Types of Clinical Decision Support

With examples from HIMSS Davies Award Winners
Types of CDS Interventions

- Immediate Alerts: warnings and critiques
- Event-driven alerts and reminders
- Order Sets, Care Plans and Protocols
- Parameter Guidance
- Smart Documentation Forms
- Relevant Data Summaries (Single-patient)
- Multi-patient Monitors and Dashboards
- Predictive and Retrospective Analytics
- Filtered Reference Information and Knowledge Resources
- Expert Workup Advisors
Davies: Role of Health IT in Preventing Errors

CDS
- Alerts and reminders
- Clinical guidelines
- Order sets
- Patient data reports, dashboards
- Documentation templates
- Diagnostic support
- Reference information

- Decision support feature identified 164,250 alerts, resulting in 82,125 prescription changes
- Problem medication orders dropped 58%, medication discrepancies by 55%
- Addressed “high alert medications,” confusing look-a-like and sound-alike drug names, patients with similar names

Maimonides Medical Center, 2002 HIMSS Davies Organizational Award

© 2011 by the Healthcare Information and Management Systems Society (HIMSS)
CDS example: drug warning (immediate alert)

Current Order:
CEFUROXIME IV

Warnings:
POSSIBLE ALLERGY

Message:
Pt. has a POSSIBLE allergy to CEPHALOSPORINS.
<Documented allergy to PENICILLINS --> HIVES.>

Options:
C Cancel order
K Keep (override) order

Use up & down arrow keys to read warning messages.
Responding to Abnormal Lab Results (Event-driven Alert)

**View PtLookup**

**Patient:** H.E 65F 06215446  Adm: 08/17/94 Room: 12B-351
**Time:** 10/19/94 05:39 AM  Alert#38269  12B phone: x7865
**Alert:** DANGEROUSLY LOW SERUM POTASSIUM
**Reason:** <BLOOD> K = 3.2 at 04:22 AM, 10/19/94
  Patient is currently on DIGOXIN.

**Relevant medications:**
LASIX 20 MG IV BID Starting on 10/18 10/17
DIGOXIN EVEN days: .125; ODD days: .25 PO 09/28

**Actions:**
- [ ] A  D/C or EDIT relevant medications
- [ ] B  Order POTASSIUM CHLORIDE IV
- [ ] C  Order POTASSIUM CHLORIDE PO
- [ ] D  Order set: STAT EKG
- [ ] E  Order set: STAT K

---

Ganesan, Shridar, M.D., Ph.D. Bp#2710 was paged on 05:40 AM Oct 19, 1994
Covering M.D.: Morrow, David Andrew, M.D. Bp#5336

Press ALT-D or ALT-G to exit and acknowledge alert.
Davies: Role of Health IT in Preventing Errors

- **CDS**
  - Alerts and reminders
  - Clinical guidelines
  - Order sets
  - Patient data reports, dashboards
  - Documentation templates
  - Diagnostic support
  - Reference information

Allina Hospitals & Clinics, 2007 HIMSS Davies Organizational Award

- Created a process to reduce drug utilization
- Ability to generate a system list of specific IV medications, which can be changed to PO medications without contacting a provider
  - PO medications are a less costly route of therapy
  - Chance of infection from IV use is decreased
  - Average length of stay is reduced
  - Pharmacy and Nursing time to prepare and administer medication is reduced
Drug substitution suggestion (critique)

In community-acquired pneumonia the relevant organisms covered by a 3rd generation cephalosporin can be well covered with cefuroxime (a 2nd generation cephalosporin). This switch will help delay the emergence of multi-drug resistant organisms and reduce the cost of treatment by half.

In patients who do not need broad spectrum gram-positive and gram-negative coverage, regimens such as TMP/SMX or ampicillin are appropriate.

<change order to cefuroxime <2nd generation cephalosporin>>

< Keep the original order > CEFOTAXIME

< order Other > (e.x. TMP/SMX, ampicillin>

Enter all or part of the route (PO, NG, IV, etc).
Please consider the following:
If you suspect appendicitis, a KUB is unlikely to change management. Appendicolith is found in approximately 1% of KUBs. If a question exists about appendicitis, consider U/S.
Davies: Role of Health IT in Preventing Errors

**CDS**
- Alerts and reminders
- Clinical guidelines
- Order sets
- Patient data reports, dashboards
- Documentation templates
- Diagnostic support
- Reference information

- New procedures regarding a medication could be introduced in just hours
  - Problems with Dilaudid, e.g., brought about different recommended doses in patients
- Changed 32 order sets and 22 preference lists in 3 hours
- Omitted administration of medications decreased 22% from a total of 18 to 14 a month

Evanston Northwestern Healthcare, 2004 HIMSS Davies Organizational Award

© 2011 by the Healthcare Information and Management Systems Society (HIMSS)
Hyperlipidemia

Setting: Ambulatory - Ongoing management of a chronic condition

Vital signs and monitoring (Select ONE OR MORE orders and modify as needed)

- Weigh patient.
- Record height of patient.
- Calculate body mass index.
- Measure waist circumference.
- Measure blood pressure.

Laboratory tests (Select ONE OR MORE orders and modify as needed)

- Fasting lipid profile routine analysis. Patient should be fasting for 8 hours.
- Complete blood count routine analysis.
- Basic metabolic panel routine analysis. Patient should be fasting for 8 hours if a fasting blood glucose level is required.
- Liver function tests routine analysis.
- Creatine kinase routine analysis. Perform if patient is on statins or fibrates and experiences myalgia or other muscular symptoms.

Diagnostic tests (Select ONE OR MORE orders and modify as needed)
Ordering Blood Products in CPOE

• Search for the Transfusion Caresets in the general order catalog.
• There are five different transfusion Caresets plus an order for Transfusion Reaction Investigation

• Select the desired Careset
• The Careset appears with pre-built order sentences
• A Type and Screen order is part of transfusion Careset
Davies: Role of Health IT in Preventing Errors

CDS
- Alerts and reminders
- Clinical guidelines
- Order sets
- Patient data reports, dashboards
- Documentation templates
- Diagnostic support
- Reference information

“Pre-EHR”...
- Offices relied on the patients to return for repeat INR blood tests

7,267 patients in the practice currently prescribed warfarin (an unknowable # prior to EMR)

“EHR”...
- Customized encounter form for warfarin management
  - Weekly reports
    - Identifies patients overdue
      - Patients overdue as much as 6 to 12 months
      - Nurses contact patients, facilitate compliance with anticoagulation monitoring.

Cardiology Consultants of Philadelphia, 2008 HIMSS Davies Ambulatory Award

© 2011 by the Healthcare Information and Management Systems Society (HIMSS)
Provider Report Cards (Retrospective Analytics)

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>SUBSERVICE</th>
<th>Percent Transfusions &gt; Active</th>
<th>Percent Transfusions &gt; Inactive</th>
<th>Total Units Transfused</th>
<th># of Transfusions</th>
<th>Single Unit Transfusions</th>
<th>Average HCT</th>
<th>Average HGB</th>
<th># of Episodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesiology - Med Serv</td>
<td>Blood</td>
<td>24%</td>
<td>0%</td>
<td>1.0</td>
<td>1</td>
<td>1</td>
<td>100%</td>
<td>1.3</td>
<td>5</td>
</tr>
<tr>
<td>Anesthesiology - Med Serv</td>
<td>UNK</td>
<td>0%</td>
<td>19.0</td>
<td>1.3</td>
<td>4</td>
<td>3</td>
<td>67%</td>
<td>1.3</td>
<td>5</td>
</tr>
<tr>
<td>Anesthesiology - Med Serv</td>
<td></td>
<td>0%</td>
<td>19.3</td>
<td>1.3</td>
<td>5</td>
<td>4</td>
<td>75%</td>
<td>1.3</td>
<td>5</td>
</tr>
<tr>
<td>Cardiology - Med Serv</td>
<td></td>
<td>0%</td>
<td>19.3</td>
<td>1.3</td>
<td>5</td>
<td>4</td>
<td>75%</td>
<td>1.3</td>
<td>5</td>
</tr>
<tr>
<td>Cardiac Surgery</td>
<td></td>
<td>33%</td>
<td>22.9</td>
<td>1.0</td>
<td>3</td>
<td>3</td>
<td>100%</td>
<td>1.1</td>
<td>8</td>
</tr>
<tr>
<td>Cardiac Surgery</td>
<td></td>
<td>20%</td>
<td>24.1</td>
<td>1.3</td>
<td>5</td>
<td>4</td>
<td>75%</td>
<td>1.1</td>
<td>8</td>
</tr>
<tr>
<td>Cardiac Surgery</td>
<td></td>
<td>25%</td>
<td>23.6</td>
<td>1.1</td>
<td>8</td>
<td>7</td>
<td>86%</td>
<td>1.1</td>
<td>8</td>
</tr>
<tr>
<td>Cardiology - Med Serv</td>
<td></td>
<td>7%</td>
<td>20.4</td>
<td>1.2</td>
<td>19</td>
<td>16</td>
<td>81%</td>
<td>1.2</td>
<td>19</td>
</tr>
</tbody>
</table>

- Reports are generated and provided to Service Chiefs
- Service Chiefs distribute and review the reports with providers
Davies: Role of Health IT in Preventing Errors

CDS
- Alerts and reminders
- Clinical guidelines
- Order sets
- Patient data reports, dashboards
- Documentation templates
- Diagnostic support
- Reference information

Cardiology Consultant of Philadelphia, 2008 HIMSS Davies Ambulatory Award

Device Recall:
- Medtronic's Fidelis defibrillator lead
  Queried EHR database
  - Able to identify all patients implanted with this lead, 10 minutes after recall notification
  - Identified 100+ patients beyond those identified in the records of the device manufacturer

Mail-merge form letters created
- Notified all patients within hours (not weeks as pre-EHR)
- Device manufacture modified their local processes for collecting implanted lead data
Davies: Role of Health IT in Preventing Errors

CDS
• Alerts and reminders
• Clinical guidelines
• Order sets
• Patient data reports, dashboards
• Documentation templates
• Diagnostic support
• Reference information

• Improved allergy documentation 88% → 100%
• Improved pain assessment documentation → 95%
• Improved medication list documentation 67% → 100%

Maimonides Medical Center,
2002 HIMSS Davies Organizational Award
Davies: Role of Health IT in Preventing Errors

CDS
- Alerts and reminders
- Clinical guidelines
- Order sets
- Patient data reports, dashboards
- Documentation templates
- Diagnostic support
- Reference information

Regional PACS (Picture Archiving and Communication System):
- Enables access to images and concurrent review by multiple providers in separate locations across the region, thereby, improving the clinical effectiveness and patient outcomes

Radiologists and other specialists can access studies for timely online comparison from the same PACS system allowing broad and rapid access to images

Eastern Maine Medical Center, 2008 HIMSS Davies Organizational Award

© 2011 by the Healthcare Information and Management Systems Society (HIMSS)
Davies: Role of Health IT in Preventing Errors

CDS
• Alerts and reminders
• Clinical guidelines
• Order sets
• Patient data reports, dashboards
• Documentation templates
• Diagnostic support
• Reference information

Access to drug references:
• Desktop access via the intranet is possible to Micromedex, OVID, ENH* Formulary, ENH Drug Use Guidelines, ENH Policy & Procedures, IV Administration Guidelines, and several other secondary and tertiary medical references.

Evanston Northwestern Healthcare (*ENH), 2004 HIMSS Davies Ambulatory Award

© 2011 by the Healthcare Information and Management Systems Society (HIMSS)
Infobuttons
(Filterated Reference Info)

<table>
<thead>
<tr>
<th>Problem Name</th>
<th>Start Date</th>
<th>Status</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>11/27/95</td>
<td>A</td>
<td>MAJOR</td>
</tr>
<tr>
<td>Elevated cholesterol</td>
<td>11/27/95</td>
<td>A</td>
<td>MAJOR</td>
</tr>
<tr>
<td>CAD</td>
<td>3/14/97</td>
<td>A</td>
<td>MAJOR</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>1/21/00</td>
<td>A</td>
<td>MAJOR</td>
</tr>
</tbody>
</table>

Enter a search term: **CHF**

Or select a problem from the favorites list below.

| Asthma, rule out |

Powered by IMO Personal Health Terminology
© 2000

Tell Me More About...
Definition
Etiology/Epidemiology
Clinical Presentation
Diagnosis
Therapy
Prognosis
Books
Journals
News
Guidelines