Answering Clinicians’ Questions within the EHR with Infobuttons

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A 51-year-old female with diabetes type 2, unable to control it in the last year (HbA1c = 9%). Taking metformin for the past 2 years. Needs additional drug, but won’t take insulin. Concern about weight gain.

Alternatives: DPP-4 inhibitors vs. SGLT2 inhibitors
- Both are effective
- Studies of the cardiovascular safety of the drugs are under way
- Distinct side effect profiles and mechanism of action

Which is the best approach for this patient?

**Case Vignette**

Agnes is a 51-year-old widow with hypertension who received a diagnosis of type 2 diabetes a decade ago. She has been worried about her diabetes since then because she has not been able to gain complete control over it. Her glycated hemoglobin level was 7.0% for 1 year but gradually increased to 9.0%. For the past 2 years, she has been taking metformin. She is maintaining her weight at 165 pounds (75 kg), but she is not able to lose weight. Agnes goes to the gym and walks on a treadmill three times a week, but she jokes that the gym members who talk about a “runner’s high” must be hallucinating. In short, she tells you that she has made as many lifestyle changes as she can.

**References**

Innovation Life Cycle

1. Understand the problem
2. Design innovative interventions
3. Evaluate
4. Disseminate
   - Tools
   - Standards
   - Regulations
Clinicians’ Information Needs

12 Clinical questions raised
6 pursued
4 answered

Del Fiol G, Workman TE, Gorman PN. Questions raised by clinicians at the point of care. JAMA Int Med. 2014.
In the movie *Life of Pi*, the protagonist and his tiger companion face a slow death from thirst while surrounded by an ocean of water. The ubiquity of the desired and vital substance, though in unacceptable form, supplies rich irony to the protagonist’s struggle, and so it is with the information needs of clinicians. It is no great revelation to say we live in a society that carries a universe of possibilities in its pocket: global telecommunication and video conferencing, instantaneous knowledge at our fingertips, business transactions via mobile applications, and libraries of books, music, and videos on demand. Even so, the information needs of clinicians who provide care in the office or at the bedside are not so easily met.
Why are information needs not met?

- 12 no time
- 7 doubt answer exists
- 5 not urgent
- 3 not important
- referred to specialist
- 2 deferred & forgotten
Information-Seeking

11 positive impact

4 2-3 min max searching
Implications

• ~60% of information needs are not met
  – Not getting better: less time, complex patients and knowledge
  – Missed opportunity: improved care & life-long learning

Efficient tools  Decision under complexity  EHR as learning environment  Integrate with maintenance of certification
Understand the problem

Evaluate

Disseminate

Tools

Standards

Regulations

Design interventions
Clinicians’ information needs

1 question out of every 2 patients seen

>60% of questions left unanswered

Resources: answer >90% of questions

Context

EHR
DrugPoint® Summary
Donepezil Hydrochloride (see details in DRUGDEX®)

Topics

- Adult Dose
- Adverse Effects
- Contraindications
- Drug Interaction
- Pregnancy Category
- Precautions
- How Supplied
- Dosing & Indications

Adult Dosing (see details in DRUGDEX®)

- Alzheimer's disease - Dementia (Mild to Moderate): tablets/solution, 5 or 10 mg ORALLY once daily at bedtime, with or without food
- Alzheimer's disease - Dementia (Mild to Moderate): orally disintegrating tablets, 5 or 10 mg dissolve ORALLY on the tongue once daily
- Alzheimer's disease - Dementia (Severe): tablets, 10 mg ORALLY once daily at bedtime, with or without food
- Alzheimer's disease - Dementia (Severe): orally disintegrating tablets, 10 mg dissolve ORALLY on the tongue once daily

Resources

- Micromedex
- UpToDate
- MDConsult
- Medline Plus

BID PRN
Type 2 diabetes is a disorder that happens when your body does not make enough insulin or is unable to use insulin properly. The inability to use your insulin is called insulin resistance. This problem with insulin causes the level of sugar in your blood to become abnormally high.

When you digest food, your body breaks down much of the food into sugar (glucose). Your blood carries the sugar to the cells of your body for energy. The pancreas gland makes insulin, which helps move the sugar from the bloodstream into the cells.

When your body does not have enough insulin or cannot use insulin properly, sugar cannot get into your cells. Sugar builds up in your blood. Too much sugar in your blood can cause many problems. These problems can be life-threatening if they are not treated. However, proper treatment can control your blood-sugar level.
Impact of Infobuttons

<table>
<thead>
<tr>
<th></th>
<th>Infobuttons</th>
<th>Unaided Search</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Session Time</td>
<td>35 Seconds</td>
<td>2 to 8 minutes</td>
</tr>
<tr>
<td>Questions Answered</td>
<td>85%</td>
<td>78%</td>
</tr>
</tbody>
</table>

- **Decision enhancement or learning**
  - Over 62% of sessions

- **Usage uptake**
  - Partners Healthcare: ~100,000 sessions / month
  - Intermountain: ~20,000 sessions / month

Maviglia et al. J Am Med Inf Assoc, 2006
Cimino JJ. J Am Med Inf Assoc. 2009
Del Fiol et al. J Am Med Inf Assoc, 2008
Potential Impact
VA Outpatient Care – 1 year

80 million visits

90 seconds savings per search

7% improved success rate

24 million questions pursued

600,000 clinician hours saved

1,680,000 more questions answered
Understand the problem

Design interventions

Evaluate

Disseminate

Standards

Tools

Regulations
Why did we need a standard?

- **Azithromycin**
- Female
- 75 years old

**Medication order entry**
- **Setting:** ED
- **Dose**

**Electronic Health Record**

http://resource1.com/search = "azithromycin"


http://resource3.com/searchConcept = 3333 ^ azithromycin
filter = 11 ^ dosage

**No Context**
Context Dimensions

Patient
- Gender
- Age group
- Concept of interest
- Secondary observations

User
- Patient vs. provider
- Discipline / specialty

EHR
- Task (e.g., order entry, problem list entry, lab results review)

Organization
- Care setting
- Service delivery location
- Location of interest
Standards-Based Approach

- EHR
- Infobutton Manager
- Resource 1
- Resource 2
- Resource 3

HL7
OpenInfobutton

http://www.OpenInfobutton.org
Demo at: http://lite.bmi.utah.edu/OpenInfobuttonDemo.html
Design interventions

Understand the problem

Evaluate

Disseminate

Standards

Tools

Regulations
US EHR Certification (Meaningful Use)

- Infobuttons: Required CDS capability compliant with HL7 Infobutton Standard
  - Provider reference information
  - Patient education
- Widely adopted by large content providers
- Adopted by over 1000 certified EHR products
A Game-Changing Standard: The Infobutton

By Amy Eckenroth

Don Kemper, MPH
Healthwise CEO

CMS in its wisdom recently over-ruled the HIT Policy Committee’s recommendation to include “patient-specific education resources” as a “meaningful use” provision. Its reason for exclusion: “…there is currently a paucity of knowledge resources that are integrated within EHRs, that are widely available, and that meet these criteria, particularly in multiple languages.”

The rising use of the Health Level 7 (HL7) “Infobutton” to easily integrate patient-specific education resources into EHRs is a trend for CMS to consider in its policies.

Posted on Tuesday, February 2nd, 2010 Filed Under: eHealth Initiative
Innovation Life Cycle

- Design interventions
- Understand the problem
- Evaluate
- Disseminate
- Tools
- Standards
- Regulations
Possibilities in Today’s Landscape

• “Gentle” push approach
  – Disease outbreaks (CDC)
  – Recruitment for clinical trials
  – Patient preferences (IOM report)
  – Pharmacogenomics

• Predictive analytics
  – Risk models
Clinical Evidence Summarization

Funded by a four-year R01 grant from the National Library of Medicine
Resistant to MTX — In patients resistant to MTX after three to six months of treatment at optimal doses, we suggest either the combination of continued MTX plus a TNF inhibitor or the use of DMARD “triple therapy” with MTX plus SSZ and HCQ, rather than monotherapy with another nonbiologic or biologic DMARD. In patients with partial responses showing progressive improvement, we may continue therapy with MTX for greater than three months before switching to one of these approaches, particularly in those with low to moderate levels of disease activity and with limited functional impairment. (See ‘Choice of therapy’ below and ‘MTX plus TNF inhibitor’ below and ‘DMARD triple therapy’ below.)

Apatascept, the T-cell costimulation blocker, is an alternative to TNF inhibitors for use in combination with MTX in patients with an inadequate response to MTX, but its use in this setting is supported by a smaller body of evidence than that for TNF inhibitor use. It can be administered intravenously or subcutaneously. Usual practice since TNF inhibitors came into clinical use beginning in the late 1990s has been to add a TNF inhibitor to MTX in patients with an inadequate response to MTX.

Clinical trials of combination therapy in persistently active rheumatoid arthritis in adults

- Nonpharmacologic and preventive therapies of rheumatoid arthritis
In patients with active RA resistant to initial therapy after three to six months of treatment, we recommend treatment with a different or additional DMARD.

“Shorter-acting sulfonylureas, such as glipizide, are less likely to cause hypoglycemia than the older, long-acting sulfonylureas, and therefore are the preferred sulfonylureas, especially in older patients.”
“For patients with multivessel coronary artery disease (CAD) and proximal LAD disease, most of the randomized trial data evaluating survival come from surgical trials comparing CABG to medical therapy that were performed more than 25 years ago.”

“The treatment of rheumatoid arthritis (RA) is directed toward the control of synovitis and the prevention of joint injury.”
**UpToDate Excerpts**

- **Initial treatment of moderately to severely active rheumatoid arthritis**
  - Definition of resistance to initial DMARDs
    - A requirement, in addition to DMARDs, for chronic glucocorticoid therapy in a dose of greater than about 5 to 7.5 mg/day of prednisone or equivalent to achieve or maintain remission or low disease activity after three to six months of treatment with DMARDs. [more ▼](#)

- **Approach to drug therapy**
  - Importantly, we do not recommend combinations of biologic DMARDs (e.g., or the combination of abatacept with either a TNF inhibitor or anakinra. [more ▼](#)

- **Pretreatment**
  - A number of important pretreatments should be performed before using DMARDs, including laboratory assessment (complete blood count, serum creatinine, aminotransferases, and other studies as indicated), evaluation of comorbidities, vaccinations, and screening for hepatitis C, hepatitis B, and latent tuberculosis infection.

- **Resistant to HCQ and/or SSZ**
  - In patients resistant to three to six months of therapy with hydroxychloroquine (HCQ) or sulfasalazine (SSZ) for initially mildly active disease, we suggest adding an alternative DMARD, usually methotrexate (MTX); [more ▼](#)

- **Choice of therapy**
  - Abatacept may be used as an alternative to a TNF inhibitor in patients in whom MTX plus a TNF inhibitor would otherwise be appropriate, particularly in patients unable to use a TNF inhibitor and in patients with a high level of disease activity.
Questions?

www.OpenInfobutton.org

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<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
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</tr>
<tr>
<td><strong>Gender</strong></td>
<td>F</td>
</tr>
<tr>
<td><strong>Problem list</strong></td>
<td>Heart Failure, Post traumatic stress disorder, Gastroesophageal reflux, Diabetes mellitus type 2, Migraine</td>
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<tr>
<td></td>
<td>Add problem Neurofibromatosis type 1</td>
</tr>
<tr>
<td><strong>Medications</strong></td>
<td>Rosuvastatin (Crestor), 20 Mg, Tablet, Oral, Linagliptin (Tradjenta), 5 Mg, Tablet, Oral, Warfarin (Coumadin) 7.5Mg, Tablet, Oral, Clopidogrel 300 MG Oral Tablet</td>
</tr>
<tr>
<td><strong>Lab results</strong></td>
<td>Serum digoxin 1.5 mg/dl, Total cholesterol 300 mg/dl, K 2.8 mEq/l, Na 127 mEq/l, C Reactive Protein 555 ug/dl, HbA1c 8.2%</td>
</tr>
</tbody>
</table>
Dosing Guidelines (2)  Drug Labels (3)  Clinical Annotations (31)

Available Guidelines

1. CPIC Dosing Guideline for clopidogrel and CYP2C19
2. Dutch Pharmacogenetics Working Group Guideline for clopidogrel and CYP2C19

CPIC Dosing Guideline for clopidogrel and CYP2C19

Summary

The CPIC Dosing Guideline for clopidogrel recommends an alternative antiplatelet therapy (e.g., prasugrel, ticagrelor) for CYP2C19 poor or intermediate metabolizers if there is no contraindication.

Annotation

last updated 05/22/2013
### Electronic Health Record

**Information audience**: Healthcare provider

<table>
<thead>
<tr>
<th>Age</th>
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#### Problem list
- Heart Failure
- Post traumatic stress disorder
- Gastroesophageal reflux
- Diabetes mellitus type 2
- Migraine

- **Add problem**: Neurofibromatosis type 1

#### Medications
- Rosuvastatin (Crestor), 20 Mg, Tablet, Oral
- Linagliptin (Tradjenta), 5 Mg, Tablet, Oral
- Warfarin (Coumadin) 7.5Mg, Tablet, Oral
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- Serum digoxin 1.5 mg/dl
- Total cholesterol 300 mg/dl
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Neurofibromatosis Type 1

Description

Other Names

NF1, von Recklinghausen's disease

ICD-9

237.7, Neurofibromatosis

For additional ICD-9 codes of related conditions, see NF1 ICD9 (54 KB).

Description

Neurofibromatosis type 1 (NF1) is a common autosomal dominant neurocutaneous genetic disorder, first described in the medical literature in 1882 and previously known as von Recklinghausen disease. The NF1 gene product, neurofibromin, is a Ras-GAP protein and acts as a "tumor suppressor." Mutations in this gene, located on the long arm of chromosome 17, typically