Appendix 2. **BRIGHAM and WOMENS NSPF MEDMARX CPOE ERRORS PROJECT - CPOE ERRORS TAXONOMY**

WHAT Happened

Patient

- Meds ordered for wrong patient
  - Meds ordered on wrong patient account
- Meds labeled for wrong patient
- Meds administered to wrong patient
  - Same or similar patient names

Drug

- Omitted drug
- Drug not available in TPN template
- Missing drug form
- Ordered wrong drug
  - Look alike sound alike drug
- Correct drug ordered/wrong drug processed
- Ordered wrong formulation/dosage form
  - Ordered wrong PO formulation (ER, XR, etc.)
  - NDC Mismatch/wrong package size
- ` Ordered wrong diluents (IV)
- Allergy
  - Prescribed drug to white patient was allergic
  - No Allergy Assessment
- Contraindicated
- Duplicate Order
  - Same exact drug
  - Same drug different routes
- Duplicate Therapy
  - Different drug same class
- Ordered a drug that was non-formulary
- Ordered a drug that was restricted
- Ordered a drug that was out of stock/drug shortage
- Ordered for a home medication
- Non-existent medication

Dose

- Ordered wrong dose or strength
  - Incorrect units used
- Correct dose ordered/incorrect dose processed
- Dose range order
- Wrong concentration/volume
- Unavailable dose ordered
  - Combinatory issues
  - Dose modification issue
- Missing number/quantity or wrong number ordered

Missing dose on Rx
Under dose or potential under dose
Patient missed dose
Potential for missed dose(s)
Dose lower than ordered
Overdose or potential overdose
Patient given extra dose
Patient potential for extra dose
Dose higher than recommended
Prolonged infusion (e.g. extra dose for IV infusion)

Route

Missing route
Ordered wrong route for patient
Route-formulation mismatch
IV/PO issue

Time

Missing time/schedule information
No start date entered
No stop date entered
Wrong time selected
Wrong schedule entered
Correct schedule entered/incorrect schedule processed
Wrong order date
AM/PM Mix-up
Date/time mismatch
Frequency range order
Patient received delayed dose
Drug product expires before infusion finished
Drug product expires before prescribed amount finished
Confusion related to initial start time and continuation
ED order issues – scheduled vs. once or future
Wrong administration rate
No administration rate
Refill information missing or erroneous

Miscellaneous

Unable to enter desired order
Staff workload increase and/or order not processed or delayed
- Order missed
- Data loss
- Order entered prior to admission
- Order wasn't renewed
- Order not verified
- Order was held
- Hold order mismatched
- Order was confusing: Order needed to be clarified
- Order was confusion: Missing info/incomplete order

- Order was confusing: Comments field has conflicting information
- Routing issue
- Missing or incorrect SIG/patient instructions
- Nursing process/administration issues
- Erroneous alert
- Ordered wrong template /order set
- Discontinuation issues
- Verbal/Telephonic issues
- Corollary order issues
- IV flush issues
- Controlled substance issues
- No valid order
- Administration/order label mismatch
- Monitoring
    - Order mismatch
    - Failure to act on critical lab
    - Inadequate monitoring
- Order entered under incorrect MD
- Ordered wrong non-drug product
- Electronic order correct; hard copy ordered incorrectly

WHY it Happened

CPOE – Order Entry Issues

- System interface/usability/visual display issues
  - Pull-down menu issues
  - SALA/LASA issues
  - Instructions/meds in comment field were not seen
  - Comments field or free text confusing/confusion
  - Use of system or SIG abbreviations
  - Computer dosing calculation issues
  - Weight information not available/inaccurate
  - Initial vs. continuing order issues
  - Discontinuation order issues
  - Hold orders
  - Order/reorder modification issues
  - Lack of transparency in duration/renewal status
  - CDS failure/problem
  - Order set/template/protocol issues
  - Issues with favorites
  - Patient information on screen after order was filed
  - Visual display confusing or inadequate
  - Transcription (copy/paste)

- System limitations/inadequacy
  - Drug formulary issues
  - Build issues—route/drug not in CPOE
  - Drug dictionary miscode/out-of-date drug information
  - Inadequate field length
  - Inability/problems in titrating/tapering
  - Inability to enter alternate day dosing
  - Error in default dose or schedule
  - Default SIG or other default issues
  - Scheduled drug routing issue
  - Pharmacy routing issue
  - Corollary orders: timing to properly linked
  - Routing/mapping issue

- Drug allergy issues
  - Drug ordered as text, unable to check for allergy in text
  - Failure to alert
  - Drug allergy field limit
  - Drug allergy incomplete/unclear/conflicting

Computer System Issues

- Computer down/outage
- Hybrid system (electronic & paper)
- eMAR/MAR issues
- Multiple systems (2 or more electronic systems)
- Pharmacy order entry problems/issues

Profiling issues—failure to perform or do correctly
TPN issues

Transition Issues

Medication reconciliation issue
Home medication issue
Patient transferred (within hospital)
Patient discharged (out of hospital)
Transferred from outside hospital

User Issues

Communication issues
2 different clinicians entered
Misinterpretation of order(s)
Lack of computer training/system knowledge
Inexperienced end user
Failure to verify patient identification
Failure to follow established procedures or protocol
Lack of protocol knowledge
Calculation error
Lack of clinical knowledge
Alert ignored/overridden
Typing error
Nursing administration

Miscellaneous/Patient Issues

Insurance Issues

Patient Access Issues

Inaccurate/Inadequate Patient Drug Knowledge

Administrative Issue/Delay

Possible PREVENTION Strategies

Clinical Decision Support (CDS) Enhancements

Ordering facilitators/alerts

ALLERGY
- Drug allergy checking (including class)
- Standardized SIGs

DUPLICATE
- Duplicate order checking/support
- Duplicate therapy checking/support

DOSING SUPPORT
- Dose availability checking
- Default dosing selections
- Dose range checking
  - Individual dosing calculations
- Auto-calculations for combinatory and other complex dosing regimens
- Dose conversion support
- Titration/dose change – better system for entering/conveying
- Scheduling feedback

DURATION SUPPORT
- Drug duration support
  - Drug expiration support
  - Reminders about automatic stop dates/need for re-order drug

route/mix/diluent

DDI
- Drug-drug interaction checking

COMPATIBILITY
- Route formulation checking (eye drops, ear)
- Patient access route guidance
- IV mix support (IV compatibility, how to mix)
- Enhanced ability to modify orders and regimens (tapers)
- Auto calculation for prescription quantities
- System for reconciling new/now with continuing dosing

FORMULARY
- Formulary status and restrictions warnings
- Alerts for non-formulary medications
- Generic substitution

DRUG LAB
- Drug-laboratory linking checking
- Automatic corollary lab orders

DRUG DISEASE STATE
- Drug-disease alerting

Pregnancy alerting

MISCELLANEOUS WORK FLOW DESIGN FACILITATORS
- Order set support
- Protocol support
- Automatic corollary products/supplies
- Blank field checking

Alert Tiering Enhancements
- Hard stops
- Tiered alerts with hard stops when necessary

Management Support (Policies/Infrastructure/Standards)
- Order set QA testing/updates
- Standardize product formulation naming
- Standardized constructs for dosing regimens
- Standardized constructs for dose form-route
- Comment field display
- Communication related to hold orders
- Systems integration
- Electronic transmission of Rx
- Remove option to e-scribe federally controlled substances
- Staff authorization issues
- Improved downtime procedures
- Improved patient registration workflow/logistics
- Operationalize TPN and IV queues
- Tie into internal scheduling
- Direct order entry: Verbal/Telephonic issues
- Medication handoff/transfer standardization

Enhanced Education/Training
- Standardized SIGs
- Standardized weights (only in kilograms)
- Enhanced allergy entry for drugs not included in allergy list

Improved Design/Functionality
- Reminders for Staff
- Facilitation of products selection by pharmacists instead of MD
- Unlimited number of medication allergies
- Include a picture of the patient on the ordering screen
- Indication on prescription
- Include time in pick list (actual time)
- Patient location support
- Patient route access availability: IV access NPO
- Provide links to clinical references
- Tallman lettering
- Order set/sentences for complex tapers
- Order set/sentences for range orders
- Weight-based dosing

Medication reconciliation support

Other CPOE & System Enhancements

Indication on prescription (standardized SIG)
Mapping standards
Direct order entry: Verbal/Telephonic issues
Direct order entry and transmission of controlled substances
DEA direct order entry

Drug Database Improvements/Enhancements

Other Pharmacist Interventions