Answering Clinicians' Questions within the EHR with Infobuttons

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Case Vignette

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CLINICAL DECISIONS

Glycemic Management in a Patient with Type 2 Diabetes

N Engl J Med 2013; 369:1370-1372 | October 3, 2013 | DOI: 10.1056/NEJMclde1311497

Comments and Poll open through October 16, 2013

Share:

Article | References

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.

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drugs

of

N Engl J Med 2013; 369:1370-1372. 2013

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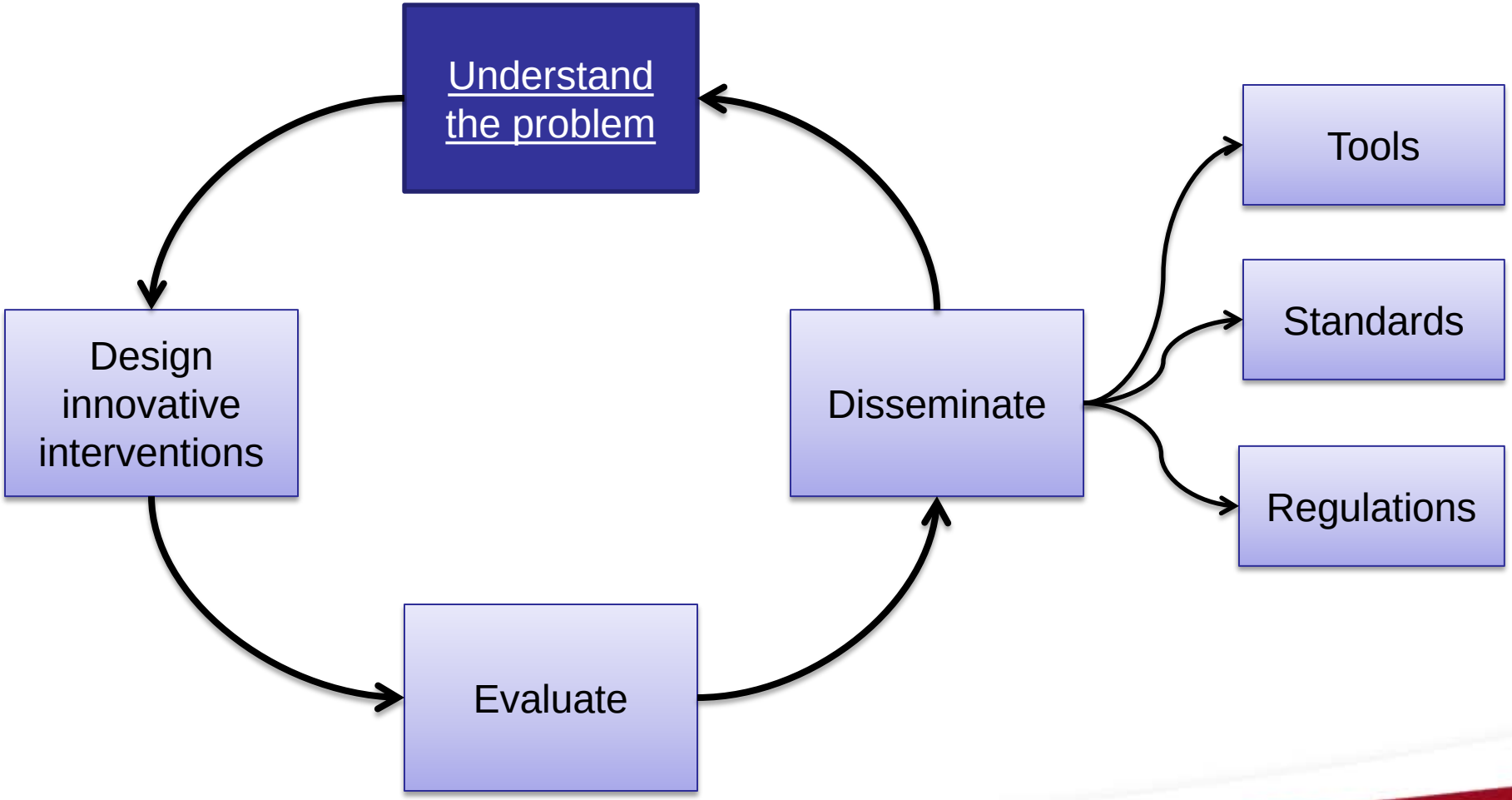
Innovation Life Cycle



Clinicians' Information Needs

20 patients

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.

JAMA Internal Medicine
Formerly *Archives of Internal Medicine*

Invited Commentary | May 2014

Water, Water, Everywhere, and Not a Drop to Drink

David Carnahan, MD, MSCE[1,2]

[+] Author Affiliations

JAMA Intern Med. 2014;174(5):719-720. doi:10.1001/jamainternmed.2014.1.

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.

Y OF UTAH
MEDICINE

Why are information needs not met?

12
no time

7
doubt answer exists

5
not urgent
not important

3
referred to specialist

2
deferred & forgotten

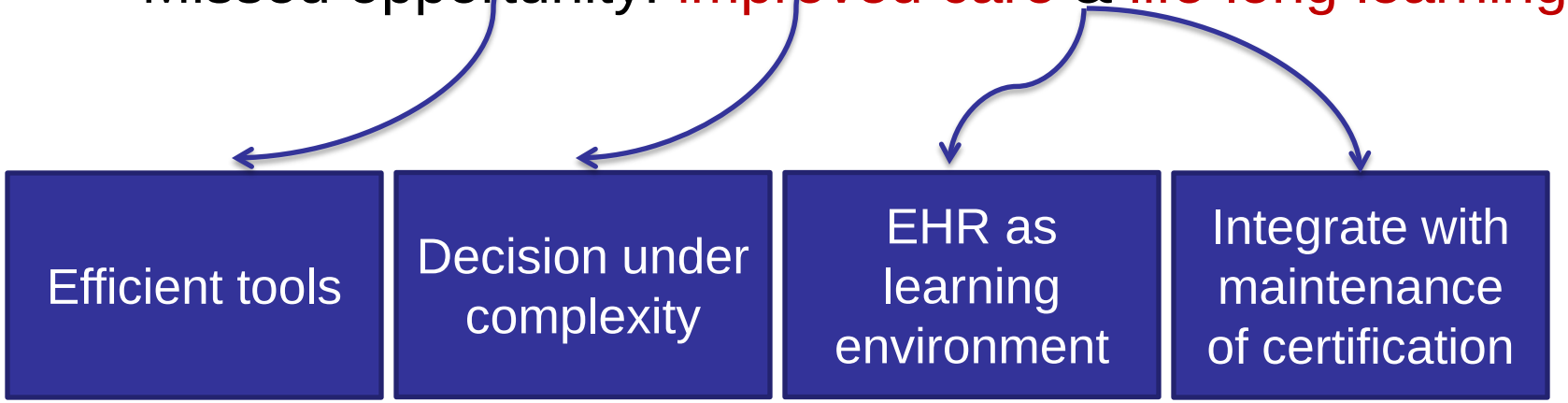
Information-Seeking

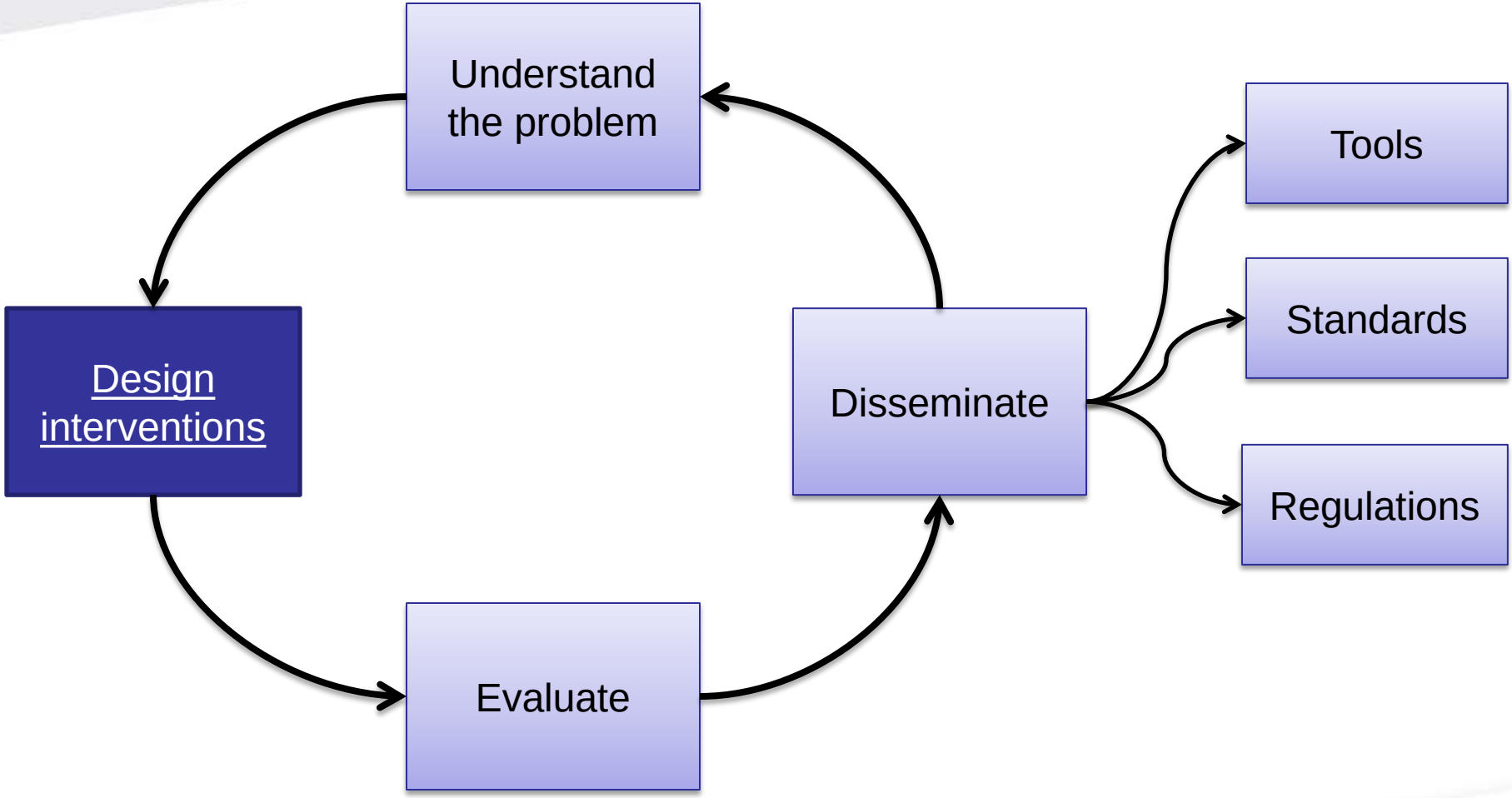
11
positive
impact

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

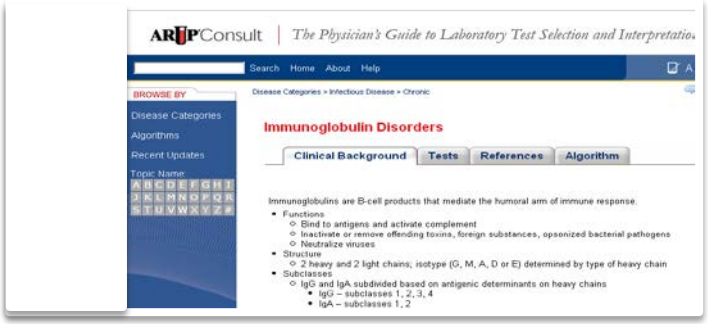



Understand the problem
Design interventions
Evaluate
Disseminate
Tools
Standards
Regulations

Clinicians' information needs

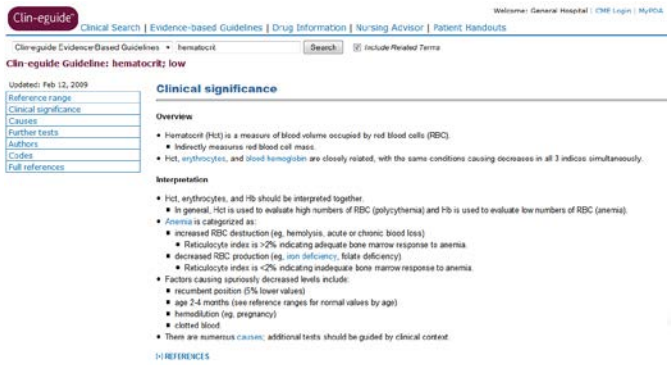
1 question out of every
2 patients seen

Resources: answer
>90% of questions



Context

EHR



> 60% of questions
left unanswered

Rx

Cancel/Refresh

Aricept (Donepezil HCl)

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

More topics...

Choose a *resource*:

- Micromedex
- UpToDate
- MDConsult
- Medline Plus

Topics

Resources

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

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 O[illegible]e daily

[illegible] (Zantac), 150mg, Tablet 1 PO PRN

BID PRN

Diabetes Mellitus, Type 2

- Overview
- Diagnosis
- Etiology
- Prognosis
- Therapy
- Patient education

Choose a *resource*:

- IHC Care Process Models
- UpToDate
- Clineguide
- MDConsult
- PubMed

Have you found the answer to your question?

- Yes
- No

What impact has the content had on your patient care decision?

- Reinforced previous decision
- Changed my decision
- Did not affect my decision

MD CONSULT

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Search Patient Education for Diabetes Mellitus Search

You are here: Home > Patient Education > Diabetes Mellitus: Type 2

Email to Colleague | Print Versi

Diabetes Mellitus: Type 2

What is type 2 diabetes mellitus?

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.

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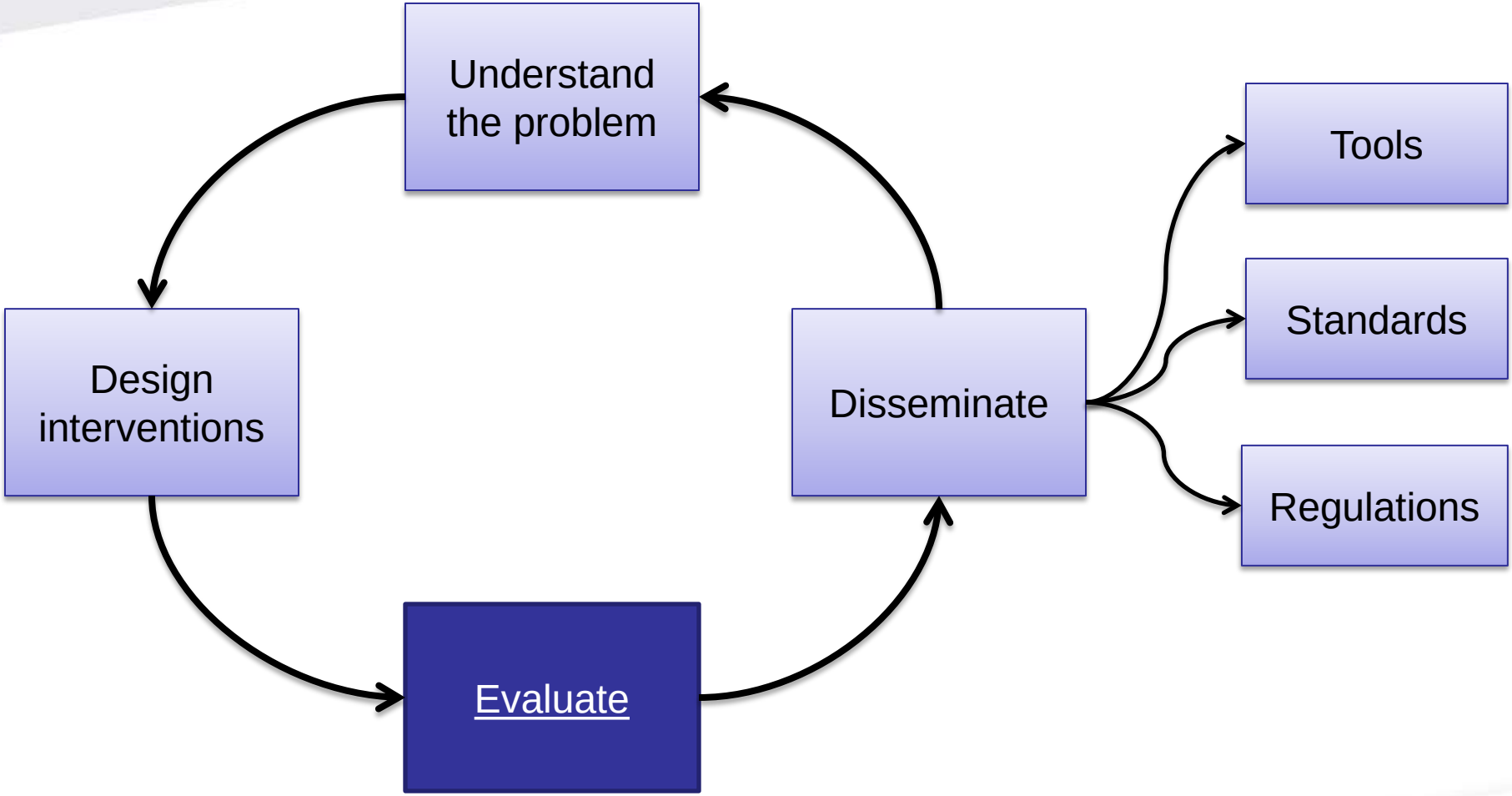
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Impact of Infobuttons

	Infobuttons	Unaided Search
Median Session Time	35 Seconds	2 to 8 minutes
Questions Answered	85%	78%

- Decision enhancement or learning
  - Over 62% of sessions
- Usage uptake
  - Partners Healthcare: ~100,000 sessions / month
  - Intermountain: ~20,000 sessions / month

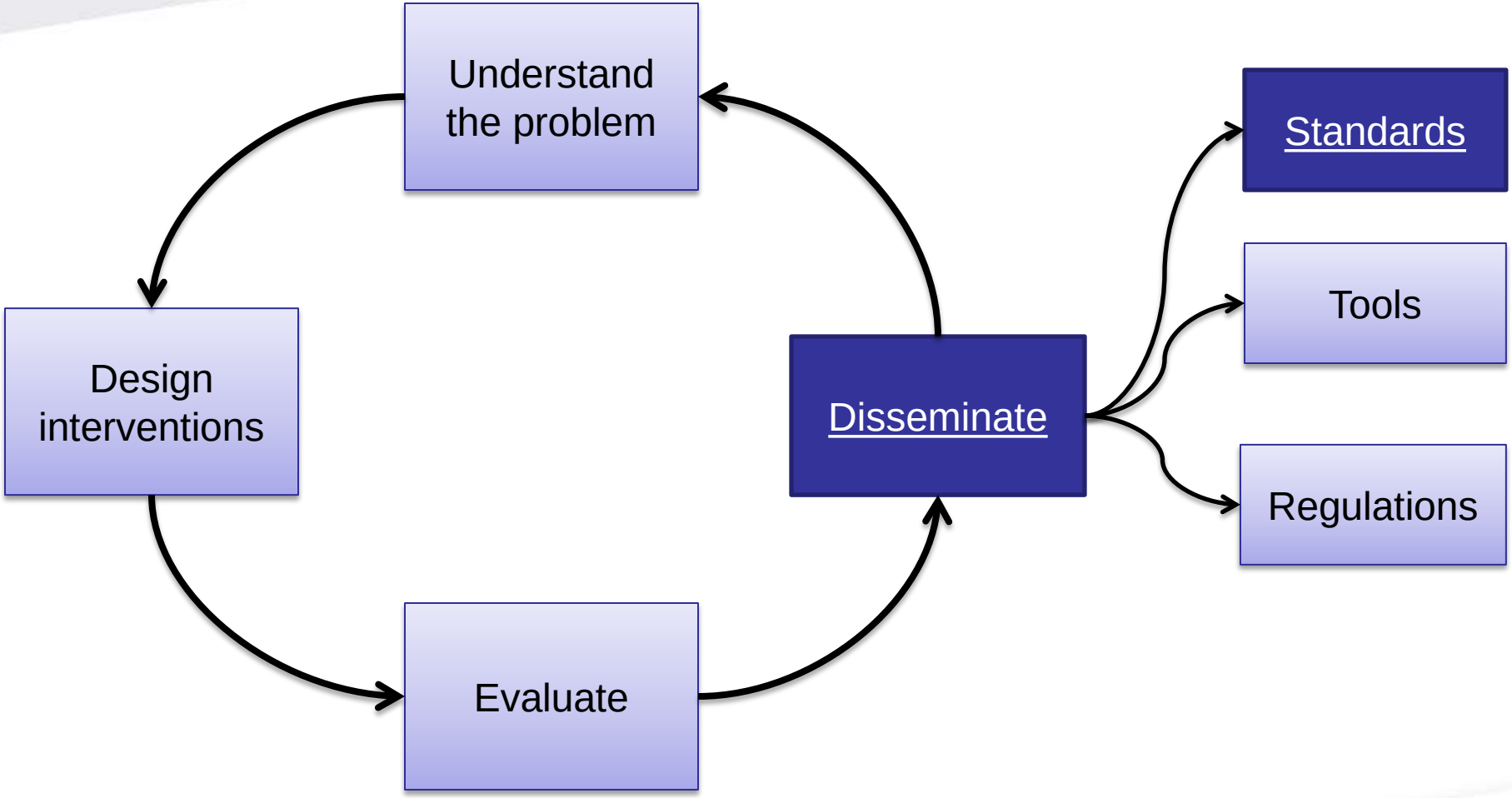
Maviglia et al. J Am Med Inf Assoc, 2006
Cimino JJ. J Am Med Inf Assoc. 2009
Del Fiol et al. J Am Med Inf Assoc, 2008

Potential Impact
VA Outpatient Care – 1 year

80 million visits → 24 million questions pursued

90 seconds savings per search → 600,000 clinician hours saved

7% improved success rate → 1,680,000 more questions answered


Understand the problem
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Why di standard?

http://resour
search = "a

http://reso
"azithrom
dose [All Fie

Azithromycin
Female
75 years old
Medication order entry
Chronic kidney disease
User: MD
Setting: ED
Dose

Electronic Health Record

API

API Resource 1

No Context

ource 2

API Resource 3

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

Context Dimensions

Patient

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

User

- Patient vs. provider
- Discipline / specialty

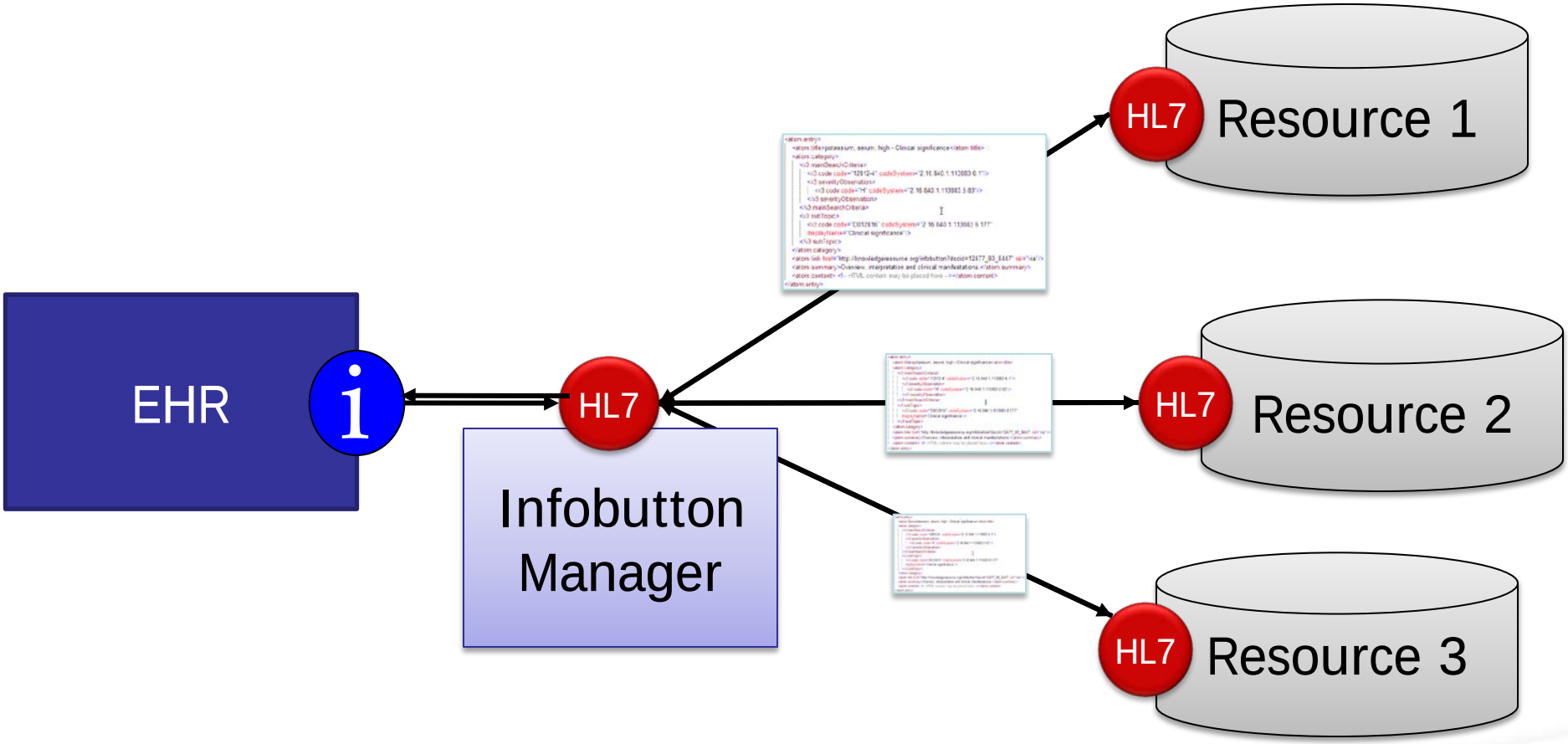
EHR

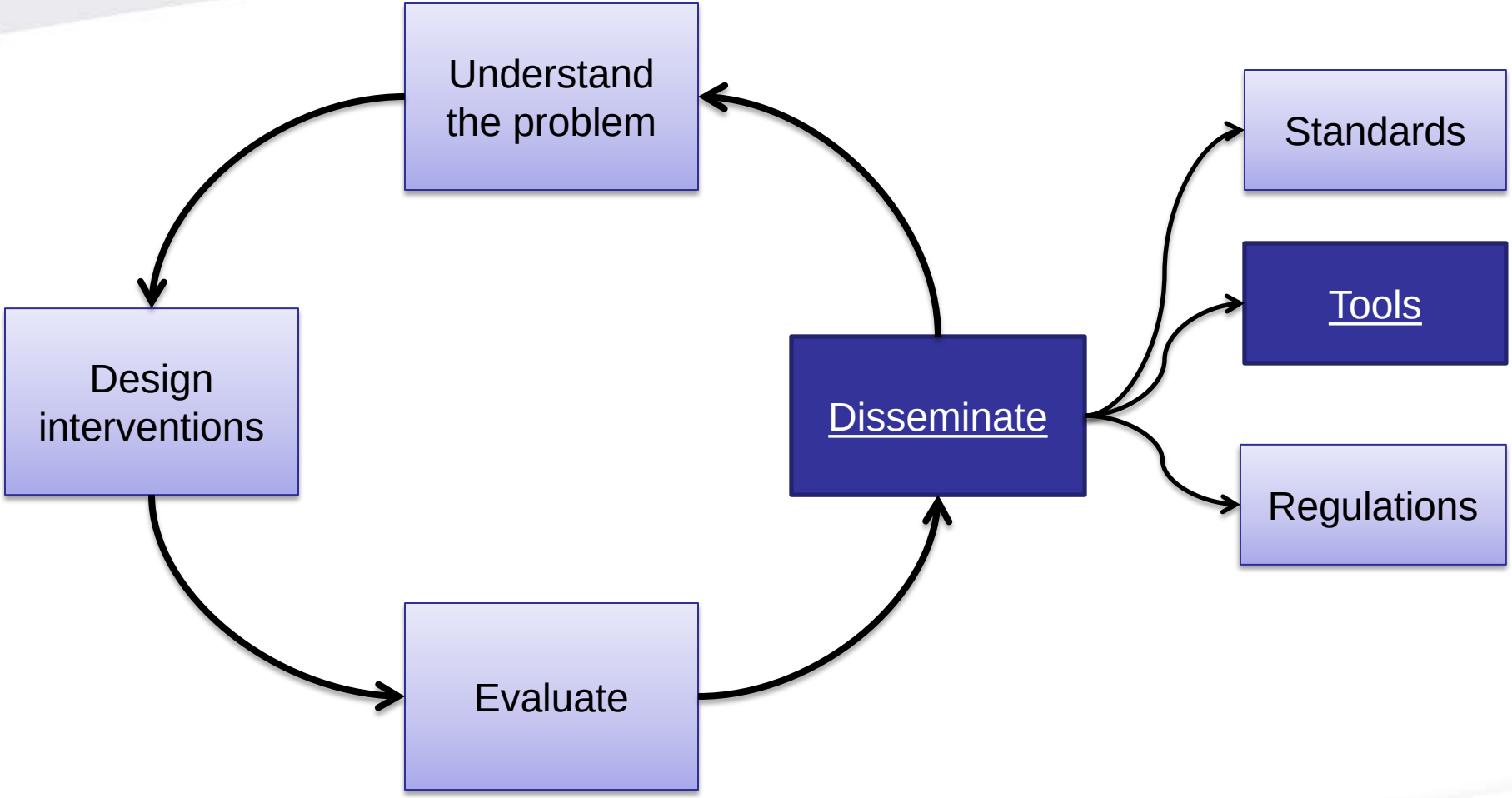
- Task (e.g., order entry, problem list entry, lab results review)

Organization

- Care setting
- Service delivery location
- Location of interest

Standards-Based Approach

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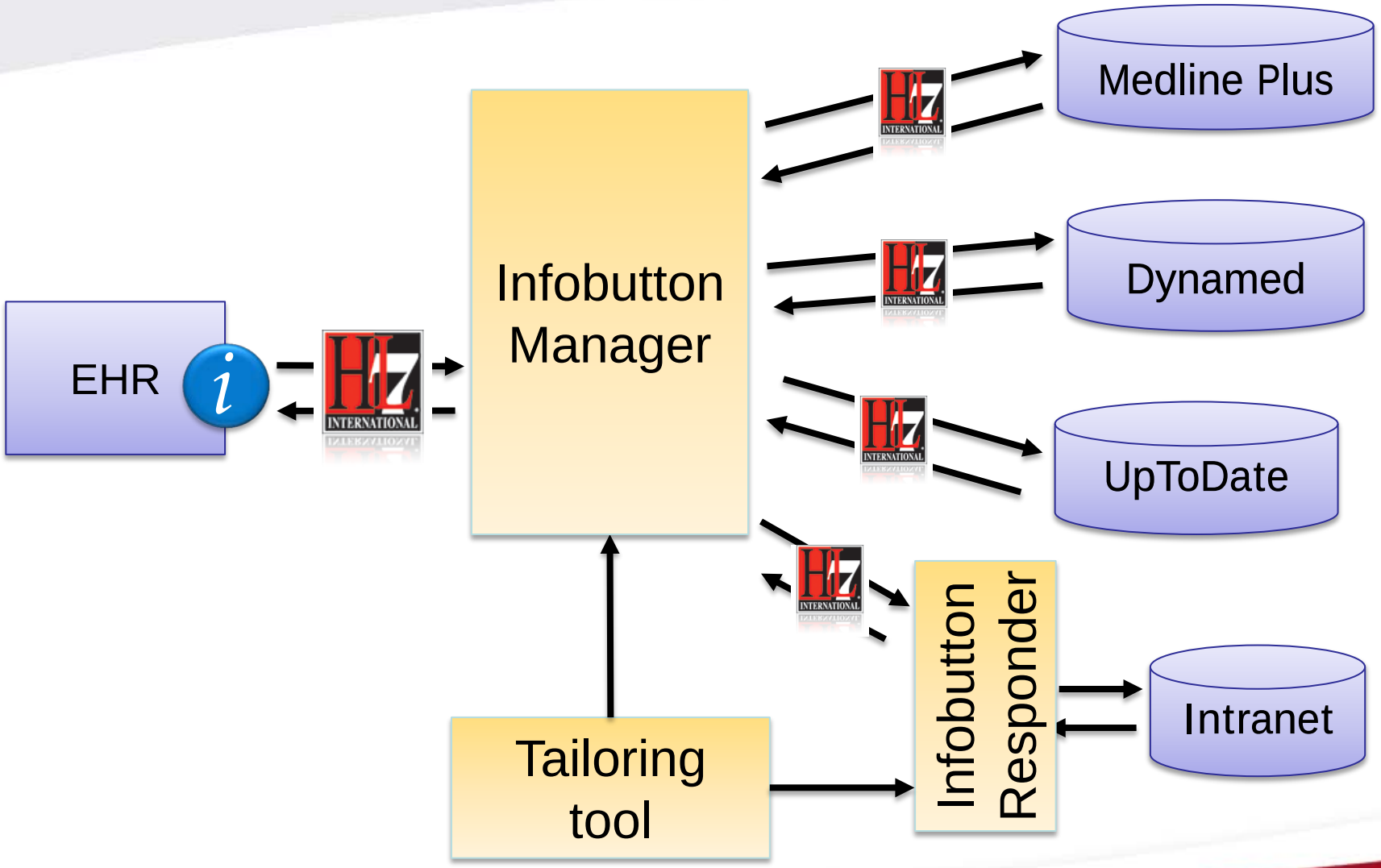
OpenInfobutton



OpenInfobutton

OSEHRA
Open Source Electronic Health Record Alliance

U.S. Department of Veterans Affairs

UNIVERSITY OF UTAH HEALTH SCIENCES

Intermountain Healthcare

MAYO CLINIC

DukeMedicine

Regenstrief Institute

The COALITION of ORANGE COUNTY COMMUNITY CLINICS

Washington University in St. Louis

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

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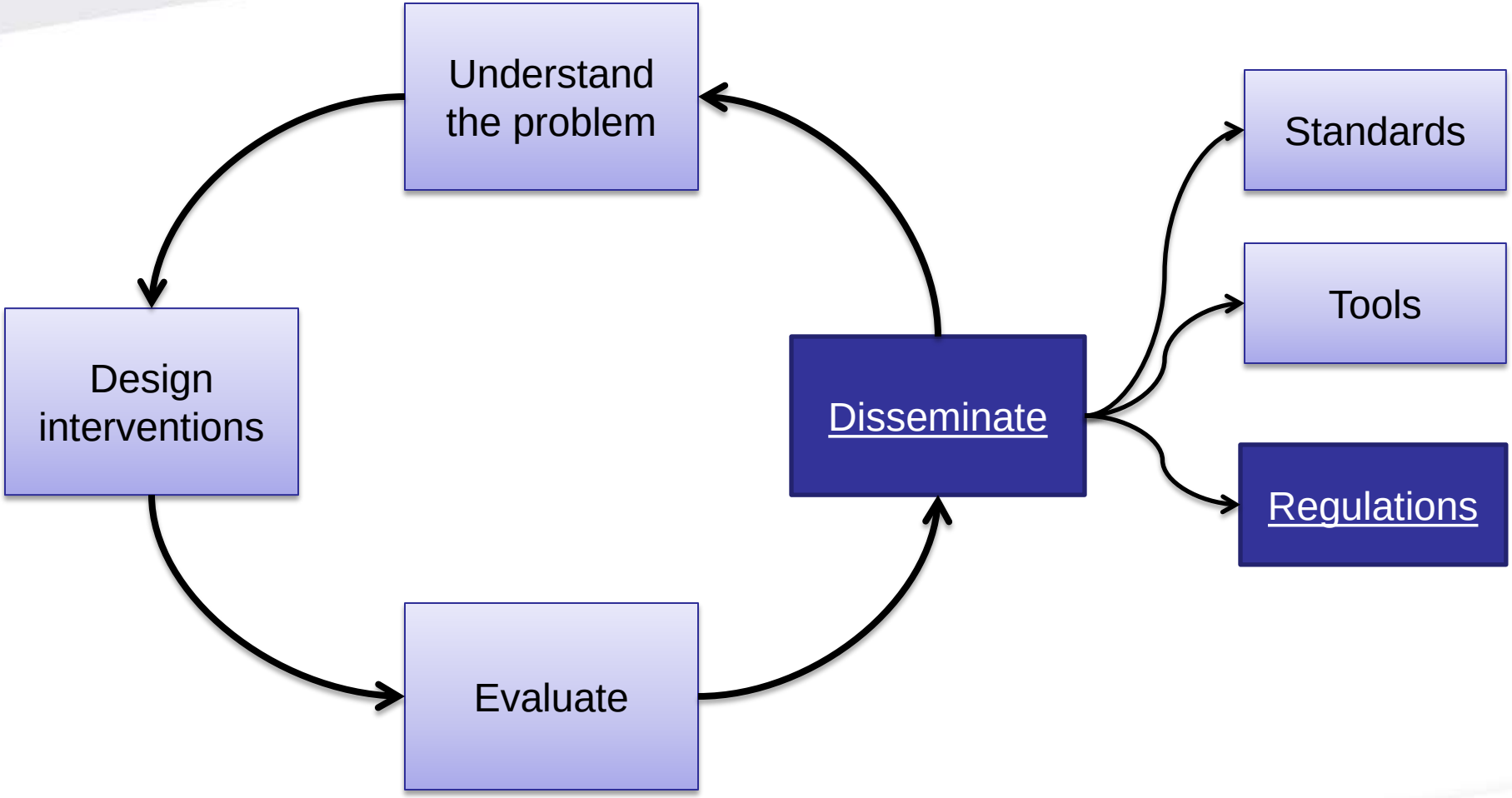
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US EHR Certification (Meaningful Use)

- 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

Adoption

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BLOG

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

A Game-Changing Standard: The Infobutton

By Amy Eckenroth

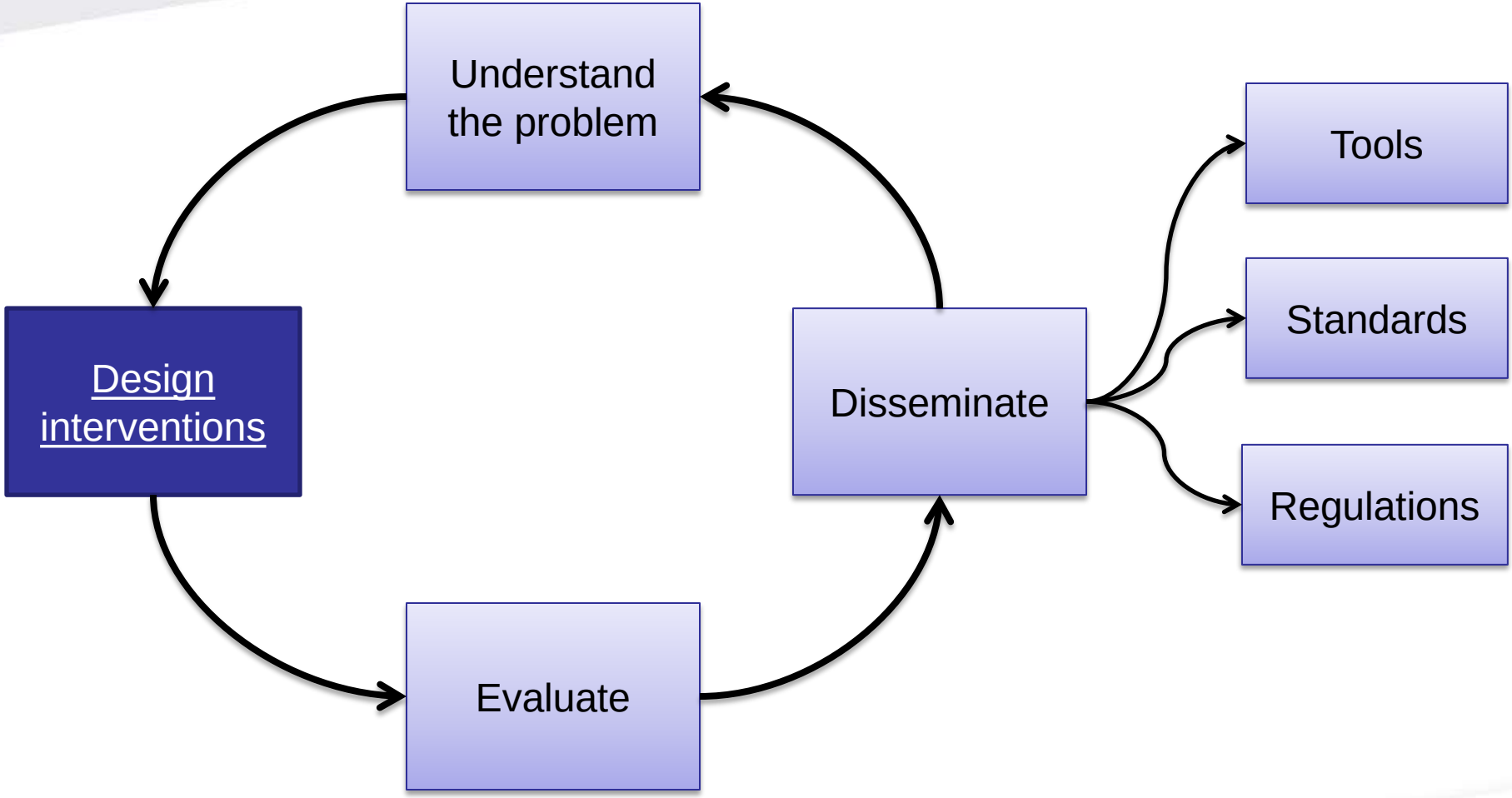
Like 0

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

Innovation Life Cycle



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

UpToDate®

rheumatoid arthritis treatment | Adult

New Search | Patient Info | What's New | Calculators

Treatment of rheumatoid arthritis resistant to initial DMARD therapy in adults

Find | Patient | Print

INTRODUCTION

GENERAL PRINCIPLES AND APPROACH

- Principles of management
- Definition of resistance to initial DMARDs
- Nonpharmacologic and preventive therapies
- Approach to drug therapy

PRETREATMENT INTERVENTIONS

RESISTANT TO INITIAL DMARD

- Resistant to HCQ and/or SSZ
- Resistant to MTX
  - Choice of therapy
  - MTX plus TNF inhibitor
    - Efficacy of MTX/TNF inhibitor versus triple therapy

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.)

Abatacept, 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

Clinically actionable statements

Patient population

"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."

Assertion

Intervention

Intervention

"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."

Assertion

Patient population

Non-actionable statements

"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."

Filters

- Biological Response Modifier Therapy (38)
- Disease-modifying antirheumatic drugs (DMARDs) (280)
  - azathioprine (8)
  - hydroxychloroquine (8)
  - leflunomide (14)
  - ***methotrexate (136)**
  - sulfasalazine (13)
  - tofacitinib (15)
- Glucocorticoids (17)
  - ***prednisone (12)**
- Nonsteroidal antiinflammatory drugs (NSAIDs) (37)
- Tumor necrosis factor (TNF) inhibitors (110)
  - adalimumab (27)
  - etanercept (27)
  - infliximab (19)

UpToDate Excerpts

Initial treatment of moderately to severely active rheumatoid arthritis in adults (10 sentences)

atoid arthritis resistant to ini adults (10 sentences)

Relevant topic excerpts from UpToDate

Recent high impact systematic reviews

Recent high impact RCTs

UpToDate topic: expand / collapse

Filters: narrow the content displayed

Article titles:
- Links to abstract in PubMed

Link shows study results

Systen

First

Showing 1-5 of 37 results

Effect of biotherapies on fatigue in rheumatoid arthritis: a systematic review of the literature and meta-analysis. ***Rheum... (Oxford).*** 2012. **Conclusions:** Few studies reported the im... therapies on fatigue. The effect of biotherapies...

Safety of m... rheumatoid ... ***(Oxford).*** 2009. **Conclusions:** Medium- to long-term glucocorticoid therapy in RA is associated with limited toxicity compared to placebo. more

Efficacy of resistance exercises in rheumatoid arthritis: meta-analysis of randomized controlled trials. ***Rheumatology (Oxford).*** 2012. **Conclusions:** Resistance exercise in RA is safe, and the improvement in most outcomes was statistically significant and possibly clinically relevant for RA disability. more

Trends in cardiovascular mortality in patients with rheumatoid arthritis over 50 years: a systematic review and meta-analysis of cohort studies. ***Rheumatology (Oxford).*** 2009.

Clinical Trial (110 citations)

First | Prev | 1 | 2 | 3 ... | Next | Last

Showing 1-5 of 110 results

Golimumab in patients with active rheumatoid arthritis after treatment with tumour necrosis factor alpha inhibitors (GO-AFTER study): a multicentre, randomised, double-blind, placebo-controlled ...se III trial. ***Lancet.*** 2009. [Industry funding]. [n=461]. C... **...ons:** Golimumab reduced the signs and sym... with active disease... TNFalpha inhib...

Effect of interleukin-6 receptor inhibition with tocilizumab in patients with rheumatoid arthritis (OPTION study): a double-blind, placebo-controlled, randomised trial. ***Lancet.*** 2008. [Industry funding]. [n=623]. **Conclusions:** Tocilizumab could be an effective therapeutic approach in patients with moderate to severe active rheumatoid arthritis. more

A pilot study of potassi... ...ementation in the treatment of ... ...toid arthritis: a ra... ...-controlled trial. ***J Pain.*** 20... ...rts a trial evaluating the effect of potassium supplementation in the treatment of pain in hypokalemic patients with rheumatoid arthritis. The elevated serum cortisol and potassium values in the treatment

Filters

- Biological Response Modifier Therapy (40)
  - abatacept (32)
  - anakinra (6)
- Disease-modifying antirheumatic drugs (DMARDs) (290)
  - azathioprine (5)
  - hydroxychloroquine (10)
  - leflunomide (12)
  - ***methotrexate (141)**
  - sulfasalazine (14)
  - tofacitinib (18)
- Glucocorticoids (15)
  - ***prednisone (10)**
- Nonsteroidal antiinflammatory drugs (NSAIDs) (37)
  - celecoxib (3)

UpToDate Excerpts

Initial treatment of moderately to severely active rheumatoid arth

Treatment of rheumatoid arthritis resistant to initial DMARD

Definition of resistance to initial DMARDs UpToDate

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 rapy UpToDate

Importantly, we do commend combinations of biologic D or the combination of abatacept with eit F inhibitor or anakinra. more

PRETREATMENT

A number of imp efore using DM cluding laboratory assessment (complete blood count, serum creatinine, aminotransferases, and other studies as d), evaluation of comorbidities, vaccinations, and screening for hepatitis C, hepatitis B, and latent tuberculosis in n.

Resistant to HCQ and/or SSZ UpToDate

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 UpToDate

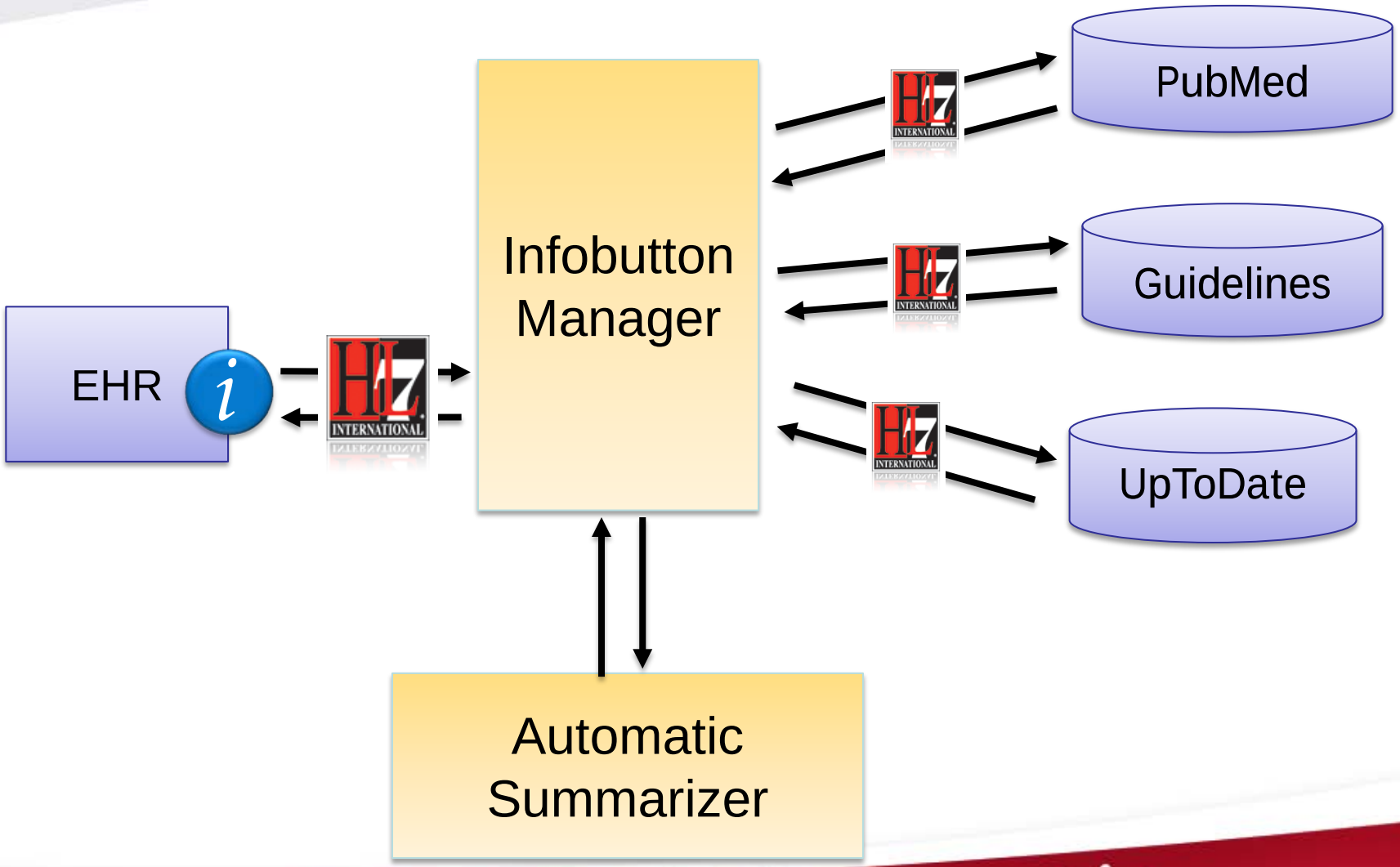
Abatacept may be used as an alternative to a TNF inhibitor in patients in whom MTX plus a TNF inhibitor would otherwise be appropriate, particularly in patients unable to use a TNF inhibitor and in patients with a high level of disease activity.

Go to sentence within UpToDate

Expand sentence.

Actionable recommendations from UpToDate

Dissemination



Questions?

www.OpenInfobutton.org
guilherme.delfiol@utah.edu

Open infobutton

Electronic Health Record Veterans Administration **Information audience** Healthcare provider

Age	47
Gender	F
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 Clopidogrel 300 MG Oral Tablet
Lab results	Serum digoxin 1.5 mg/dl **N** Total cholesterol 300 mg/dl**H** K 2.8 mEq/l **L** Na 127 mEq/l **L** C Reactive Protein 555 ug/dl **H** HbA1c 8.2% **H**

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- Patient education

UpToDate
- Dose
- Adverse effects
- Contraindications
- Drug interactions

MedlinePlus
- Clopidogrel

Micromedex
- Drug monograph

PharmGKB
- Dosing guidelines

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DRUG/SMALL MOLECULE:
clopidogrel

Clinical PGx | PGx Research | Overview | Properties | Pathways | Is Related To | Publications | Downloads/LinkOuts

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 *last updated 05/22/2013*

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 contraindicaiton.

Annotation

Open infobutton

Electronic Health Record	University of Utah	Information audience	Healthcare provider
Age	5		
Gender	F		
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 Clopidogrel 300 MG Oral Tablet		
Lab results	Serum digoxin 1.5 mg/dl **N** Total cholesterol 300 mg/dl**H** K 2.8 mEq/l **L** Na 127 mEq/l **L** C Reactive Protein 555 ug/dl **H** HbA1c 8.2% **H**		

UPTODATE

- Diagnosis
- Treatment
- Etiology
- Prognosis
- Symptoms and Signs

GENETICS HOME REFERENCE

- Genetic conditions

KRAMES

- Patient education

MEDICALHOME PORTAL

- Disease Module

PUBMED

- Systematic reviews
- Therapy
- Diagnosis

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Utah

Select Language

Diagnoses & Conditions | Newborn Disorders | Caring and Advocating for Children and Youth: For Parents & Families, For Physicians & Professionals | Services | Other Resources

Home > Diagnoses & Conditions > Neurofibromatosis Type 1

Print Share

Diagnoses & Conditions

Current Diagnosis

Neurofibromatosis Type 1

- Description
- Clinical Assessment
- Treatment & Management
- Frequently Asked Questions
- Related Issues
- Resources
- Services for Patients & Families
- Authors
- Bibliography

Neurofibromatosis Type 1

Description

Related Links

Within the Portal

Mucopolysaccharidosis Type I (MPSI)

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