AHRQ / TEP Update
Feb 1 - 2, 2010
Project Status

GLIDES PROJECT
GuideLines Into DEcision Support
sponsored by
the Agency for Healthcare Research and Quality

YALE NEW HAVEN HEALTH

Yale School of Medicine

Nemours

Goals of the GLIDES Project

1. Implement evidence-based guideline recommendations that address *prevention* of **pediatric obesity** and *chronic management* of **asthma**

Selected Guidelines

- Asthma
  - EPR3 *Diagnosis and Management of Asthma* from the NHLBI (2007)
  - Demonstrates challenges involved in implementation of recommendations for chronic management of complex disease

- Obesity
  - *Screening and Interventions for Overweight in Children and Adolescents* (2007) from the Expert Committee on the Assessment, Prevention, and Treatment of Child and Adolescent Overweight and Obesity
  - Convened by the AMA, HRSA, and CDC

Asthma Control: Katherine Flanagan

CLASSIFYING COMPONENTS OF ASTHMA SEVERITY AND INITIATING TREATMENT

Visit Type
- ☐ Well Child
- ☑ Asthma

Is patient currently on controller medication? ○ yes ◉ no
Has this patients severity been classified? ○ yes ◉ no

Assessment for: ○ Control ◉ Severity

Prompts for documentation

Real-time calculation and display

Impairment	Intermittent	Mild	Moderate (Persistent)	Severe
Cough due to asthma	○ None			
Wheezing	○ None			
Chest tightness	○ None			
Shortness of breath	○ None	◉ <=2 days/wk	○ >2 days/wk	○ Daily — ○ All Day
Nighttime awakening	◉ None	○ <=2x/month	○ 3-4x/month	○ >1x/wk — ○ Often 7x/wk
Interference with normal activity Reduction in school/play/work	○ None	○ <--------	○ Mild	◉ Moderate — ○ Severe
SABA use (not for EIB)	◉ None	○ <=2 days/wk	○ >2 days/wk but n(	○ Daily — ○ Several times per
Lung Function FEV1 or peak flow	○ FEV>80% predicte	○ <--------	○ <--------	◉ FEV=60-80% prec — ○ FEV<60% predicte
FEV1/FVC	○ >85%	○ <--------	◉ >80%	○ =75-80% — ○ <75%

Impairment Classification: Moderate

Risk

○ 2 in last year ○ 3 in last year ○ >=4 in last year
○ 2 in last year ○ 3 in last year ○ >=4 in last year
○ >=2/year
AND [Risk Factors] for persistent asthma

Treatment-related adverse effects	Medication Adverse Effect	Comments
	☐ Thrush ☐ Palpitations ☐ Jitteriness ☐ Sleep Disturbances ☐ Decreased Growth ☐ Other	

Risk Classification: Low
Asthma Severity Classification: Moderate Persistent

Sidebar tabs: HPI, Cntrl/Sev, Inhaler/Env, PE, Asmt, Tx Plan, Action Plar, Asmt/Plan

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```
                    ┌─────────────────┐
                    │    Severity     │
                    └────────┬────────┘
                             │
        ┌──────────────┬─────┴─────┬──────────────┐
   Intermittent    Mild Pers    Mod Pers      SevPers
  ┌──────────┐  ┌──────────┐  ┌──────────┐  ┌──────────┐
  │  Step 1  │  │  Step 2  │  │  Step 3  │  │ Step 4,5 │
  │Eval control│ │Eval control│ │Eval control│ │Eval control│
  │  2-6 wk  │  │  2-6 wk  │  │  2-6 wk  │  │  2-6 wk  │
  └──────────┘  └──────────┘  └──────────┘  └──────────┘
```

```mermaid
flowchart TD
```

Severity defined?
ATEflg := clear

— Yes / No

Adherence?
Technique?
Env controls?
— Not OK → Address ATEflg:= set
— OK

Medication
Side effects?
— Address

Control Level?

Severity
— Intermittent: Step 1 Eval control 2-6 wk
— Mild Pers: Step 2 Eval control 2-6 wk
— Mod Pers: Step 3 Eval control 2-6 wk
— SevPers: Step 4,5 Eval control 2-6 wk

Well-controlled
Regular F/U Q 1-6 mo
Well controlled ≥3 mo?
Consider Step Down

Not Well Controlled
Coexisting condx?
Psychosocial probs?
Alternative dx?
— Yes → No advice
— No → **ATEflg**
  — set → No advice
  — clear → Step up 1 step Re-eval 2 wks

Very Poorly Controlled
Coexisting condx?
Psychosocial probs?
Alternative dx?
— Yes → No advice
— No → **ATEflg**
  — set → No advice
  — clear → Consider short course Systemic Steroids Step up 1-2 steps Re-eval 2 wks

ASTHMA MEDICATION: Katherine Flanagan

Visit Type	Problems	Medications	Allergies
☐ Well Child ☑ Asthma		ALBUTEROL SULFATE 0.083 % NEBU (ALBUTEROL SULFATE) 2.5 mg .5cc with 3cc NS nebulized every 4 hours PULMICORT 0.25 MG/2ML SUSP	

Update Problems   **Update Meds**   **Update Allergies**

- ◉ HPI
- ◉ Cntrl/Sev
- ◉ Inhaler/Env
- ◉ PE
- ◉ Asmt
- ◉ Tx Plan
- ◉ Action Plan
- ◉ Asmt/Plan

Order Set   **Selected Treatment Step : 3**

Quick-Relief

Short acting B-2 agonist   [ALBUTEROL NEBS .083% Q4 hrs PRN ▼]   **NEW ORDER**   **REFILL**

Long Term Control

Preferred

1. Low-dose inhaled steroid   [PULMICORT 0.25 MG BID ▼]   **NEW ORDER**   **REFILL**

or

LTRA   [▼]   **NEW ORDER**   **REFILL**

or

2. COMBO: [▼]   **NEW ORDER**   **REFILL**

- -

3. Medium-dose inhaled steroid   [▼]   **NEW ORDER**   **REFILL**

Added: Albuterol sulfate 0.083 % nebu 2.5 mg .5cc with 3cc NS nebulized every 4 hours
Added: Pulmicort 0.25 mg/2ml susp 0.25 MG/ML nebulized twice a day

Prev Form (Ctrl+PgUp)   Next Form (Ctrl+PgDn)   Close

Goals of the GLIDES Project

1. Implement evidence-based guideline recommendations that address *prevention* of **pediatric obesity** and *chronic management* of **asthma**

2. Apply GEM (Guideline Elements Model) and its associated tools **to systematically and replicably transform the knowledge** contained in these guidelines into a computable format

Guideline Knowledge Modeling
## Svatek & Ruzicka 2003

Model-Centered

- Knowledge engineer reads and assimilates the guideline narrative, formulates an internalized conceptual model, and gradually converts the model to a computable representation
- The translation process is implicit
- Ultimately, the relationship of the guideline knowledge model to the original guideline document may be only indirect or tangential

Document-Centered

- Relies heavily on the original textual guideline
- Explicit
- Iterative
- Produces a series of artifacts that can serve as an audit trail preserving relationship to original text
- "The leader in this stream is the GEM methodology and model."

Challenge of Representing
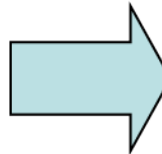# Guideline Knowledge Electronically
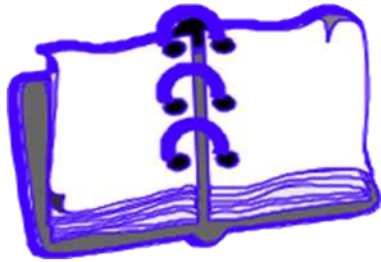
Published Guideline

Black Box

Computer-Based
Decision Support

Identify Clinical Objectives
Select Guideline

Narrative Guideline

COGS, AGREE
GLIA

GEM Cutter Markup

Semi-structured

XML file
Quality & Implementability Appraisals
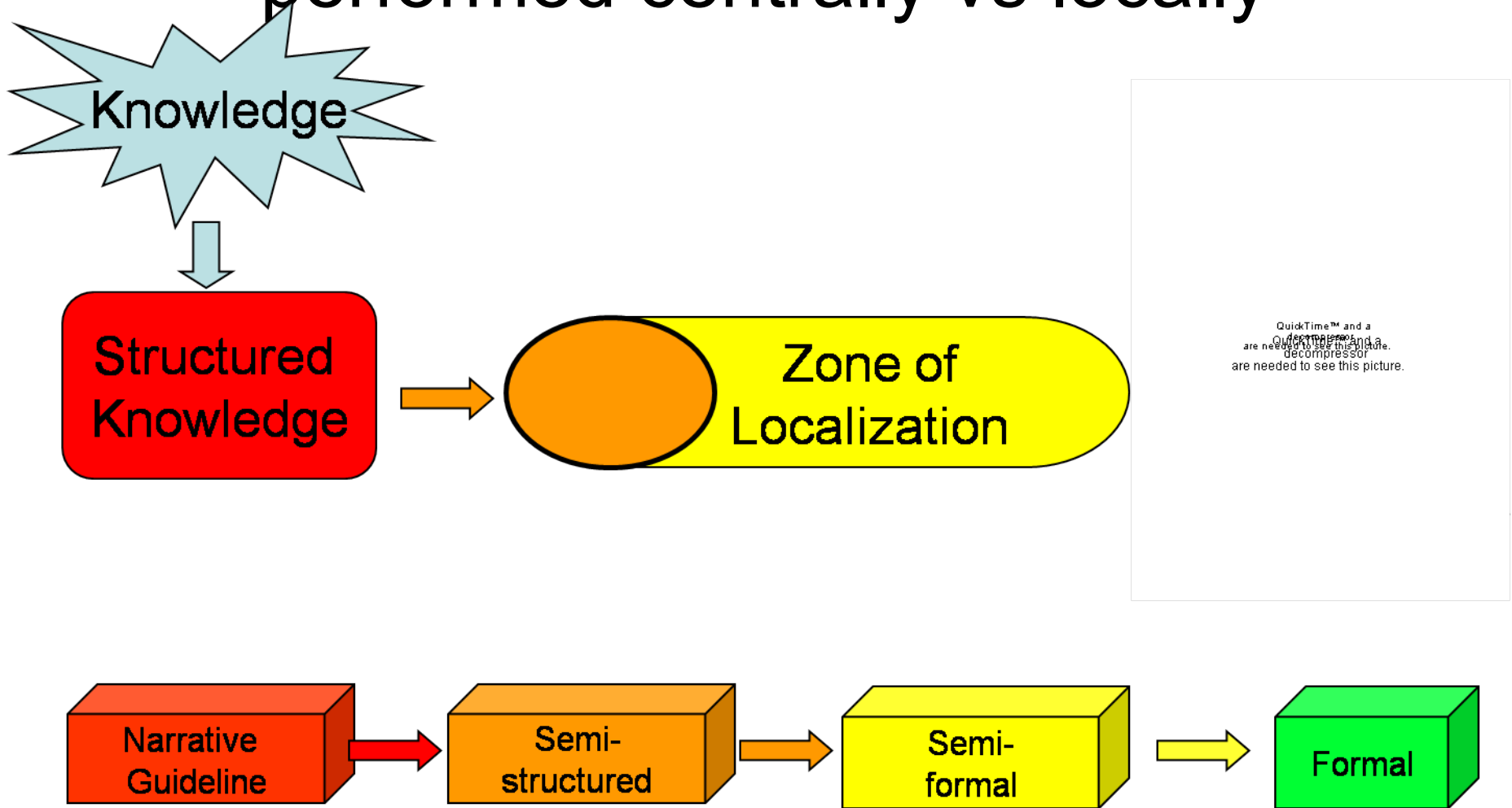
EXTRACTOR Transforms

Semi-formal

Statement logic
Coded decision variables & actions
Action-types

Local workflow / barrier analysis (technical, people, organizational); local codes; origins/insertions; CDS modality
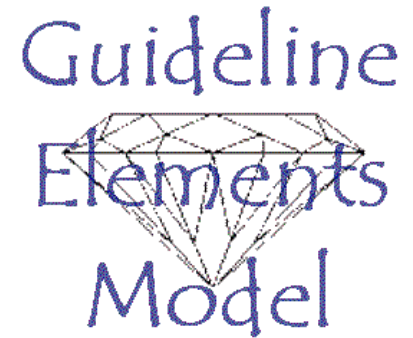
Formal

Local EHR scripting language, UI

Tension between work that can be performed centrally vs locally

Knowledge

Structured Knowledge → Zone of Localization

QuickTime™ and a
decompressor
are needed to see this picture.

Narrative Guideline → Semi-structured → Semi-formal → Formal

GEM

- *Knowledge model* for guideline *documents*
  - Multi-level hierarchy (>100 elements)
  - Parses heterogeneous information contained in guidelines
  - Facilitates translation of guidelines into a format that can be processed by computers
- GEM DTD adopted as ANSI standard (ASTM E2210-02)
- GEM II Schema adopted as ANSI standard (E2210-06)

Recent External Publications Addressing GEM

Abidi SR, Hussain S, Shepherd M, et al. Ontology-based Modeling of Clinical Practice Guidelines: A Clinical Decision Support System for Breast Cancer Follow-up Interventions at Primary Care Settings, Medinfo 2007: Proceedings of the 12th World Congress on Health (Medical) Informatics; Building Sustainable Health Systems; Kuhn, Klaus A (Editor); Warren, James R (Editor); Leong, Tze-Yun (Editor). Amsterdam: IOS Press, 2007. Studies in health technology and informatics, v. 129, pp 845-849.

Bouffier A. From texts to structured documents: The case of Health Practice Guidelines. International Semantic Web Conference, Doctoral Consortium, Busan, Cor, 2007.

Bouffier A. and Poibeau T. Automatically restructuring practice guidelines using the GEM DTD. In Proceedings of the Workshop on BioNLP 2007: Biological, Translational, and Clinical Language Processing (Prague, 2007).

Brandhorst CJ, Sent D, Stegwee RA, et al. Medintel: decision support for general practitioners: a case study. Stud. Health Technol Inform. 2009; 150: 688-92.

Franz M. What Makes Diabetes Medical Nutrition Therapy Effective? Review of Endocrinology. 2008;4:16-19.

Georg G and Jaulent M. 2007. A document engineering environment for clinical guidelines. In Proceedings of the 2007 ACM Symposium on Document Engineering (2007). DocEng '07. ACM, New York, NY, 69-78.

Hashmi Z, Zrimec T, Hopkins A, CPG-Knowledge Computerization Framework towards Augmenting Context and Semantic from UMLS via Ontology-Based-Extension of GEM Model, The XXII International Conference of The European Federation For Medical Informatics, MIE 2009, August, Sarajevo, 2009, pp 638-642

Hussain S. and Abidi S. Ontology Driven CPG Authoring and Execution via a Semantic Web Framework, In Proceedings of the 40th Annual Hawaii international Conference on System Sciences (2007). HICSS. IEEE Computer Society, Washington, DC, 135

Lehtonen M, Pharo N, Trotman A. A Taxonomy for XML Retrieval Use Cases, INEX 2006 Workshop Proceedings(2006) pp. 413-422.

Mille F, Degoulet P, Jaulent M-C. Modeling and Acquisition of Drug-drug Interaction Knowledge. Medinfo 2007: Proceedings of the 12th World Congress on Health (Medical) Informatics; Building Sustainable Health Systems; Kuhn KA, Warren JR, Leong, Tze-Yun (Eds). Amsterdam: IOS Press, 2007. Studies in health technology and informatics, v. 129 , pp 900-904.

Moskovitch R, Shahar Y. Vaidurya--a concept-based, context-sensitive search engine for clinical guidelines. Journal of Biomedical Informatics, v 42, issue 1, 2009, pp 11-21.

Pech-May F, Lez-Aralo I, Sosa-Sosa, V. Validator for Clinical Practice Guidelines. IWANN (2) 2009: 539-546.

Quaglini S, Ciccarese P. Models for guideline representation, Neurol Sci, (2006) 27:S240-S244.

Wright A, Bates DW, Middleton B, et al. Journal of Biomedical Informatics, Volume 42, Issue 2, April 2009, Pages 334-346.

Zhuchkov A, Tverdokhlebov N, Alperovich B, et al. Distributed Processing of Clinical Practice Data in Grid Environment for Pharmacotherapy Personalization and Evidence-Based Pharmacology: Lecture notes in computer science (2007), v. 4743, pp 435-443.

GEM Uptake 2009

- GEM web site visits averaged 4,658 per month,
  - serving an average of 13,461 pages
  - 25,513 hits
  - Traffic is very stable.
- GEM Cutter downloads
  - 93 times
  - from 25 different countries

GEM Cutter Downloads 2009

- University of Udine
- University of Vienna
- Sentry Data Systems
- Regenstrief Institute
- Fremantle Hospital & Health Service
- Renaissance Computing Institute
- St. Georges Hospital and Medical School
- Answare Ltd.
- I-CUBE
- Banner Health
- Thomson Reuters
- Cincinnati Children's Hospital Medical Center
- ECRI Institute
- Arizona State University
- Bologna University
- Fremantle Hospital Library
- CHHMPA
- Interamerican University of PR
- University of Pittsburgh

- Oregon Health & Science University
- catholic medical center
- Center for Interoperable EHR
- PROGESAL Ltd. Consulting Office
- Seoul National University
- Vanderbilt University
- Umass
- MoH
- Università degli studi di Pavia
- University of Georgia
- VA
- Mayo Clinic
- HRR PEMEX
- Paris Decartes
- College of American Pathologists
- JHU
- McMaster University
- Universidad Nacional de Colombia
- National Guideline Clearinghouse
- Milliman CareGuidelines
- New Zealand Guidelines Group
- Centre for Health Informatics UNSW
- Technical University of Vienna

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3. **Deliver the guideline knowledge via electronic decision support** at ambulatory sites that employ Centricity EMR at Yale and EpicCare at Nemours

Deliver the Guideline Knowledge

- Demos to follow

Implement evidence-based guideline recommendations

- <u>Chronic Management of Asthma</u>
  - ✓ Pediatric Pulmonology: Yale
  - ✓ Pediatric Primary Care : Yale
  - ✓ Nemours Pulmonology: Florida sites
  - ✓ Nemours Primary Care: Delaware Valley sites
- <u>Prevention of Obesity</u>
  - ✓ Pediatric Primary Care: Yale
  - ✓ Nemours Primary Care: Delaware Valley sites

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4. **Evaluate** the fulfillment of these goals and the effectiveness of the decision support tools in improving the quality of health care

Evaluation Approaches

- Quantitative evaluation: *what*
- Qualitative evaluation: *why*
- Mixed methods evaluation plan:
  - data completion rate
  - direct observation
  - survey of clinicians
  - in-depth interviews
  - review of charts in which clinicians did not follow CDS recommendations
- Evaluation of clinical outcomes: years 3-5

Use

- Uptake of asthma CDS at Yale pulmonary has been generally high; however, tools are often used after the clinic visit is over (Jan-May 2009)
  - 55 new visits: 78% had enough data entered for CDS to work
  - 390 return visits: 65% had enough data entered for CDS to work
- Uptake of asthma CDS at Nemours has been generally low; attributable to lack of a clinical champion
- Uptake of obesity CDS at Nemours has been good

Effectiveness of CDS

- CDS prompts high use of key guideline recommendations:
  - Yale obesity (819 visits)
    - 83% document screen/counsel for >5 servings fruits/vegetables
    - 75% document screen/counsel for no sugar-sweetened beverages
  - Yale pulmonology (390 visits)
    - 90% document "impairment"
    - 88% document "risk"
- Experts do not always agree with CDS

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5. **Disseminate** the findings and lessons learned

DISSEMINATE

- <u>MANY</u> presentations
- Recommendations to CCHIT, vendors
- Guideline manual
- IOM Committee "Developing Standards for Trustworthy Clinical Practice Guidelines"
- ECRI pilot: GEM-ifying guidelines for NGC
- GLIDES Website

http://gem.med.yale.edu/glides
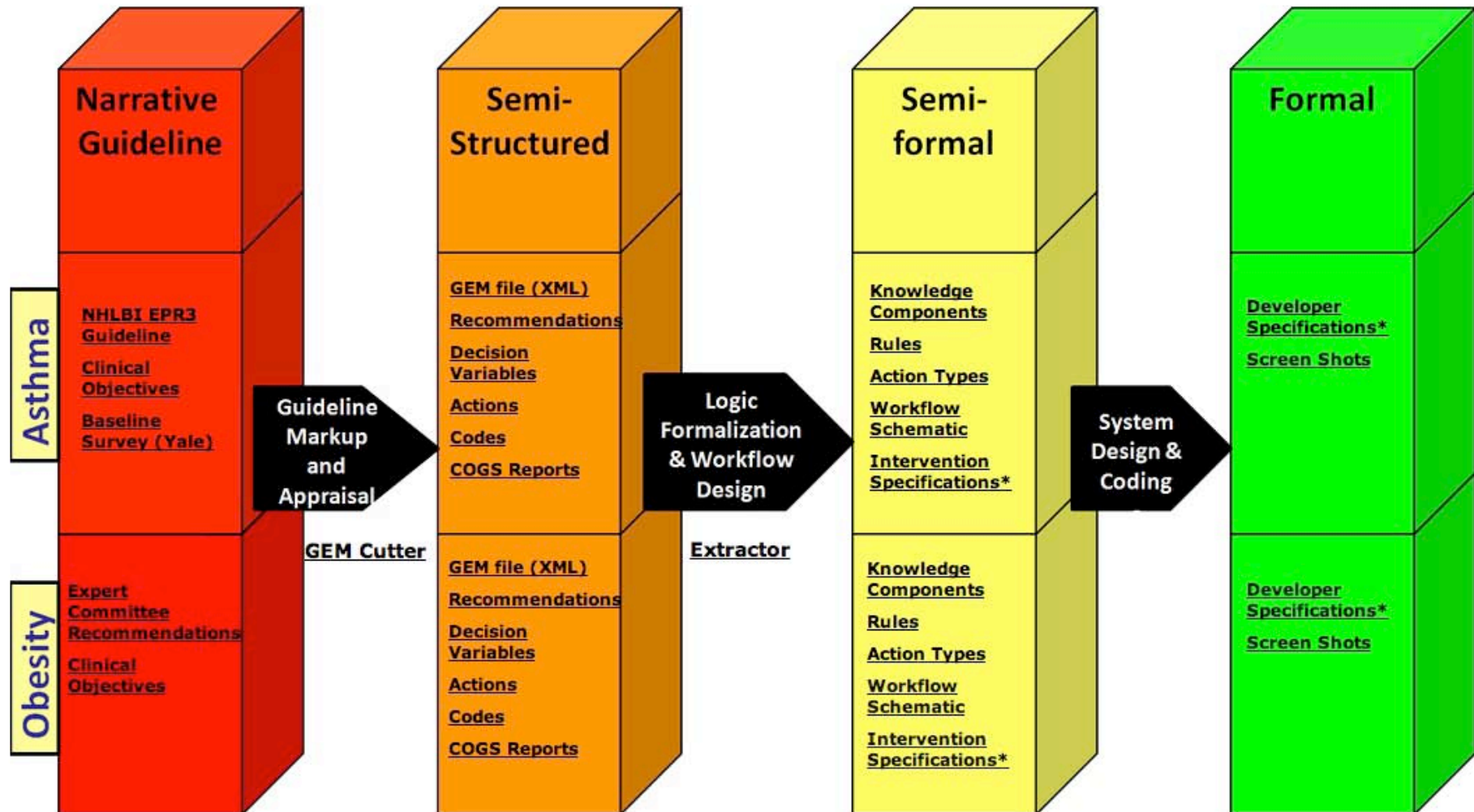
Proposed Aims: Years 3-5

1. Continue to use systematic and replicable processes to design, implement, and demonstrate guideline-based CDS

2. Work with guideline developers to provide tools and guidance to improve guideline development

3. Update GEM and increase its adoption

4. Continue evaluation of both existing and newly developed CDS implementations

5. Collaborate with CDSC to pilot distribution of CDS
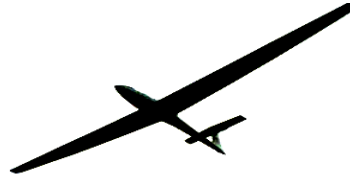
6. Disseminate lessons learned
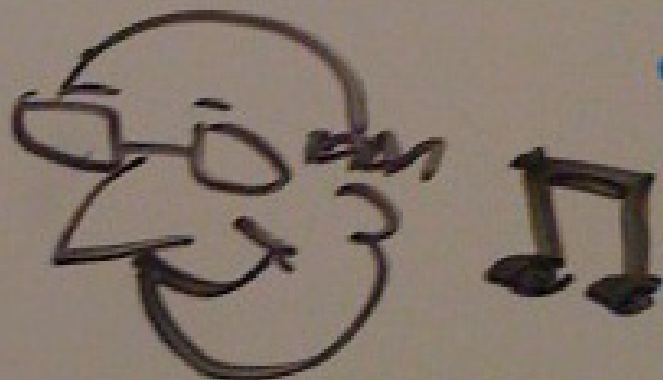
Chicago
August 25-28, 2010
www.gin2010.org

Thank You!

http://ycmi.med.yale.edu/people/shiffman.html

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