.
  - ⌘ Zofran ordered by MD. During administration, RN told patient she was receiving Zofran. Patient stated she was allergic. RN failed to double check allergies.
  - ⌘ Timentin ordered and administered. MD asked if drug given. Verbal order was to administer “if patient not penicillin allergic”
  - ⌘ Allergy to penicillin. Patient ordered and administered Zosyn.
  
- Literature
  - ⌘ Zosyn for a patient with a history of anaphylactoid reactions to penicillin.



## ED ERRORS

- Wrong route
  - ⌘ The nurse administered sumatriptan (Imitrex) IV instead of subcutaneously
- Other
  - ⌘ KCL 40mEq/100mL found free flow infusing upon transfer to the floor. Not on IV pump.
  - ⌘ Order for atazanavir 600 mg daily and Reyataz 600 mg daily (same medication)



## CAUSES FOR MEDICATION ERRORS

- Performance deficit 29%
- Procedure/protocol not followed 17%
- Communication 11%
- Knowledge deficit 9.2%
- Abbreviations 5.6%
- Transcription inaccurate/omitted 4.1%
- Calculation errors 3.8%



## CONTRIBUTING FACTORS FOR MEDICATION ERRORS

- Distractions 7.5%
- Emergency situation 4.1%
- Workload increase 3.4%
- Staff inexperienced 3.1%
- Patient transfer 2.2%
- Cross coverage 1.5%
- No 24h-pharmacy 1.4%
- No access to patient information 1.4%
- Shift change 1%



## MAJOR DRUG CLASSES

- Antimicrobials (32.1%)
- Central nervous system drugs (16.2%)
- Anticoagulants and thrombolytics (14.1%)
- Cardiovascular drugs (12.7%)
- Insulin (6.7%)

Rotschild et al. J Ann EmergMed (2009)



## HIGH RISK DRUGS FOR MEDICATION ERRORS IN PEDIATRICS

- Acetaminophen (35%)
- Antibiotics (20%)
- Asthma inhalers (11%)
- Antihistamines (10%)
- Other analgesics (7%)
- Other (17%)

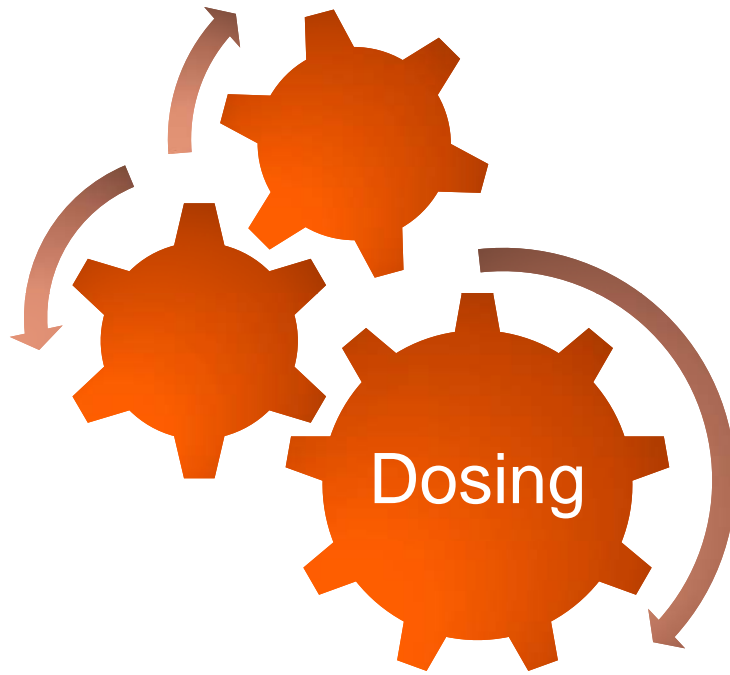
Kozer et al. Pediatrics 2002



### EXAMPLES FOR INCORRECT DOSE IN PEDIATRICS

- Order written for 0.8mg of morphine for a 14kg patient. The correct dose would have been 1.4mg at 0.1mg/kg
- Order written for Oxacillin 725 mg QID. The correct dose would have been 181 mg QID. The prescriber forgot to divide the total daily dose by QID regimen. At 50 mg/kg per day + QID, the dosage for 14.5-kg patient is 181 mg QID





## HOW CAN WE FIX DOSING PROBLEMS?

- Preprinted order sets for:
  - ⊗ Common diagnoses
  - ⊗ All high-alert medications
- Pediatric order forms
- Access to up-to-date drug information including pediatric dosing references
- Clinical decision support systems and order entry
- Nurse double-check of dosing calculations for all high-alert drugs
- IV smart pumps



## SPECIALIZED ORDER FORM

**Medications:**

Date	Time	Drug Name	Patient Weight (kg)	Dose (mg/kg)	Total Daily Dose	Dose to Administer (mg)	Frequency	Dosing Route	Physician's Signature

**Intravenous (iv) Fluids:**

Date	Time	Fluid	Patient Weight (kg)	Infusion Rate (cc/hr)	Weight Adjusted Infusion rate (cc/kg/time)	Infusion Duration	Total Infused	Physician's Signature

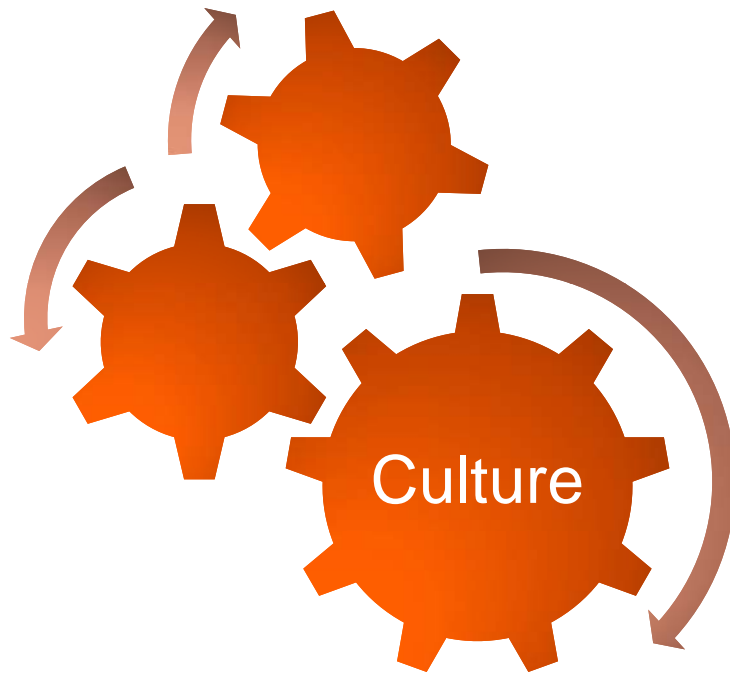
**Inhaled:**

Date	Time	Drug Name	Patient Weight (kg)	Dose (Units)	Dose to Administer (units)	Frequency	Total Dose (Units)	Physician's Signature



**Other Orders:**





## HOW CAN WE FIX CULTURE?

- Increase error reporting (incentive campaigns)
- Conduct root cause analyses / identify error causes
- Separate errors in those truly associated with emergency care and those due to other causes
- Identify solutions that would accept emergency situations but prevent errors
- Identify quality champion / quality team
- Measure processes / performance
- Reinforce best practice and compliance with protocols and procedures



## BARRIERS TO NATIONAL PATIENT SAFETY GOALS

### *Improve the accuracy of patient identification 386-2884110*

- Comparing unique patient identifiers
  - **Barriers:** Chart unavailable; verbal order not yet written in chart or entered in order entry system; identification bracelet not always on patient before medication administered
- Prior to the start of any surgical or invasive procedure, conduct a final verification process, such as a "time-out," to confirm the correct patient, procedure, and site
  - **Barriers:** Immediate clinical needs of the patient; lack of buy-in by all team members; forgetting to do time-outs; not a current expectation in my ED; other patient priorities take precedence

Juarez et al, JtComm J Qual Patient Saf. 2009



## BARRIERS TO NATIONAL PATIENT SAFETY GOALS

### *Improve the effectiveness of communication among caregivers*

- Read-back of verbal/telephone orders
  - **Barriers:** Prescriber does not wait for read-back; hard to hear/poor phone connection; unable to understand prescriber; prescriber is intimidating
- Read-back of critical test results
  - **Barriers:** Caller does not wait for read-back
- Standardized hand-off communication
  - **Barriers:** Limited availability of colleagues when hand-offs are necessary; lack of colleague cooperation to perform as suggested; colleagues do not actively participate in the hand-off

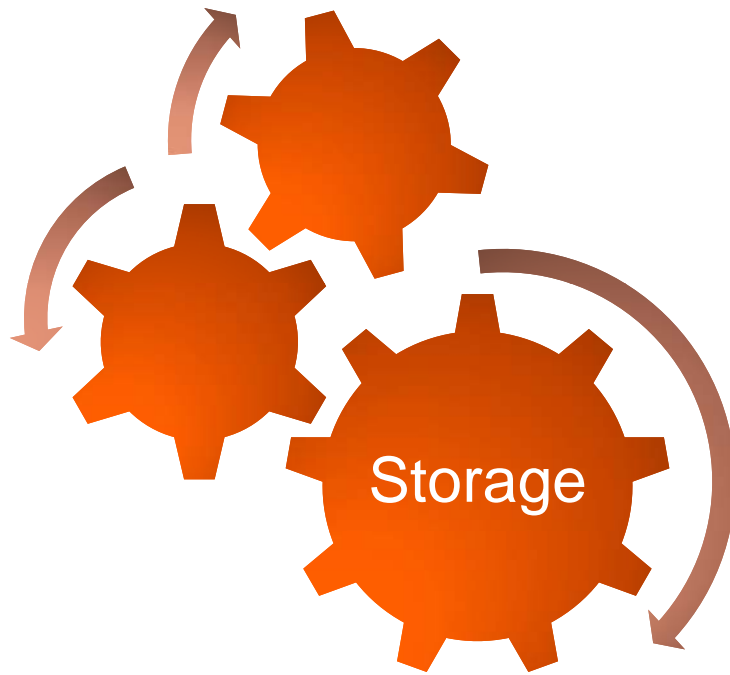


## BARRIERS TO NATIONAL PATIENT SAFETY GOALS

### *Improve the safety of using medications*

- Standardize and limit drug concentrations
- Identify and annually review a list of look-alike/sound-alike drugs and implement error prevention strategies
- Label all medication, medication containers, or other solutions
- **Barriers:** Labeling is not a current expectation in ED; in too much of a hurry/takes too much time; sterile markers / labels unavailable







## STORAGE SAFETY

- Standardize the use of products to one concentration/strength if possible
- Segregate pediatric and adult strengths from one another. Label pediatric strength with "pediatric"
- Determine safe cabinet configuration, including separate bins in refrigerated storage for each available product
- Clearly segregate neuromuscular blocking agents from other vials
- Have a return bin for medications after removal from storage and do not return drugs directly to a specific location in the storage unit



## STORAGE SAFETY (CONT.)

- In all types of storage systems, consider requiring an independent double check for high-alert medications
- Regularly update the staff when new medications or dosage forms or “brands” are added to storage
- Discourage the storage of sample medications
- Regularly evaluate storage practices for chemicals, contrast agents, and respiratory supplies
- Support staff in understanding that carrying medications in uniform pockets can be an “at risk” behavior



