

Clinical Decision Support: What is it? Why is it so hard?

Dean F. Sittig, Ph.D.

UT – Memorial Hermann Center for
Healthcare Quality and Safety

The University of Texas School of Health
Information Sciences, Houston



THE UNIVERSITY of TEXAS

SCHOOL OF HEALTH INFORMATION
SCIENCES AT HOUSTON

A part of The University of Texas Health Science Center at Houston

MEMORIAL[®]
HERMANN

Breakthroughs every day

Clinical Decision Support is...

“Providing clinicians or patients with clinical knowledge and patient-specific information, intelligently filtered and presented at appropriate times, to enhance patient care.”

- *Includes and builds on what’s already being done on a daily basis in the organization...*
- **NOT** *just rules and alerts...*

Why do we need CDS?

- Can increase rate of preventive care delivered
- Can improve medication management
- Can increase adherence to clinical guidelines
- Can reduce medication errors
- Can decrease cost of ordered tests
- On the order of 10-20% relative improvement

What we **ALSO** know about **CDS...**

- Often ignored, or overridden, by clinicians
- Often incorrect...false-positives
- Interrupts clinicians' workflow, train of thought, clinical routine
- Requires clinical and IT personnel to create, test, & maintain
- Requires additional computing resources to tailor the recommendations

CDS, *well developed and deployed*, provides...

- the right information,
- to the right person,
- in the right format,
- through the right channel,
- at the right point in workflow

**to allow clinicians to
make the RIGHT decisions.**



Why is this so hard?



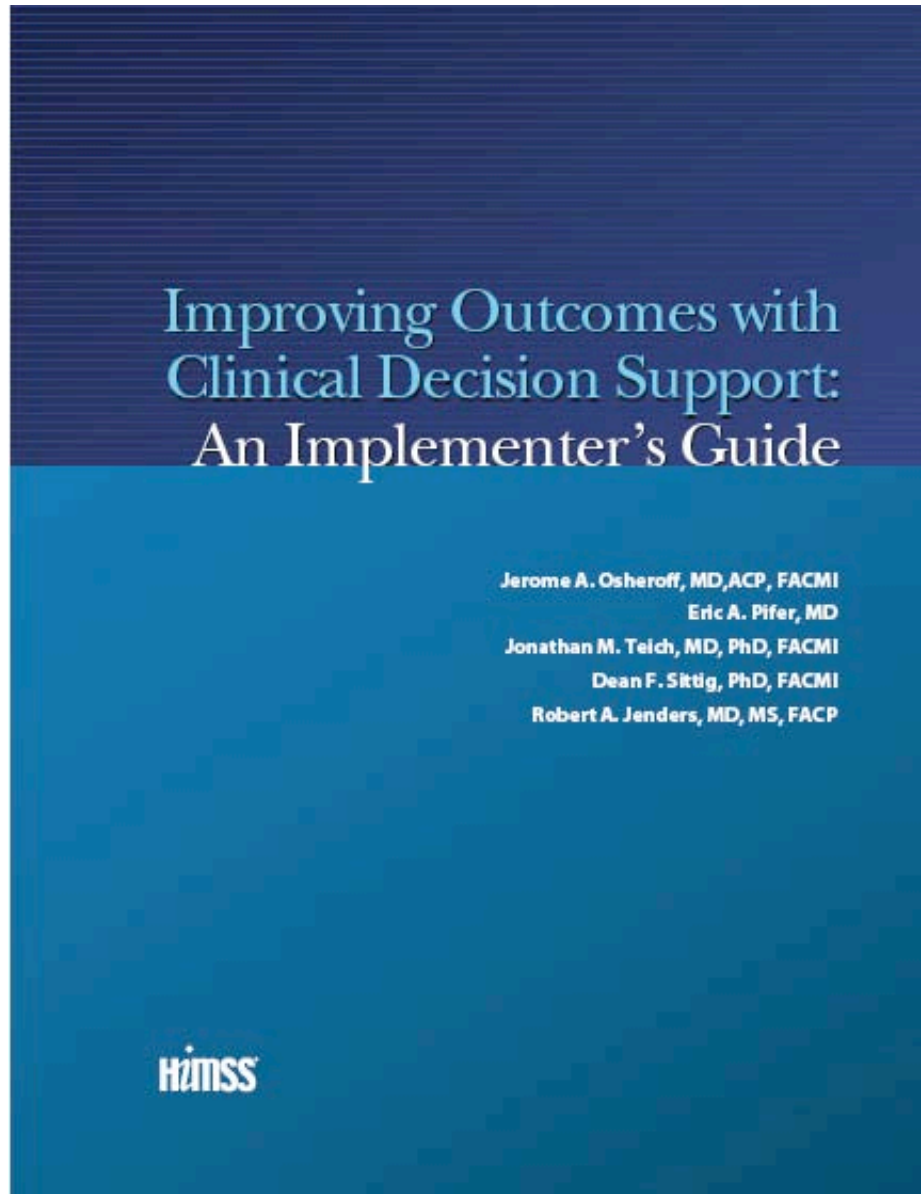
Why is this so hard?

	Dose	Dose (Calc)	Units	Mixed In	Route	Frequency	Stop After (Duration)	PRN Reason
item(s)								
us		*	milliGRAM(s)		IntraVenous	Once		
		*	MICRO Gram...		IntraVenous	Once		
ml) Inj	2		milliGRAM(s)		IntraVenous	Q6H		
ntment	1		Application(s)		OU (Both...	Q2H		Dry Eyes
oy								
	300		milliGRAM(s)		Rectal	Daily		
		40	milliGRAM(s)		Subcutaneo...	Daily		
		30	milliGRAM(s)		Subcutaneo...	Daily		
		5000	Unit(s)		Subcutaneo...	Q8H		
earch								
	20		milliGRAM(s)		IntraVenous	Q12H		
	20		milliGRAM(s)		IntraVenous	Q24H		
	40		milliGRAM(s)		IntraVenous	Daily		
earch								
le - 1 item(s)								
Sliding Scale HIGH			Unit(s)		Subcutaneo...	Q4H		Blood Glucose..
Scale - 1 item(s)								
Sliding Scale...			Unit(s)		Subcutaneo...	Q4H		Blood Glucose..
e - 2 item(s)								
Sliding Scale LOW			Unit(s)		Subcutaneo...	Q4H		Blood Glucose..
earch								
	25		milliGRAM(s)		IntraMuscul...	Once		Shivering
ide IVPB		10	milliEquivale...	100 mL	IntraVenous	Q1H		<3.4
ate IVPB		1	Gram(s)	D5w 50 mL	IntraVenous	Per...		Mg<2
earch								

1. CDS means different things to different people

- Users: anything that assists and guides them...
 - Simple charting templates or default values,
 - Exchange of information, reports, notes, problem lists, and treatment plans is key
 - Want to interact with other physicians in a way that can help them understand what others think about specific patients.

Informaticists say...



- Documentation forms and templates
- Relevant Data Presentation
- Order Creation Facilitators
- Time-based Checks and Pathway support
- Reference Information and Guidance
- Reactive Alerts and Reminders

**2. For patient-specific
CDS, you need DATA!**

2. For patient-specific CDS, you need DATA!

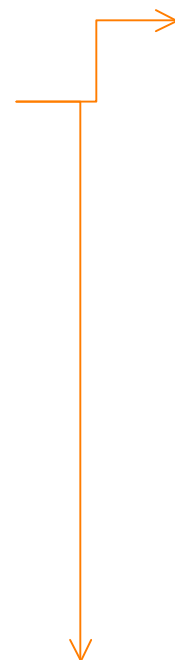
Input Data Element	Rule Types	Rules
Laboratory result/observation	126	2,087
Drug list	108	4,752
Hospital unit	85	906
Diagnosis/problem	43	1,587
Age	39	3,131
Nondrug orders	15	694
Gender	12	1,595
Family history	10	10
Allergy list	9	649
Weight	8	1,310
Surgical history	8	8
Reason for admission	2	148
Prior visit types	2	2
Race	1	1

Labs



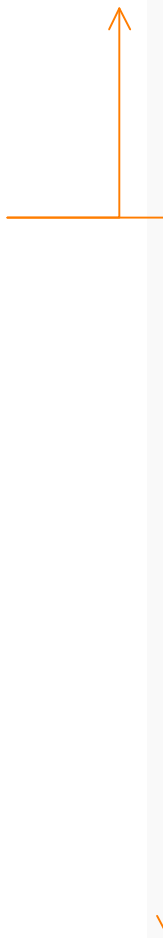
Input Data Element	Rule Types	Rules
Laboratory result/observation	126	2,087
Drug list	108	4,752
Hospital unit	85	906
Diagnosis/problem	43	1,587
Age	39	3,131
Nondrug orders	15	694
Gender	12	1,595
Family history	10	10
Allergy list	9	649
Weight	8	1,310
Surgical history	8	8
Reason for admission	2	148
Prior visit types	2	2
Race	1	1

Meds



Input Data Element	Rule Types	Rules
Laboratory result/observation	126	2,087
Drug list	108	4,752
Hospital unit	85	906
Diagnosis/problem	43	1,587
Age	39	3,131
Nondrug orders	15	694
Gender	12	1,595
Family history	10	10
Allergy list	9	649
Weight	8	1,310
Surgical history	8	8
Reason for admission	2	148
Prior visit types	2	2
Race	1	1

Admin



Input Data Element	Rule Types	Rules
Laboratory result/observation	126	2,087
Drug list	108	4,752
Hospital unit	85	906
Diagnosis/problem	43	1,587
Age	39	3,131
Nondrug orders	15	694
Gender	12	1,595
Family history	10	10
Allergy list	9	649
Weight	8	1,310
Surgical history	8	8
Reason for admission	2	148
Prior visit types	2	2
Race	1	1

Demog

Input Data Element	Rule Types	Rules
Laboratory result/observation	126	2,087
Drug list	108	4,752
Hospital unit	85	906
Diagnosis/problem	43	1,587
Age	39	3,131
Nondrug orders	15	694
Gender	12	1,595
Family history	10	10
Allergy list	9	649
Weight	8	1,310
Surgical history	8	8
Reason for admission	2	148
Prior visit types	2	2
Race	1	1

Orders

Input Data Element	Rule Types	Rules
Laboratory result/observation	126	2,087
Drug list	108	4,752
Hospital unit	85	906
Diagnosis/problem	43	1,587
Age	39	3,131
Nondrug orders	15	694
Gender	12	1,595
Family history	10	10
Allergy list	9	649
Weight	8	1,310
Surgical history	8	8
Reason for admission	2	148
Prior visit types	2	2
Race	1	1

Vitals

Input Data Element	Rule Types	Rules
Laboratory result/observation	126	2,087
Drug list	108	4,752
Hospital unit	85	906
Diagnosis/problem	43	1,587
Age	39	3,131
Nondrug orders	15	694
Gender	12	1,595
Family history	10	10
Allergy list	9	649
Weight	8	1,310
Surgical history	8	8
Reason for admission	2	148
Prior visit types	2	2
Race	1	1

Input Data Element	Rule Types	Rules
Laboratory result/observation	126	2,087
Drug list	108	4,752
Hospital unit	85	906
Diagnosis/problem	43	1,587
Age	39	3,131
Nondrug orders	15	694
Gender	12	1,595
Family history	10	10
Allergy list	9	649
Weight	8	1,310
Surgical history	8	8
Reason for admission	2	148
Prior visit types	2	2
Race	1	1

History

3. Clinical Knowledge Management is necessary for CDS

- Standardize data representation across the environment
- Standardize knowledge and logic
- Standardize workflow in an incremental and progressive way



A multidisciplinary team responsible for creating and maintaining clinical content



- Staff of dedicated knowledge engineers
- Subject matter experts
- Clinical content committees



An external repository of clinical content with web-based viewer

The screenshot displays the Knowledge Management Portal interface. At the top right is the PARTNERS logo. Below it is a search bar with the text "Keyword Search:" and a "Search" button. A navigation bar contains "Home", "Browse by Topic", and "Filter-based Search" (which is highlighted). Below the navigation bar is a blue header for "Search Criteria". The main content area is divided into several sections:

- Clinical Disciplines:** A list of medical specialties including All Clinical Disciplines, Anesthesiology/Perioperative Medicine, Behavioral Medicine, Burn Management, Cardiology (Interventional), Cardiology (Medical), Cardiology (Surgical), Emergency Medicine, Endocrinology, Gastroenterology, General Medicine - Primary Care, General Surgery, GI Colorectal Surgery, Hematology and Oncology, Infectious Disease, Nephrology, Neurology, Neurosurgery, Newborn/Neonatology, Obstetrics and Gynecology, and Ophthalmology.
- Filters:** A section with a note "CTRL - click to select multiple choices from the filters". It contains several filter categories, each with a list of options and up/down arrows:
 - Entity:** All Entities, All Entities - PCHI, BWH
 - Venue:** Acute Care, All Venues, Ambulatory Care
 - Patient Age Group:** Adult, All Patient Age Groups, Geriatric
 - Application:** All Applications, BICS Event Monitor, BICS Order Entry
 - Content Type:** All Content Types, Drug Information, Expert Dosing
 - Patient Safety:** Alerts and Notification, All Patient Safety, Consequent Order/Lab Display
 - Disease Management:** ADHD, All Disease Management, Asthma
- Submit Filter Search:** A large blue button at the bottom right of the filter section.

A tool to maintain the controlled clinical terminology

QMCriteria - Microsoft Internet Explorer

Address: http://cmt-dev4.dwny.ca.kp.org/Portal/QueryModel/QueryModel_v1.0/Web/QMCriteria.aspx

Query Model

Save CQML | VCG/HCM Metadata | Run | Clear

Criteria Link | Export | Help

Query Details

Query Name: EDG_ClinicalFinding_Template

Query Desc: Queries: [1] IsA FocusConcept; [2] IsA Clinical finding (404684003); AssociatedWith FocusConcept; [3] IsA

INI: EDG Clinical (Diagnosis)

Load CQML: Browse... | Re-Load

Property Based Query

	Value	300000	300010
Icd-9 Code	250		
Icd-9 Code			
Icd-9 Code			
Icd-9 Code			

Add more rows +

Hierarchical Based Query

SCTID: 73211009

SCTID:

SCTID:

Add more rows +

Subsumption Based Query

Add concept with +

Is A: 404684003

Role: Associated with (attribute) | 73211009

-- Select Role Type --


-- Select Role Type --


1 2 3 4 5 6 7 8 9 10 ... Total Results = 420

Exclude	CSM ID	item_2	item_1	item_11	item_40	ite
<input type="checkbox"/>	102325	DIABETIC RETINOPATHY, BACKGROUND.	23255	12123255	362.01J	36
<input type="checkbox"/>	102402	BLINDNESS DUE TO DM	23331	12123331	500663	50
<input type="checkbox"/>	103008	DM 1, UNCONTROLLED, W MANIFESTATION..	23935	12123935	250.83A	25
<input type="checkbox"/>	103009	DM 2, UNCONTROLLED, W MANIFESTATION	23936	12123936	250.92B	25
<input type="checkbox"/>	103010	DM 2 W INTRACAPILLARY GLOMERULOSCLEROSIS	23937	12123937	500742	50
<input type="checkbox"/>	103011	DM 1 W DIABETIC PERIPHERAL VASCULAR DISEASE	23938	12123938	500717	50
<input type="checkbox"/>	103012	DM 1 W PERIPHERAL NEUROPATHY	23939	12123939	500572	50
<input type="checkbox"/>	103013	DM 2 W DIABETIC PERIPHERAL AUTONOMIC NEUROPATHY	23940	12123940	500568	50
<input type="checkbox"/>	103014	DM 2, UNCONTROLLED, W COMA	23941	12123941	250.32B	25

Internet

An internet-based tool to facilitate content development.

agree as it is (Ω [REDACTED], 19 Sep 07 12:59pm) 

In general agree... (Ω [REDACTED], 22 Sep 07 5:50pm) 

but as with the moderate risk, am a little concerned about the "Done Elsewhere" response snoozing the reminder for a full 5 years given the possibility of getting a patient's report that things were normal (and they misunderstood the path report, endoscopists letter, or never even got it).

Question (Ω [REDACTED], 1 Oct 07 9:55pm) 

How does everyone feel about this?


1. Should we turn the reminder off for a shorter period of time if "Done elsewhere" is chosen?
2. Should we add (or change) a coded response "Done elsewhere and no adenomas/cancer"?

#2 (Ω [REDACTED], 2 Oct 07 11:29am) 

Agree with [REDACTED], I like option # 2.

Regarding the 10-year interval:

- a.) I think it helps me "sell" the exam and thus boosts compliance
- b.) Perhaps we could automate a reminder to start doing stool cards at the 5-year mark (if experts think this strategy is actually helpful).

Option #2 looks good. (Ω [REDACTED], 15 Oct 07 4:25pm) 

It is more specific, adding an extra inducement for us to get the facts straight with patients.

[REDACTED], regarding the 10-year interval, this is for patients at moderate-to-high risk and so the recommendation is q 5 years.

4. Knowledge engineers are “special people”

- Knowledge engineers (KEs) encode the logic in the CIS.
- KEs manage the controlled clinical vocabulary used to drive the CDS.
- KEs work collaboratively with domain experts to create clinical content for CDS.
- KEs must be technically astute as well as clinically knowledgeable.



5. Work to facilitate translation for collaboration



- Culture clash between developers of clinical information systems (CIS), the users and administration.
- An US vs. Them culture exists
- Often physical separation, too!



6. The system, including hardware, software and user interface must be easy to use and fast

- Users should not have to wait for the CDS.
- Users always want to see “everything” on “one-page”.
- Organizations in general and users in particular, think they need to be able to customize the CDS.

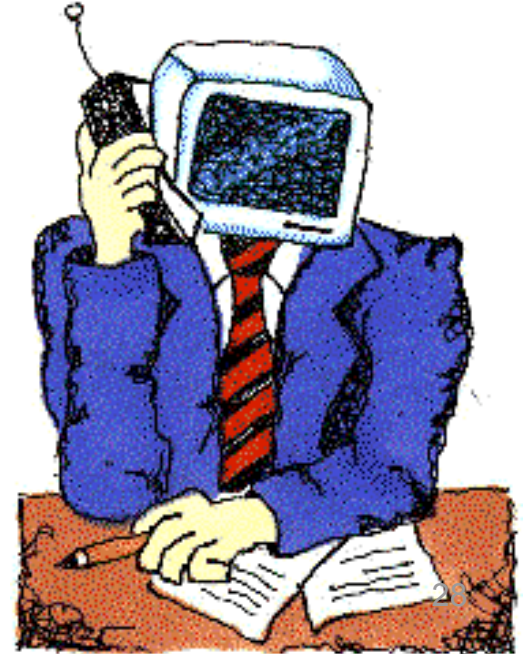


7. Workflow analysis must be a part of the organizational culture

- Must balance need for *standardization to improve quality and safety* with need for *individualized customization to improve workflow*.
- 80% of workflow in a clinic can be anticipated prior to implementation.
 - Additional 10% can be accommodated within existing system capabilities.
 - Final 10% requires major software/hardware reconfiguration

8. Communicating new CDS features and functions to clinicians is hard

- Most users learn about new CDS by chance
- CDS developers do not get enough credit for the improvements they make
- Keeping clinical content current and accurate is a major task
- Communication about CDS must not add to “alert burden or fatigue”



9. Measuring the use and effect of the CDS is essential

- Is the CDS functioning as expected?
- What effect is CDS having on clinician behavior?
- What is the effect of the CDS on patients?



10. Governance of the CDS interventions is on-going

- Structure
 - Committees
 - Process for making decisions
 - Feedback from clinicians
- Resource management
- Relationship with vendors



We invite you to our website

www.cpoee.org

Thank you.

Dean.F.Sittig@uth.tmc.edu

