

Mediating Access to Knowledge: The Principles & Practice of Infobuttons

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1 December 2006

Infobuttons

- **Why do we need them?**
- **What are they?**
- **How are they used?**
 - CSMC case study
- **Standards**
- **Do they work?**



Need for Decision Support: Evidence of Poor Performance

- **USA: Only 54.9% of adults receive recommended care for typical conditions**
 - community-acquired pneumonia: 39%
 - asthma: 53.5%
 - hypertension: 64.9%

McGlynn EA, Asch SM, Adams J et al. The quality of health care delivered to adults in the United States. *N Engl J Med* 2003;348:2635-2645.

- **Delay in adoption: 10+ years for adoption of thrombolytic therapy**

Antman EM, Lau J, Kupelnick B et al. A comparison of results of meta-analyses of randomized control trials and recommendations of clinical experts. Treatments for myocardial infarction. *JAMA* 1992;268(2):240-8.



Need for Decision Support: Questions, Questions

- **Information needs: Fulfilled; Unfulfilled but recognized; Unrecognized**
 - Need: user-initiated support + “push” technology
- **Questions during clinical care**
 - N = 90 patients, 24 physicians
 - Avg 5 questions/patient
 - 52% = fact about patient
 - 48% = medical knowledge or synthesis with patient data

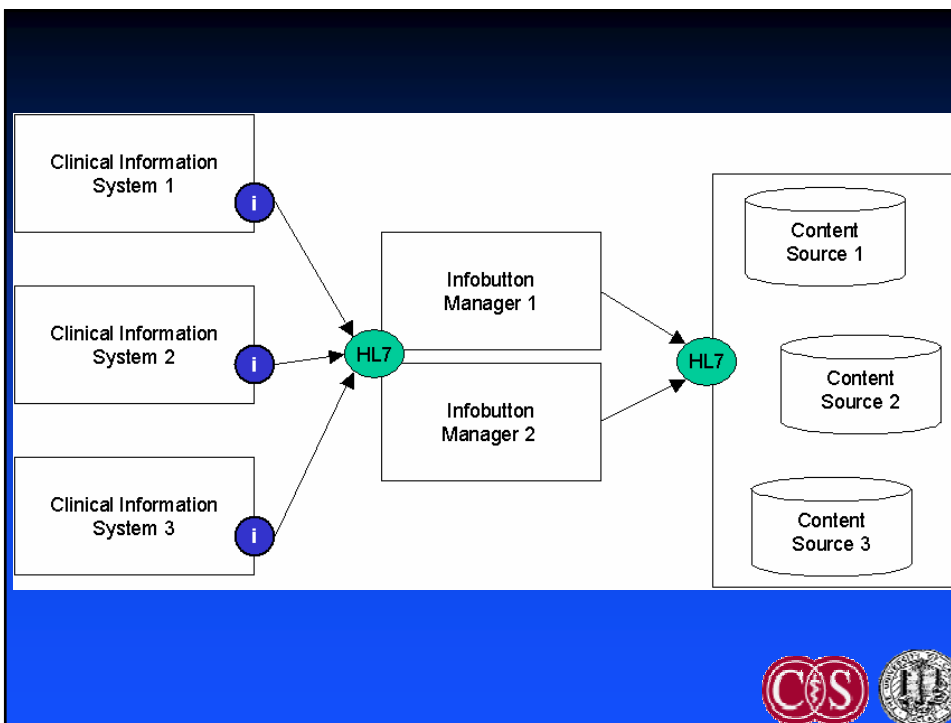
Osberoff JA, Forsythe DE, Buchanan BG et al. Physicians' information needs: analysis of questions posed during clinical teaching. *Ann Intern Med* 1991;114(7):576-81.



Access to Knowledge: Infobuttons

- **Infobutton:** Application that mediates queries of knowledge sources by clinical applications (EHRs, etc)
- **Process**
 - Clinical information system invokes infobutton manager (IM) with patient/user data
 - IM creates 1+ infobuttons, each = different kind of query
 - User chooses infobutton to execute query against a knowledge source, which displays response

Cimino JJ, Li J, Bakken S, Patel VL. Theoretical, empirical and practical approaches to resolving the unmet information needs of clinical information system users. Proc AMIA Symp 2002;:170-174.



Pharmacy Medication List as of 8/26/2004 02:00
 PMDC Allergy Information as of 8/25/04 **TETRACTYLIN**

Note: This Pharmacy Medication List reflects active orders that were received and verified by the Pharmacy Department. The Pharmacy Medication List will be updated throughout the day. Start times may not reflect the actual time of first dose administration. ZTAD and one time orders are not listed.

11/8/2004 10:55 JENDEKER

Scheduled Medication	Start Date	Med
	8/25/2004 09:00	
	8/25/2004 14:00	

PRN Medications	Start Date	Med
	8/25/2004 14:00	ACT
	8/25/2004 10:00	DES
	8/25/2004 07:00	HVT
	8/25/2004 07:00	ME
	8/25/2004 15:00	ONI

Note: Click medication dose for...

Confidentiality Warning: The info here is inappropriate access only.

MICROMEDEX Healthcare Series Integrated Index

Terms Match: (CYCLOBENZAPRINE,)

- Summary Documents**
 - Drug Summary Information [CYCLOBENZAPRINE HYDROCHLORIDE - Drug Summary Information]
- Drug Information**
 - DRUGDEX DRUG EVALUATIONS (15 Related Occurrences)
 - Ingredients from DRUGDEX Tradename Products [CYCLOBENZAPRINE - Drug Evaluation]
 - PHYSICIANS' DESK REFERENCE (2 Related Occurrences)
 - MARTINDALE - The Complete Drug Reference (6 Related Occurrences)
 - MDS [CYCLOBENZAPRINE HYDROCHLORIDE]
 - List Of DRUGDEX Tradename Products
 - List Of MARTINDALE Tradename Products
- Disease Information**
 - DISEASEDEX(TM) Emergency Medical Abstracts: Back Bukata MD, Jerry Hoffman MD (9 Related Occurrences)
 - DISEASEDEX(TM) Emergency Medicine Clinical Reviews [LOW BACK PAIN - therapy of]
- Toxicology Information**
 - SUBSTANCE MANAGEMENTS [CYCLOBENZAPRINE - Dose and...

Drug Info	Sup Date	Micro Medex	Skolar MD
		1.0	1.0
		1.0	1.0

Drug Info	Sup Date	Micro Medex	Skolar MD
PER MODERATE PAIN		1.0	1.0
SH CONSTIPATION		1.0	1.0
HR PER SEVERE PAIN		1.0	1.0
MHR PER SEVERE NAUSEA		1.0	1.0
HR PER NAUSEA/VOMITING		1.0	1.0

Note: All accesses are logged with your name, the patient's name, the type of data viewed, the date and...

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SKOLAR.MD

DRUG DATABASE RESULTS:

Query: hydromorphone has produced 8 hits.

- A to Z Drug Facts: 1 (Handy quick reference for drug information)
- Drug Facts and Comparisons®: 6 (Comprehensive Drug Information)
- FDA MedWatch: 1 (Alerts issued by the FDA)
- Review of Natural Products: 0 (Quick reference for natural drug information)

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Infobutton Use by Knowledge Source: CSMC

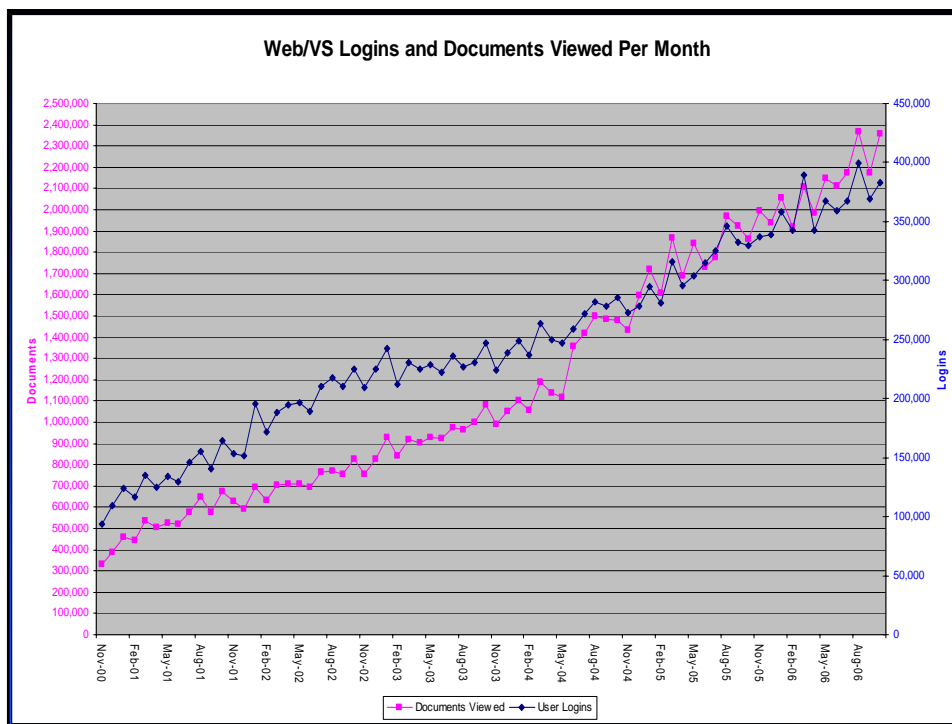
Source	Accesses	Time Period (mo)	Avg/Month
Medication	58130	31	1876
Literature/ Textbook	3906	28	139
Lab	3583	46	77



Infobutton Use by Time: CSMC

Period	Medication	Literature	Lab	Total
10/2004	1347	146	335	1828
10/2005	2407	127	372	2906
10/2006	2870	215	378	3463





Infobuttons: Standardization

- What to Standardize
 - API calls by CIS to IM and by IM to knowledge sources
 - API call by IM to knowledge sources
 - Value: Organizations + vendors need to support only one kind of interface

- HL7: Current status
 - HL7 membership ballot December, 2006
 - Main standard = XML, RIM-based call
 - Ancillary = HTTP/URL-based implementation guide
 - Products developed by vendors

<http://www.hl7.org>



Infobutton Parameters

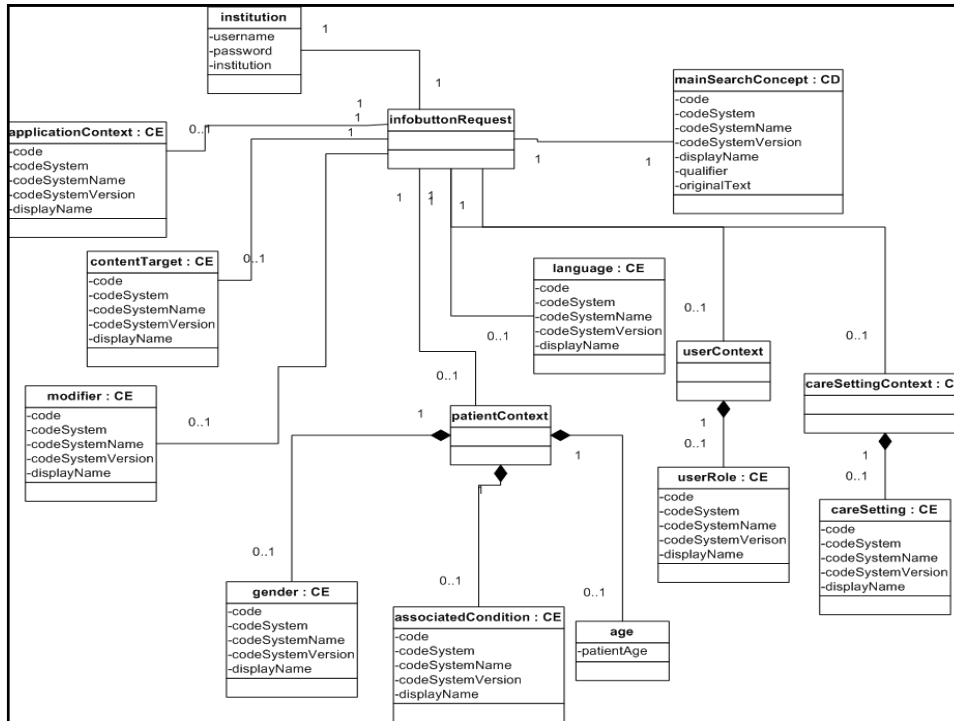
- Parameters
 - Patient context: age, sex, associated condition (coded)
 - User context: user role (coded)
 - Care setting context (coded)
 - Main search concept (coded)
 - Other: Language, modifier of main search concept (coded) [e.g., treatment, differential diagnosis, etc]
- Coded attributes
 - Code, code system, code system name, version, display name



Infobuttons: Recommended Terminologies

- Problems: MeSH, ICD9, ICD10, DRG, SNOMED CT
- Medications: NDC, RxNorm
- Lab tests: LOINC





Infobutton Example

- **Goal:** Provide information regarding the treatment of bacterial pneumonia in a 67-year-old patient

- **Query**

<http://www.eresourcewebsite.com/search.cgi?mainSearchConcept=482.9^I9^ICD9^^Pneumonia, Bacterial&applicationContext=ProblemList^HL7IBAappContext^^2.5^ProblemList&patientAge=67&patientGender=M^HL70001^Administrative sex^^2.5^Male&language=eng^ISO639.2^Languages^^2.5^English&modifier=^^^treatment>



Standardization: Next Steps

- **Promulgate (HL7) standard -> (vendor) implementations**
- **Problem: No standard way to communicate between EHRs and knowledge sources**
 - Mark up resources
 - Possible standard formalism for clinical practice guidelines



Infobuttons: Do They Work?

- **Study: Medication infobuttons**
 - N = 18 clinics, 359 users, 4961 patients
 - Avg use = 2/month (21 sec/session), 1.2% of encounters
 - Survey:
 - Answered questions 84% of time
 - 15% resulted in change of care

Maviglia SM, Yoon CS, Bates DW, Kuperman G. KnowledgeLink: Impact of context-sensitive information retrieval on clinicians' information needs. *J Am Med Inform Assoc* 2006;13(1):67-73.



Infobuttons: Assessment

- **Limitation**: Partly “pull” technology
 - Prompted by presence of something in EMR
 - Medication, problem, etc must be entered first
 - Relies on user to initiate
 - Some allow asking of free-form questions not linked to current EMR content
- **Benefits**
 - Context-specific
 - Links to multiple knowledge sources
 - Sometimes integration of different sources



Infobuttons: Overall

- Help address unmet information needs to improve performance
- Useful, but infrequently used
- Standardization useful
- Work is ongoing





Thank you!

- **Professor Tom Horan & Sue Feldman**
- **California Healthcare Foundation**

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