The Unintended Consequences of Clinical Decision Support

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The Unintended Consequences of Clinical Decision Support

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Conflict of Interest Disclosure

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Have no real or apparent conflicts of interest to report.
Session Objectives

• Recognize common process and standard work and the impact on success of clinical information systems

• Describe how to use data effectively to manage the change process associated with clinical decision support

• Identify unintended consequences of clinical decision support embedded into clinical information systems
Agenda

- Critical Success Factors for Clinical Decision Support (CDS)
- Definition of Unintended Consequences (UC’s)
- Standard Work
- Challenges to Effective CDS
- Examples of UC’s
- Responsibilities and Mitigation
- Conclusion
Who We Are

- Largest academic community hospital in PA
- Largest Level 1 Trauma Center in region
- Certified Stroke Center
- Employees – 10,200
- Medical Staff – 1,200+
- Nurses – 2,334

- Magnet Hospital
- 163,000 ED visits
- 68,602 admissions
- 981 acute care beds
- 3 hospital campuses
- Revenues over $1 Billion
<table>
<thead>
<tr>
<th>Year</th>
<th>Quality Milestones</th>
</tr>
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<tbody>
<tr>
<td>2007</td>
<td>- America's Best Hospitals for cancer care, digestive disorders, endocrinology, heart care and heart surgery, kidney disease, orthopedics-U.S. News &amp; World Report</td>
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<tr>
<td></td>
<td>- Leapfrog Top Hospital-The Leapfrog Group</td>
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<td></td>
<td>- Primary Stroke Center-Joint Commission</td>
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<tr>
<td></td>
<td>- Best 100 Companies to Work For-FORTUNE</td>
</tr>
<tr>
<td></td>
<td>- Top 100 Integrated Health Networks-Verispan</td>
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<td></td>
<td>- 100 Most Wired and 25 Most Wireless Hospitals-Hospitals &amp; Health Networks</td>
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<td>- HEALTH CARE'S MOST WIGED 2007 WINNER</td>
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<td>2008</td>
<td>- America's Best Hospitals for digestive disorders, geriatrics, and heart care-U.S. News &amp; World Report</td>
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<td>- Nation's Highest Heart Attack Survival Rate-Centers for Medicare and Medicaid Services (CMS)</td>
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<td>- Burn Care Re-verification for Adults and Children-American Burn Association and the American College of Surgeons</td>
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<td>- First LEED-Certified Inpatient Facility in Pa.-U.S. Green Building Council</td>
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<td>2009</td>
<td>- America's Best Hospitals for geriatrics, and urology-U.S. News &amp; World Report</td>
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<td></td>
<td>- Pennsylvania's Highest Heart Attack Survival Rate-Centers for Medicare and Medicaid Services (CMS)</td>
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<tr>
<td></td>
<td>- Accredited Chest Pain Center-Society of Chest Pain Centers</td>
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<td></td>
<td>- Best 100 Companies to Work For-FORTUNE</td>
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<td></td>
<td>- Leapfrog Top Hospital-The Leapfrog Group</td>
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<td>- Full Accreditation-Association for the Accreditation of Human Research Protection Programs (AAHRPP)</td>
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<td>- Outstanding Program Achievement Award-American College of Surgeons' Commission on Cancer (CoC)</td>
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<td>- Get With the Guidelines-Stroke Gold Performance Achievement Award-American Stroke Association</td>
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<td>- 100 Most Wired and 25 Most Wireless Hospitals-Hospitals &amp; Health Networks</td>
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<td>- EPA Mid-Atlantic Region Environmental Achievement Award-U.S. Environmental Protection Agency</td>
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<td></td>
<td>- One of the 10 Best Hospitals in America-Becker's Hospital Review</td>
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<td>2010</td>
<td>- America's Best Hospitals for geriatrics-U.S. News &amp; World Report</td>
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<td>- No. 1 in PA and No. 2 in the Nation for Heart Attack Results-Centers for Medicare and Medicaid Services (CMS)</td>
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<td>- Top 5 Academic Medical Centers in U.S.-University HealthSystem Consortium (UHC)</td>
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<td>- NCI Community Cancer Centers Program-National Cancer Institute, U.S. National Institutes of Health</td>
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<td>- 100 Best Places to Work in Healthcare-Becker's Hospital Review</td>
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<td>- Carolyn Boone Lewis Living the Vision-American Hospital Association (AHA)</td>
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<td>2011</td>
<td>- America's Best Hospitals for endocrinology, gastroenterology and geriatrics-U.S. News &amp; World Report</td>
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<td>- No. 1 and No. 2 Hospitals in the Region-U.S. News &amp; World Report</td>
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<tr>
<td></td>
<td>- Magnet Hospital redesignation for nursing excellence-American Nursing Credentialing Center</td>
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<td></td>
<td>- Top Performer on Key Quality Measures-Joint Commission</td>
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<tr>
<td></td>
<td>- Architecture and Design Award for environmentally friendly health care-GreenCare</td>
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<td></td>
<td>- Top 100 Integrated Health Networks-Verispan</td>
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<td>- 100 Best Places to Work in Health Care-Becker's Hospital Review</td>
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<td></td>
<td>- Hospital Review</td>
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</table>
Keys To Success with CDS

- Leadership Support
- System Access
- Standard Process
- Communication
Leadership Support

• Credible sponsorship throughout the organization
• Medical Staff Leadership
• C-Suite support and leadership
• Medical Executive Committee
Unintended Consequences

• Definition:
  – Unintended Consequences (UC’s) refer to events that are neither anticipated nor are the intended specific goals of the CDS intervention.

• Important to separate the technology from the process/communication issues

• Will require different approaches and solutions
“Some Unintended Consequences of Information Technology in Healthcare: The Nature of Patient Care Information System-related Errors”

- Published in JAMIA 2004 -- Ash, Berg, Coiera

- Two Main Categories:
  - Process of entering and retrieving information
  - Communication and coordination process that the Patient Care Information System is supposed to support
“Types of Unintended Consequences Related to CPOE”

- Published in JAMIA 2006 -- Campbell, Sittig, Ash, et al

- Nine Categories:
  - More/New work for physicians
  - Unfavorable work flow
  - Never ending systems demands
  - Problems related to paper persistence
  - Untoward changes in communication patterns and practices
  - Generation of new kinds of errors
  - Unexpected changes in the power structure
  - Overdependence on the technology
  - Negative emotions
Standard Work

• SPPI: Systems for Partners in Performance Improvement
  – Based on Toyota Lean Methodology

• Standard Work Infrastructure
  – Committees
  – Orders/Order Set request process
  – Multi-disciplinary process
"That's *gemba* - not gumbo. And no, lunch will not be served..."
Standard Process in Action

• Consolidation of order sets
• Value-based ordering
• Evidence based order sets
• Antibiotic Stewardship
• Anti-coagulation Task Force
Venous Thromboembolism Incidence in the Trauma Unit
Challenges to Effective CDS

• Culture
  – Loss of autonomy
  – “Continuum of Intrusion”

• Access and devices
  – Need for 24x7 access
  – Challenges of technology

• Communication
  – Change management communication
  – Clinical communication
COMMUNICATION
It's best to pretend people are actually listening to you.
Resident’s Perception of Nursing Unit Communication

- More Efficient: 24%
- Less Efficient: 48%
- No Change: 28%

Acknowledgment:
Thomas Jefferson University Hospital
Nurses’ Perception of Nursing Unit Communication

77% More Efficient
6% Less Efficient
17% No Change

Acknowledgment: Thomas Jefferson University Hospital
Physician’s Perception of Communication With Other Departments

- 67% No Change
- 19% More Efficient
- 14% Less Efficient

Acknowledgment: Thomas Jefferson University Hospital
Nurses’ Perception of Communication With Other Departments

- More Efficient: 44%
- Less Efficient: 39%
- No Change: 17%

Acknowledgment:
Thomas Jefferson University Hospital
I only had enough room to go up to 2012.

Ha! That’ll freak somebody out someday.
Alert Fatigue
LMM... THAT'S NOT A GOOD SIGN... BAD
Do you use the main Clinical Decision Support tools?

Number

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Number</th>
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<tbody>
<tr>
<td>Never</td>
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<tr>
<td>Rarely</td>
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</tr>
<tr>
<td>Occasionally</td>
<td>8</td>
</tr>
<tr>
<td>Sometimes</td>
<td>12</td>
</tr>
<tr>
<td>All of the time</td>
<td>15</td>
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Do you read the pop ups and alerts?

<table>
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</tr>
<tr>
<td>Rarely</td>
<td>8</td>
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<tr>
<td>Occasionally</td>
<td>13</td>
</tr>
<tr>
<td>Sometimes</td>
<td>22</td>
</tr>
<tr>
<td>All of the time</td>
<td>31</td>
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"Because the Computer Said So"

<table>
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<th>Ln</th>
<th>DO</th>
<th>Status</th>
<th>Date</th>
<th>Time</th>
<th>Result</th>
<th>Medication</th>
<th>Dose</th>
<th>Units</th>
<th>Y Rate</th>
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<td>A/ Appr</td>
<td>19DE</td>
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<td>mg</td>
<td>RXQD</td>
<td>PO</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- INFUSE hanging bag BEFORE STARTING new bag.
- INFUSE bag when discontinuing IV/discharging patient.
<table>
<thead>
<tr>
<th>Ln</th>
<th>DO</th>
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<th>Date</th>
<th>Time</th>
<th>Result</th>
<th>Medication</th>
<th>Dose</th>
<th>Units</th>
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<th>IV Units</th>
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<td>02</td>
<td></td>
<td>D5W - LACTATED RINGERS (D5LR)</td>
<td>1000</td>
<td>mL</td>
<td>100</td>
<td>mL/H</td>
<td></td>
<td></td>
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<td>14</td>
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<td>10</td>
<td>mg</td>
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<td></td>
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</tr>
<tr>
<td>15</td>
<td>A/Appr</td>
<td>20JAN...</td>
<td>0900</td>
<td>02</td>
<td></td>
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<td>325</td>
<td>mg</td>
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<td>0900</td>
<td>02</td>
<td></td>
<td>HYDROCHLOROTHIAZIDE</td>
<td>12.5</td>
<td>mg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>17</td>
<td>A/Appr</td>
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<td>0900</td>
<td>02</td>
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<td>5</td>
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<td>02</td>
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<td>5</td>
<td>mg</td>
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<td>0900</td>
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<td></td>
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<td>02</td>
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<td>1302</td>
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<td></td>
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<td>5</td>
<td>mg</td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**IV's:**
- INFUSE hanging bag BEFORE STARTING new bag.
- INFUSE bag when discontinuing IV/discharging patient.
Is It Really About the Orders
### Guide to using this Order Set:

- **Check the box next to the desired order.**
- **To change the start date or time, type exact date or time.**
- **Press the Collapse button to view only selected orders.**

<table>
<thead>
<tr>
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<tr>
<td>ENALAPRIL TABLET 5MG, PO, BID</td>
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<tr>
<td>ENALAPRIL TABLET 10MG, PO, BID</td>
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<tr>
<td>ENALAPRIL TABLET 20MG, PO, BID</td>
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<td>FOSINOPRIL TABLET 10MG, PO, DAILY</td>
<td>19Dec 08:59</td>
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<tr>
<td>FOSINOPRIL TABLET 20MG DOSE, PO, DAILY</td>
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<tr>
<td>LISISOPRIL TABLET 40MG DOSE, PO, DAILY</td>
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</tr>
<tr>
<td>CAPTOPRIL TABLET 50MG, PO, TID</td>
<td>19Dec 08:59</td>
</tr>
</tbody>
</table>
Diagnosis/Condition
Specific Order Sets

To select the order, single-click
Generic Orders

Order Reference

NOTE: This order is to be used as a one-time communication to the nurse. Not to be used as a Daily instruction.

1. This order is to be used as a communication tool to nursing.

2. It is intended for orders that cannot be found in any of the lists, or for special circumstances associated with an order.

3. It is NOT to be used to order medications, diets, NPO status or diagnostic tests.

4. The use of this order will be monitored for appropriate usage.
Unintended Consequences

“Issues that no amount of testing would ever uncover”

- Efficiency of order entry vs. clinical data awareness
- Best of Breed Systems
- Downtime: impact on clinical decision making
- Avoidance of system use
- Maintaining up to date CDS (alerts and order sets)
- Curses of Success
Unintended Consequences

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Who is Responsible to Address Unintended Consequences

• How are UC’s identified
  – Clinicians
  – Committees
  – Online feedback form

• Multi-disciplinary approach
  – I.T. Staff
  – CDS and other Committees
  – Quality/Legal Departments
Mitigation

- Timing of Meds
- Cancel vs. Discontinue
Proximity Alert

FIRST DOSE WITHIN 2 HOURS OF SCHEDULED DOSE ALERT

Patient MRN#: 01009020
Name: SMART, Patientone

Scheduled Time: 0900
First Dose Time: 0835

NOTICE! Your ordered first dose is within 2 hours of the scheduled dose.

TO CONTINUE: Click "PLACE THIS ORDER" button.
TO CANCEL START NOW: Erase Start Time field THEN erase Start Date field.

OK
Mitigation

• Timing of Meds
  – Alert for proximity administration

• Cancel vs. Discontinue
The Hanging Discontinue Order

### Chart Medications

**Current:**
- Date: 18DEC2011
- Time: 0808

**Worklist:**
- Start Date: 18DEC2011
- Time: 
- End Date: 20DEC2011
- Time: 0100

<table>
<thead>
<tr>
<th>Ln</th>
<th>DO</th>
<th>Status</th>
<th>Date</th>
<th>Time</th>
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**IV’s:**
- INFUSE hanging bag BEFORE STARTING new bag.
- INFUSE bag when discontinuing IV/discharging patient.

**Patient Id**
- SMART, PATIENTONE
- DOB: 4-Feb-1975

**Buttons:**
- Initiate Charting
- Order Detail
- Result Detail
- Audit
- Action Level
- Barcode Charting
- Rx COM
- Status Help
Specific Cancel/Discontinue Options

Current Order Information
- Drug: Heparin 25,000 Units/250mL D5W - ACS Scale
- Status: A/Approved
- Ordered By: LEVICK, DONALD
- Signed By: CACCESE, DAVID
- Order Mode: W
- Start Date: 19DEC2011, Time: 09:06

D/C Date & Time defaults to current, adjust as indicated
- D/C all actions as of >> Date: 19DEC2011, Time: 09:06
- Retract - medication entry error
- Cancel - non-med order

Exit
Conclusions

• Realize that unintended consequences will occur, and only some can be predicted
• A comprehensive CDS Program is critical
• Must understand capabilities and limitations of the systems
Conclusions

• Must have a full understanding of clinician workflow and care process

• The organization must understand what can be solved by technology, and what should be solved by process

• Be creative and involve others in finding solutions
There are solutions:
even to the hardest problems
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