November 3, 2016
Education and Development Program
Roll Call

WELCOME
Disclosures

• Tonight’s Program
  – Nursing Clinical Decision Support: Governance, Life Cycle and Implementation at the Bedside

• Purpose /Objective
  – The purpose of this program is to provide the participants with an overview of the implementation of nursing Clinical Decision Support (CDS) in the Electronic Health Record (EHR). The program will cover CDS governance structure, processes, and lifecycle, as well as the communication, roll out strategy and impact of nursing CDS at the bedside.

• In order to receive the contact hour(s), the participant must attend the entire program and complete the evaluation

• Conflict of interest has been disclosed and reconciled
Congratulations!
Nursing Clinical Decision Support: Governance, Life Cycle and Implementation at the Bedside

Karen Bavuso, MS, RN, Clinical Informatician
Clinical Informatics, Partners Healthcare

Denise Goldsmith, MS, MPH, RN, FAAN
Chief Nursing Information Officer
Brigham and Women’s Hospital

November 3, 2016

NENIC Fall Program
Disclosure

We disclose that we do not have relevant financial relationships with commercial interests.
Agenda

- Clinical Decision Support (CDS) Governance Structure
- CDS Lifecycle
- Nursing CDS Implementation Strategy
- Nursing CDS Interaction Usage Analysis
- CDS Impact on Nursing Workflow
- Lessons Learned
Partners Healthcare Systems (PHS) has a strong history of robust clinical decision support (CDS) solutions for clinicians.

A recent PHS initiative to move to an integrated vendor-based EHR created an opportunity to provide enterprise-wide CDS tools to nurses:

- Prior to this move the majority of nursing flow sheet and note documentation was paper-based, limiting the availability of CDS.
- Nurses were experienced with electronic medication administration (eMAR) CDS for more than 10yrs.
- Ripe opportunity to provide enterprise-wide CDS generated from nursing documentation.
What is Clinical Decision Support?

- Computer-based tools which provide clinicians, patients or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health and health care.

- Includes:
  - alerts and reminders
  - dosing guidance
  - order sets
  - patient data reports and summaries
  - documentation templates
  - diagnostic support
  - contextually relevant reference information
  - …

http://www.healthit.gov
CDS Governance at Partners Healthcare

- **CDS Committee (Approval and Prioritization)**
  - ~50 voting members
    - Enterprise wide health professionals from different specialties
  - ~30 non-voting members
    - Representatives from clinical informatics, application teams, clinical content, and EHR vendor
  - In-person meetings and asynchronous discussions via collaboration tools

- **CDS Planning Committee (Oversight)**
  - Sub-group of the CDS Committee
    - Representatives from clinical informatics, application teams, clinical content, and EHR vendor
  - Reviews options for how best to implement requests
  - Summarizes and prepares requests for review by the CDS Committee
  - May make decisions on behalf of the CDS Committee
  - May seek decisions or advise from enterprise councils or committees (i.e. Nursing  Informatics Advisory Committee (NIAC))
Processes and Tools to Guide CDS Implementation

- Process is driven by the CDS lifecycle with consistent implementation across the enterprise.
  - Site-specific CDS is built on an exception basis according to predefined guidelines
- Process includes:
  - Site CDS inventory prior to go-live
  - New and Temporary CDS requests
  - Enhancements, silencing or retiring of existing CDS

<table>
<thead>
<tr>
<th>Governance</th>
<th>Rules and enterprise decisions for CDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifecycle</td>
<td>Process framework for CDS</td>
</tr>
<tr>
<td>Collaboration tools</td>
<td>Means for asynchronous communication, decisions</td>
</tr>
<tr>
<td>CDS tracking tool</td>
<td>Database of CDS interventions</td>
</tr>
<tr>
<td>Testing tools</td>
<td>Testing tracking and bug reporting</td>
</tr>
<tr>
<td>Monitoring portal</td>
<td>Robust set of CDS monitoring tools</td>
</tr>
<tr>
<td>Support and issue tracking</td>
<td>Database for all issues identified in the production environment</td>
</tr>
</tbody>
</table>
CDS Lifecycle Phases

- **Request**: KE
- **Evaluate**: KE, CDS, CI
- **Approve/Prioritize**: KE, CDS
- **Monitor**: CI, KE, RT
- **Design**: SME, KE, AC
- **Test**: KE, AC
- **Build**: SME, KE, AC

CDS Committee (CDS)
Knowledge Engineers (KE)
Clinical Informaticians (CI)
Subject Matter Experts (SME)
Application Coordinators (AC)
Reporting Team (RT)
PHS personnel make requests for CDS

- Anyone can submit a request
  - Varying background/expertise
- Requests should be well formed and require minimal clarification
- Ability to identify similar, related or duplicate requests
- The submitter is kept informed of the status of their request
- Requests are tracked with robust metadata

Current state is an Excel worksheet

- Available via collaboration and CDS tracking tools
  - Contains instructions and e-mail address for submission

We are transitioning away from excel worksheet to online form with the ultimate goal of a self-serve model
CDS Lifecycle Phases

- CDS requests are accepted, processed and released on a continuous rolling basis
  - Worked on based on site prioritizations
  - Workload is balanced against support and maintenance requests
- Evaluation and prioritization is made by representatives of a broad set of stakeholders
  - Members of CDS Committee and CDS Planning Committee
- Requests are systematically evaluated
  - Desirability and feasibility of CDS
  - Cost/benefit to organization
  - Consider the best method of implementation
  - Regulatory requirements often drive prioritization
- Decisions are transparently documented
  - Ability to raise/discuss questions, concerns
  - Formal voting and vote tally with recorded and transparent decisions
CDS Lifecycle Phases

- Collaboration tool used for CDS approval process

Many of these fields mimic the 11 questions on the request form

Copy of original request form

Link to CDS tracking tool
CDS Lifecycle Phases

- The Design Phase output is a CDS design specification
  - Specifies the design requirements for build within the EHR (the blueprint for build)
- Specification documented within a semi-structured form within CDS tracking tool
  - Well-documented collaboration between SME, KE and AC
  - Ability to report and export content
  - Robust metadata to link design to other phases of lifecycle
- Continually improving the CDS tracking tool with more structured fields, filters and dashboards
CDS Lifecycle Phases

- The Build Phase output is the build of the CDS in the EHR as well as a build specification
  - Manual documentation of actual CDS build
- Specification is documented within a semi-structured form within CDS tracking tool
  - Well-documented collaboration between KE and AC
  - Ability to report and export content
  - Robust metadata to link build specifications to the design specification on which they are based
  - Build specification mirrors design specification

- Future state:
  - More structured fields for build details and dependencies
    - e.g., content IDs (flowsheet rows), build groupings (subsets for medications) and other criteria (custom built criteria rules)

- \textit{FUTURE} future state:
  - Extract automatically from EHR editors
The purpose of the testing phase is to test the CDS interventions that have been built using test cases.

Current state:
- Test cases are written and executed in testing software
- Bugs, if any, are resolved
- Testing results are imported back into CDS tracking tool and linked to associated build specification
- Originally only able to conduct positive testing due to time constraints
- Now perform negative testing, especially for complex CDS
CDS Lifecycle Phases

- The purpose of monitoring is to confirm that CDS continues to work as intended (after testing)
- CDS monitoring portal provides reports and graphs which present CDS firing data from the production environment
  
  - Rate of firing acceptable?
  - For the right patients?
  - To the right provider?
  - At the right time?
  - Within the right workflow?
  - Appropriately silenced?
CDS Lifecycle Phases

- CDS tracking database captures the monitoring summary and individual CDS details
  - Dashboard summary of all CDS
  - Details of individual CDS

- Types of monitoring
  - Pre-activation
  - Post-activation
  - Ad-hoc
The purpose of evaluation is to determine if the CDS is having the intended effect (Value)
- How are recipients responding to it? (alert fatigue)
  - Ex. override rates, number needed to remind (Einbinder, 2010)
- What behavior is it trying to change? (process measures)
  - Ex. Increased rate of discontinuing urine Foley catheters after 3 days
- What patient characteristics is it trying to change? (clinical outcomes)
  - Ex. Decreased incidence of hospital acquired urinary infections

Current state
- CDS monitoring portal
  - Reports and graphs
  - Can be exported to Excel and/or SQL database for further analysis

Future State
- More detailed reports of user actions associated to CDS recommendations
CDS has been successfully integrated into electronic health records (EHRs) to enhance nursing decision-making and to drive evidence-based practice. (Bakken et al., 2008)

We conducted an analysis of the CDS nursing requests that were received within a three month time span in spring 2014. The highest priority categories for nursing CDS requests were:

- Risk Assessments/Risk Reduction/Promotion of Healthy Habits (24%) and High cost/risk intervention (17%).

These high priority categories are consistent with the core of nursing care, nurse decision making, and rigorous research on clinical decision support for nursing. (Alvey, Hennen, & Heard, 2012; Dykes et al., 2010)
Interventions are rules based and driven off nursing assessment documentation
Non interruptive alerts presented as an interactive window within the admission assessment and shift assessment documentation screen
When presented with CDS nurses can:
  - Agree with and act on recommendation
  - Acknowledge but not act on recommendation
  - Choose to not interact with the alert
Not So Strategic Nursing CDS Education

- CDS (or Best Practice Advisories) were reviewed/taught in the pre implementation training program

- CDS education was not “highlighted” or stressed in the training materials

- Some passive expectation that alerts and reminders were familiar to nurses who had been using an eMAR for years

- Scope of EHR implementation prioritized nursing documentation over CDS implementation

- Post implementation evaluation reveals that additional emphasis on CDS would be beneficial to achieving the intended impact of the CDS
Clinical Decision Support in Nursing Workflow

- Nursing Assessment/Reassessment
- Facilitate Data Capture
- Patient Data Documentation in EHR
- CDS Rules Applied to the Data: “Trigger or Not to Trigger”
- Meeting Information Needs
- Guiding knowledge-based decision making
- Evidenced Based Recommended Action is added to POC/Order
- Nurse determines Action/Non Action
- Non interruptive Alert is presented to Nurse in documentation screen
- CDS persists or is silenced based on nursing response

Partners eCare
Evaluation of CDS in Nursing Practice

- We evaluated the actions taken by nurses when presented with evidenced-based POC/Order intervention alerts related to:
  - Risk for falls
  - Risk for skin breakdown
  - Patient restraint use

- These domains were chosen to evaluate primarily because:
  - The CDS rules fire solely within nursing documentation
  - Accountability for assessment, intervention and outcomes associated with these elements are within the scope of nursing practice
  - Fall risk and skin integrity are contained within the National Database of Nursing Quality Indicators
  - Appropriate restraint use is a Joint Commission (TJC) standard
Process of Data Analysis

- CDS alert firing data was extracted from the EHR
  - Separated into discrete excel worksheets
  - Custom sort by Date, then Time, the patient ID, then Follow-up action
  - Removed rows that were not unique instance of a CDS intervention
  - Coded actions as “accepted” (recommended action taken) or “overridden”
    - Accepted - Clicking a link within the alert message/selecting an order
    - Overridden - Acknowledged, commented on, or labeled as insignificant without taking the recommended action
    - Ignored - No interaction with the alert window at all

- Data set represents 22 week time period beginning 5 months following EHR implementation
The 3 CDS intervention alerts collectively fired more than 30,600 times over the 22 weeks of data collection.

When nurses interacted within the CDS window the recommended actions were taken 15 to 52% of the time.

<table>
<thead>
<tr>
<th>CDS 11/15 - 04/16</th>
<th>CDS Fired n=</th>
<th>CDS Nurse Interaction n=</th>
<th>% CDS Recommended Action Taken</th>
<th>% CDS Overridden</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Fall Risk Morse Score &gt;=45</td>
<td>17,398</td>
<td>1,539</td>
<td>52% (799)</td>
<td>48% (740)</td>
</tr>
<tr>
<td>Risk for Impaired Skin Integrity Braden Score &lt;=18</td>
<td>4,292</td>
<td>219</td>
<td>31.5% (69)</td>
<td>68.5% (150)</td>
</tr>
<tr>
<td>Restraint Plan of Care Active Restraint Order w/o POC</td>
<td>8,944</td>
<td>428</td>
<td>15% (64)</td>
<td>85% (364)</td>
</tr>
</tbody>
</table>
Following data analysis we held focus group with 32 clinical nurses to explore the following questions:

1. Does CDS for nurses that recommend POC interventions have value within your documentation workflow?
2. We choose these CDS alerts to be non interruptive to your work flow. Was this the right decision?
3. What reason might you have for not acting on the alert recommendation?

Themes that emerged from analysis of the discussion comments:

1. Design in the workflow
2. Lack of knowledge
3. Alert fatigue
Design in the Nurse’s Workflow

- “I’ve never seen it”
  - There are pathways in the system to document and avoid the locations where the CDS advisory is located

- “Didn’t even see that link to the Plan of Care”
  - “acknowledge” users didn’t see and/or realize that the POC link was there to take them to the POC to add the problem

- “I wasn’t ready to go to the plan of care”
  - POC documentation occurs after completion of the assessment.
  - This workflow represented an interruptive change

- “Can the problem automatically populate the POC when alert fires?”
- “Can the BPA display in the POC?”
  - Because all nurses are “required” to review and update the patient’s POC daily they felt the alert would be more visible and less likely to be ignored.
  - Technical limitations to this approach
Interventions are rules based and driven off nursing assessment documentation.

Non interruptive alerts presented as an interactive window within the admission assessment and shift assessment documentation screen.

When presented with CDS nurses can:
- Agree with and act on recommendation
- Acknowledge but not act on recommendation
- Choose to not interact with the alert
Lack of Knowledge & Alert Fatigue

➢ “I didn’t understand what it was”
  • Understood the content of the alert but not the intent…
  • Did not understand
    That “acknowledge” was an “override” action
    That “clicking” the POC link was an “accepted” action

➢ “every patient gets it, so I just ignore it”
  • Most of our inpatients are at risk for falls or impaired skin integrity

➢ “its just one more thing to look at”
  • Novice EHR users continue to be overwhelmed by the documentation requirements and “busy” screen design
Implementation Lessons

- CDS education effort was lost in the larger implementation activities.
  - Purpose of the CDS advisory & response expectation of the user

- “Make it easy to do the right thing”
  - Rationale for using a non interruptive alert was sound
  - Location of the alert was not in a user “workflow” friendly location
  - The recommendation “actions” were less evident then the “override” actions

- Contextualize the alerts
  - Placing the alerts within the reassessment flow sheets would have emphasized their importance

- Continue CDS Lifecycle process that includes direct care nurses
  - Place greater emphasis on Nursing requestor/owner pre/post implementation responsibilities
What’s next for us?

Applying changes/enhancements to align with best practices/and our lessons learned.

Design in the Nurse’s Workflow
1. A user interface that guides user towards the recommendation action is now in place
2. Reconsidering location placement for all non-interruptive nursing alerts

Lack of Knowledge & Alert Fatigue
1. Instituting a broad re-education and communication program
2. Continue to monitor program to identify improvements
3. Recommend the CDS requestors/owners identify a quality improvement initiative associated with their request; (i.e. articulate a goal for the CDS implementation and a measurement of success)
4. Recommend the CDS requestors propose a communication plan
Conclusion

- Best practices for CDS exist in the literature, and overall, align/confirm with these lessons
  - Interface design principles for usable decision support: A targeted review of best practices for clinical prescribing interventions. (Horsky, Schiff, Middleton et al, 2012)

- Our findings demonstrate that application of known best practices for CDS requires explicit translation to:
  - Apply them to nursing documentation workflows
  - Work within technical limitations of nursing documentation modules, particularly the plan of care
Acknowledgements

Implementation of the Nursing CDS would not be possible without the valuable contributions and indispensable support of our:

- Requestors,
- Subject Matter Experts,
- CDS Committee members,
- Application Coordinators,
- Knowledge Engineers,
- Clinical Informaticians,
- Associate Director and Director of Clinical Informatics,
- Clinical Informatics development staff,
- Enterprise Research Infrastructure and Services engineers
- Local site-based implementation leaders and teams
Thank You!!

Karen Bavuso
kbavuso@partners.org

Denise Goldsmith
dgoldsmith@partners.org