Clinical Decision Support: The Rules for Pharmacy Systems

Objectives

- Gain insight into what advanced Clinical Decision Support (CDS) can do
- Define the what is necessary to implement CDS in your organization
- Evaluate how CDS enhances Pharmacy Systems and Electronic Medication Administration records

Background

Gary Nechvatal, Director of Pharmacy, Sun Health Boswell Hospital in Sun City, AZ
- BS in Pharmacy
- Masters in Computer and Information Sciences
- Cerner Classic and Millennium
- Pyxis
- All aspects of Pharmacy
  - Retail Management
  - Staff Hospital Pharmacist
  - Clinical Pharmacist
  - Supervisor
  - IT Pharmacy Manager
Sun Health Corporation

- Nonprofit Community Healthcare Network
- Serving the Northwest Valley of the greater Phoenix, Arizona area.
- Two hospitals servicing about acute 650 beds and 120 Acute Rehab and SNF beds
  - Sun Health Boswell Hospital in Sun City, AZ.
  - Sun Health Del E. Webb Hospital in Sun City West, AZ.
- Utilizes Cerner’s PharmNet and PathNet Millennium Systems

Sun Health Boswell Hospital

- 501 beds
- 85 ICU / 143 Tele / 158 MS / 44 Rehab / 71 SNF
- Named in Solucient 100 top Cardiovascular Hospitals past 5 years (only one in AZ)
- Treats more heart patients than any other AZ hospital
- One of Arizona’s leading providers of care for older adults

Sun Health Del E. Webb Hospital

- 254 Beds
- Family Hospital in West Valley of Phoenix
- Leading center for Hip and Knee replacements
- Pain Management Program
- Medical-Psychiatric Unit
- OB-GYN / Maternity Nursery
Clinical Decision Support = Rules

- Rules created with IF-THEN logic that allows users to apply their own criteria to a set of events and then take actions compatible with their goals.
- Evaluates at three levels:
  - EVOKE – determines what event will “trigger” the execution of a rule.
  - LOGIC – The “IF” portion of the rule once a rule has been triggered.
  - ACTION – The “THEN” portion of the rule. Determines what will take place if the rule logic is satisfied.

Rules Overview

- Benefits of Rules Established
  - Raschke, et.al. "A computer alert system to prevent injury from adverse drug events: Development and evaluation in a community teaching hospital"

What is Discern Expert?

- An event-driven, rules-based clinical decision support system
- Can access all information within Cerner’s Millennium Clinical Data Repository
  - generated by a Cerner clinical application or interfaced from a non-Cerner system
- Monitors events of interest and takes action based upon user-defined criteria
  - evoked by defined triggering events (admissions, transfers, discharges, orders, results, etc.)
- Can act prospectively through synchronous or asynchronous processing
  - asynchronous - relevant clinical data is analyzed without interaction from the user
  - synchronous - results of data analysis can initiate a real-time clinical conversation with the user.
Why Rules?
- Power
- Capabilities
- Functionality
- Ease of Use

How Rules Are Selected
- Patient Safety
- Reduce ADEs
- Enhance Therapy
- Enhance Medication/Antibiotic Use
- Enhance Workflow
- Reduce Costs
- Manage Disease States

Making a “Rule”
- What to tackle?
  - Clinical team input
    - Regulations, sentinel events, committees
    - Serious problems, common problems
    - Literature, colleagues inside and out
- Outline steps/actions (Flowchart)
  - Decide “WHEN” to trigger
  - Develop “IFs” to fine-tune (Specificity/Sensitivity)
  - Implement “WHAT” actions to be taken by the rule.
Making a "Rule"

- **BUILD IT**
- **TEST IT**
  - Implement it in a test world with imaginary patients
    - Test it and fine tune it as needed to achieve the specificity and sensitivity needed.
  - Implement it in "silent" mode in the real world
    - Test it and test it again. Fine tune again if needed.
  - Let it go and see what happens

---

**O.K., and now you'll do exactly what I'm telling you!**
Prime Directive

- Test, test, test and test some more

Type of Rules

- Synchronous
  - Acts in real time.
  - Event is often an order being placed.
  - Often pop-up alert to notify or require some action to continue
- Asynchronous
  - Works in background
  - Event occurs such as lab result, patient transfer or discharge
  - Notification sent via report, page, email

Sun Health Rule Decisions

- Type of rule
  - Pop up alert or notification
    - Decide on urgency of notification
    - Worries about “alert fatigue”
- Information Presented in Alert
  - Try to provide as much information as possible to allow user to make informed decision or action
  - No CPOE or EMAR so pharmacy gets all the rules
Use of Clinical Decision Support

- Variety of uses outside Pharmacy
  - CPOE Variants:
    - Turn off duplicate and drug-drug warnings
    - Develop "intelligent warnings" using CDS
      - Reduces alert fatigue and alert apathy
      - Provide customized information and alerts for most important notifications.
  - EMAR Uses
    - Request clinical pharmacy consults
    - Request information via form entry
    - Problem list assistance

Words to Think about

- “Automate the support of decision making, do not simply automate decision support.” - Paul Gorup, Cerner Corporation
- Present appropriate and clinically relevant data at the optimal time to the correct clinician in an concise format. Thus enabling efficient adjustment to therapy to ensure optimal therapeutic outcomes.

Sun Health Rules

- ADE Package
- Antibiotic-Microbiology Rules
- Clinical Pharmacist Rules
- Patient Safety Rules
- Core Measure Rules
- ISMP Rules
- Specialized Rules
ADE Package

- 35+ ADE Prevention Rules
  - Low K+ or Mg++ resulted with digoxin ordered
  - Renal function rules and delta creatinines
  - INR results with warfarin therapy
  - PTT results with heparin therapy
  - Hepatotoxicity from drugs
  - Metformin orders/lab work

Antibiotic-Microbiology Rules

- Antibiotic Utilization
  - IV to PO Switch (cost savings $380K annual)
- Antibiotic Therapy Recommendations
  - Positive C/S – No susceptible antibiotic
  - Positive C/S – No antibiotic ordered
  - Positive C/S – Is cost-effective antibiotic ordered?
  - Antibiotic ordered – No C/S ordered
- Oral Vancomycin
  - Has stool culture been ordered
  - Is metronidazole also ordered
- Positive MRSA or VRE cultures
- Renal Dosing
  - Synchronous alerts recommending dosage changes based on CrCl

Clinical Pharmacist Rules

- Automate some ADR capture
  - Kayexelate ordered if on potassium or potassium sparing medication
  - D50 use if on hypoglycemic medication
  - Vitamin K use if on warfarin
- Restricted Medication Use
  - Restricted medications to specific providers – user must verify and change prescriber to allow entry
  - Require reason for use of restricted med

**Patient Safety Rules**

- Weight change > 20%
- 20% increase or decrease in CrCl if on specific medications
- Platelets less than 100,000 if on Heparin or LMWHs
- 20% decrease in platelets if patient on heparin or LMWHs
- Alert if on LMWH and warfarin and INR > 2.0 x 2

**Patient Safety Rules**

- Metformin order with SCr > 1.4 or 1.5 depending on sex of patient.
- Nitrofurantoin or allopurinol in patients with renal dysfunction.
- Blackbox warning for promethazine in patients < 2 years
- Xigris order checks INR and platelets and alerts if either is outside of guidelines for use

**Core Measure Rules**

- CHF
  - Rule #1
    - Trigger on BNP result indicating CHF
    - Checks for presence of ACE-I or ARB
    - Lists medication found or missing
    - Allows pharmacist intervention
  - Rule #2
    - Triggers on discharge if Rule #1 triggered
    - Lists medication order sentence if found
      - Automates compliance verification
Core Measure Rules

AMI

- Rule #1
  - Trigger on Trop-I result indicating AMI
  - Checks for presence of ACE-I or ARB, Aspirin, and beta-blocker
  - Lists medication(s) found or missing
  - Allows pharmacist intervention

- Rule #2
  - Triggers on discharge if Rule #1 triggered
  - Lists medication order sentence(s) if found
  - Automates compliance verification

ISMP Rules

- ISMP 2005 Pharmacy Computer Field Survey
- 18 Test scenarios
- Able to accomplish all 18 test scenarios using Clinical Decision Support to fill in the gaps missing in the standard pharmacy package.

Specialized Rules

- Dofetilide (Tikosyn) Rule
  - Dofetilide FDA restrictions
    - Approved physicians, approved nurses
    - Restriction based on physician and nursing unit
    - Lab result requirements
      - SG, K, Mg, Digoxin if on Digoxin
    - Max dosage based on Creatinine Clearance
    - Contraindicated Medications
    - Nine possible variables
  - Rule builds message as it evaluates and presents Pharmacist with missing elements for order to be processed
Specialized Rules
- Medication Reconciliation Form
  - Ordered via HIS system or based upon transfer of patient
  - Used for Meds Reconciliation
- MAR on Demand
  - Ordered via HIS system
  - Prints MAR to nursing unit printer.
- Enoxaparin Switch form
- Date of Service check
- No Allergy warning
- Patient service check

Our Pharmacist’s Favorite
- Autosub form for chart
  - Physician order form for chart
  - Contains notification of autosub with dose, route, frequency
  - Trigger on Dispense Category
  - Saves Pharmacist time
  - Legible / Chart copy
  - Prints directly to nursing unit

EXAMPLE OUTPUT
AMI Discharge Notice

Renal Warning

Enoxaparin Renal Alert
Lessons Learned

- Nothing is perfect
- Alert fatigue still occurs
- Requires auditing of alerts
  - Especially after upgrades or changes to your environments
  - May discover “flaws” in rule
- CPOE physician alerts can be ignored
- Some have backup plans in place to notify others to assure someone “acts”
- Escalation plans may be enacted