

# Enhancing Clarity and Transparency of Public Health Guidelines

**CDC Office of the Director  
Office of the Associate Director for Science (OADS)  
Office of Science Quality (OSQ)**

Roybal Building 19, CDC Library, Room 131  
Friday, March 29, 2013: 9:00am – 12:00pm

**Live Meeting:**

**<https://www.livemeeting.com/cc/cdc/join?id=5RSD3J&role=attend>**

**Bridge line: (866) 541-9445 Participant code 2135225#**



## March 29, 2013

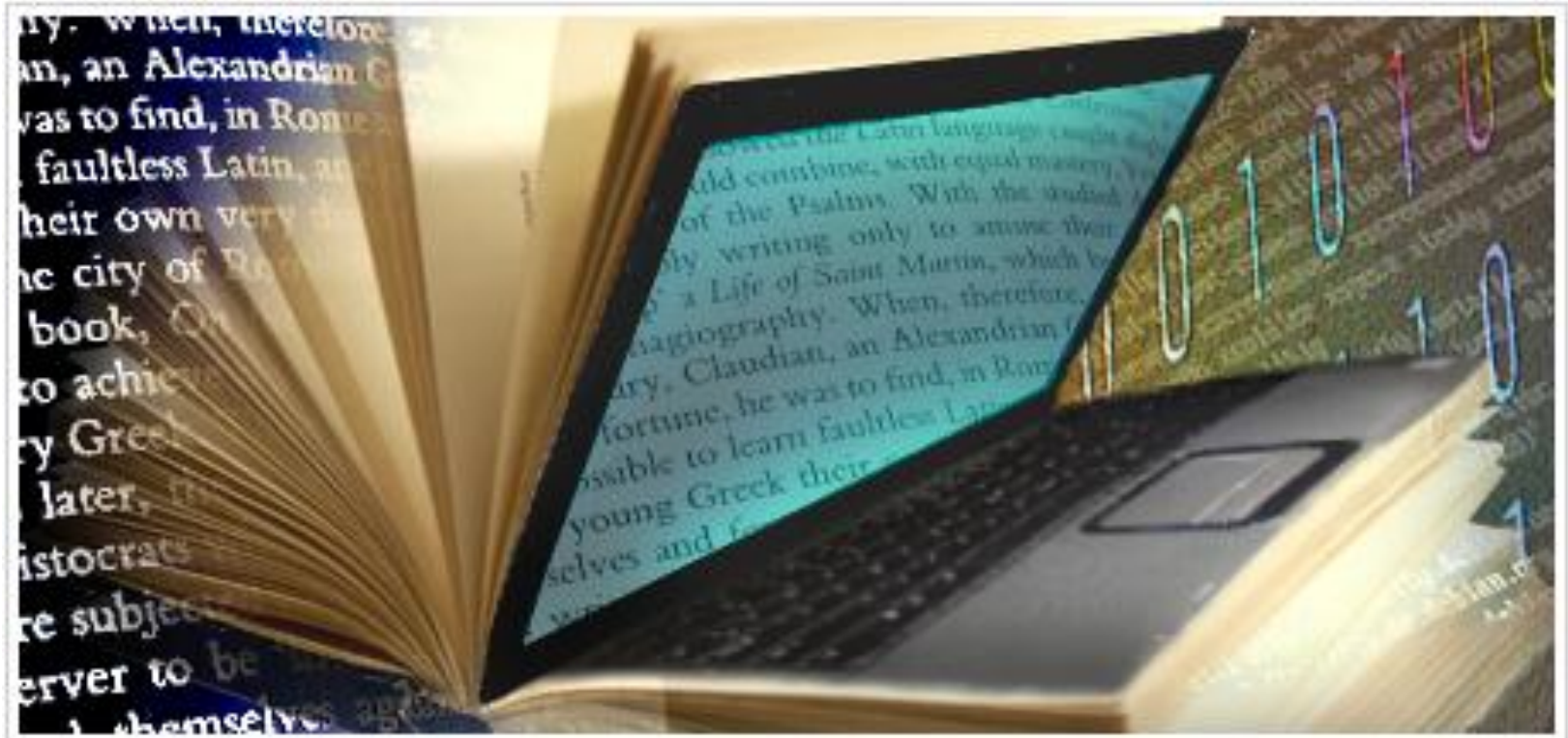
Time	Format	Agenda	Topics	
9:00-9:40	L	Transforming Guideline Knowledge Into Decision Support	<ul style="list-style-type: none"> <li>• What is GEM?</li> <li>• 4 Steps in Knowledge Formalization;</li> <li>• Clinical Decision Support Tool for Asthma</li> <li>• Using action-types for CDS design</li> </ul>	4-GLKnowledgeIntoDS.ppt
9:40-10:00	D	Group Discussion		
10:00-11:00	H	GEM Cut a guideline & design a clinical decision support system prototype (25 individuals on computers)	Introduction to GEM Cutter and markup of guideline text; EXTRACTOR reports; markup conventions	GEM_Nutshell-CDC.ppt AAOTonsillectomy.pdf GEMCutterManual.pdf
11:00-11:15		Break		
11:15-11:50	D	Report on GEM Cutting experience and CDS design		
11:50-Noon		Course Evaluation		Evaluation Forms

(L= lecture; D = class discussion; H = hands on)

# Housekeeping

- ❑ **Mobile devices on mute**
- ❑ **No food/beverages in room**
- ❑ **Remote attendees & recording**
  - March 29: 9:00 – 10:00am
- ❑ **Ensuring audio quality**
  - Remote attendees: Keep phones on mute; use Live Meeting questions box
  - Instructor to repeat questions
- ❑ **Evaluation**
  - In-person attendees: complete hard copy before you leave
  - Remote attendees: send to [OSITraining@cdc.gov](mailto:OSITraining@cdc.gov) or fax to (404) 639-3249 Attn: Julie Orta by COB Friday, March 29

# Converting Guideline Knowledge into Clinical Decision Support



**Rick Shiffman**

# Today

- Improving Practice, Improving Care
- 4 Steps in Knowledge Transformation
- A Clinical Decision Support Tool
- Using Action-Types As a Design Pattern

# The GLIDES PROJECT



## **THE GLIDES PROJECT** **GuideLines Into DEcision Support**

sponsored by

The Agency for Healthcare Research and Quality



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GEISINGER



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American  
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Association



**ALLIANCE OF CHICAGO**  
Community Health Services, L3C



American Society of Clinical Oncology

# CDS Demonstration Projects

## *Objective*

To develop, implement, and evaluate projects that advance the understanding of how best to incorporate clinical decision support (CDS) into health care delivery.

Explore how the translation of clinical knowledge into CDS can be routinized in practice and taken to scale to improve the quality of healthcare delivery in the U.S.

Recognizing the critical importance of transparently developed and clearly stated guideline recommendations for effective implementation, work closely with guideline developers to improve guideline development

# Interventions to Improve Practice

Grol, Grimshaw Lancet 2003

- Education (conferences, courses)
- Audit & feedback
- Financial incentives/disincentives
- Patient-mediated interventions
- Computer based decision support



IMPLEMENTATION SCIENCE



# Clinical Decision Support: Definition

- Systems that link **health observations** with **health knowledge** to **influence health choices** by clinicians for improved health care (Hayward)

# Systematic Reviews of Computer-Based Decision Support

Name	Organization	Year
Mary Johnston	McMaster	JAMA 1994
Derek Hunt	McMaster	JAMA 1998
Amit Garg	Univ. W. Ontario	JAMA 2005
Ken Kawamoto	Duke	BMJ 2005
Basit Chaudhry	UCLA	Ann Intern Med 2006
Monique Jaspers	Amsterdam	JAMIA 2011
Remy Coeytaux	Duke	Arch Intern Med 2012

- Computer-based decision support often—but not always—improves the process of care
- Outcomes—though infrequently measured—sometimes improve

# Features Predicting Success

Kawamoto K BMJ 2005

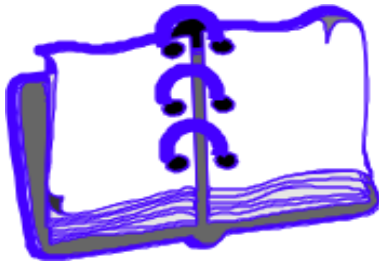
- Provision of DS at time and location of decision making ( $P=0.0263$ )
- Automatic provision of DS as part of clinician workflow ( $P<0.00001$ )
- Provision of recommendations rather than just assessments ( $P= 0.0187$ )
- Providing periodic performance feedback
- Requesting documentation of reasons for not following recommendations

# Knowledge into CDS

- **Knowledge Synthesis:** combine results of systematic review of biomedical literature with experience and expertise of guideline developers to create recommendations
- **Knowledge Formalization:** translate natural language recommendations into formats computers can process
- **Knowledge Localization:** introduce transformed knowledge into systems that influence care, considering local resources, workflow, technical capabilities, etc.

# Challenge of Representing Guideline Knowledge Electronically

## Published Guideline

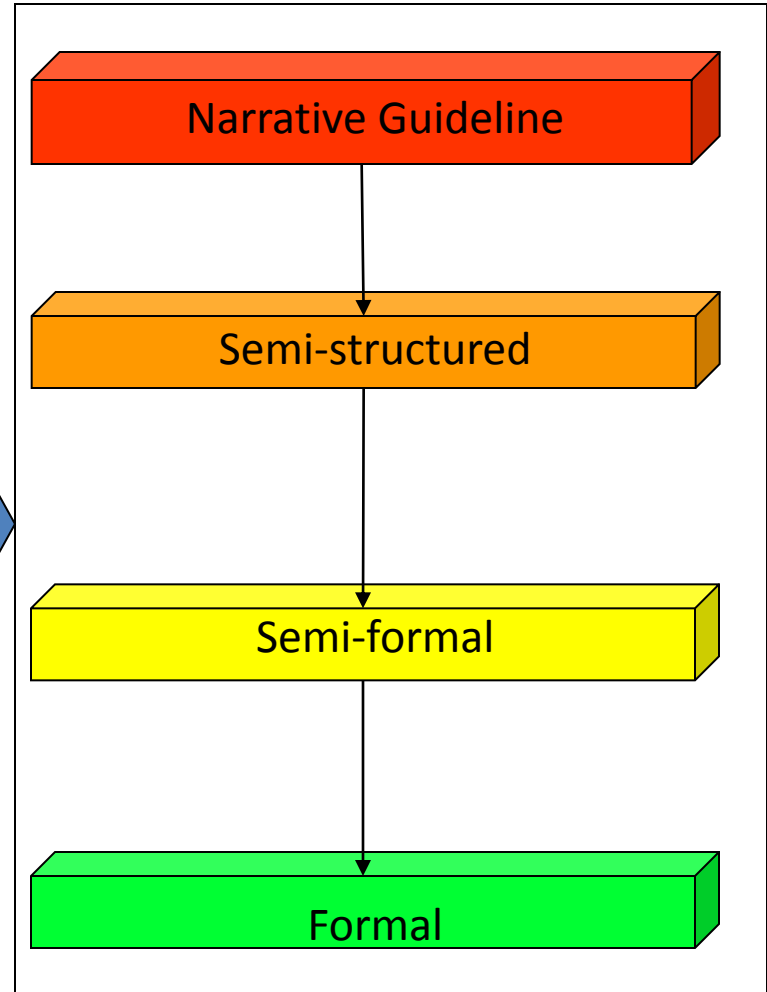
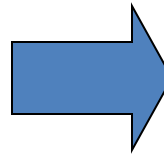


**Black Box**



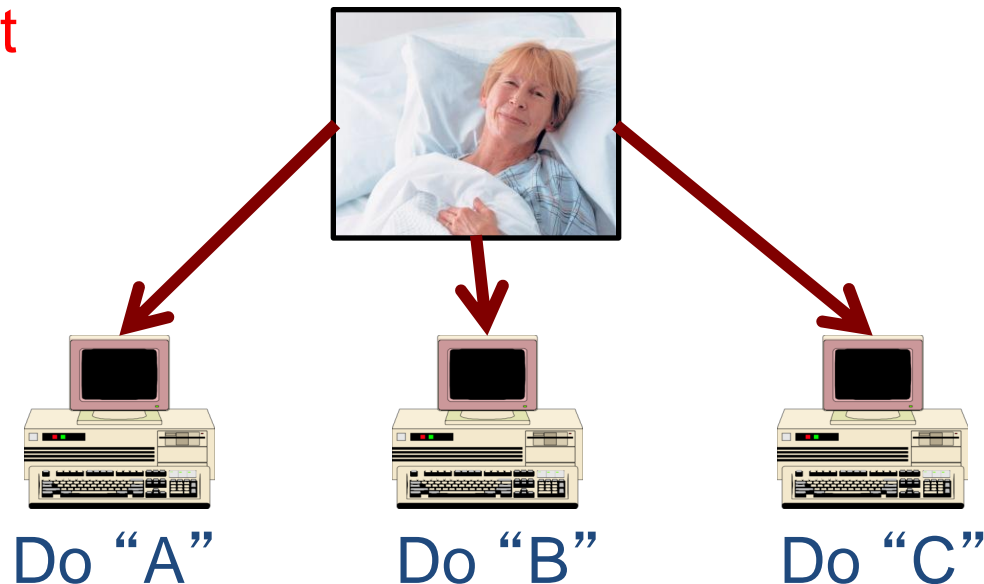
## Computer-Based Decision Support

# Black Box



# Risk of Ad Hoc Transformation

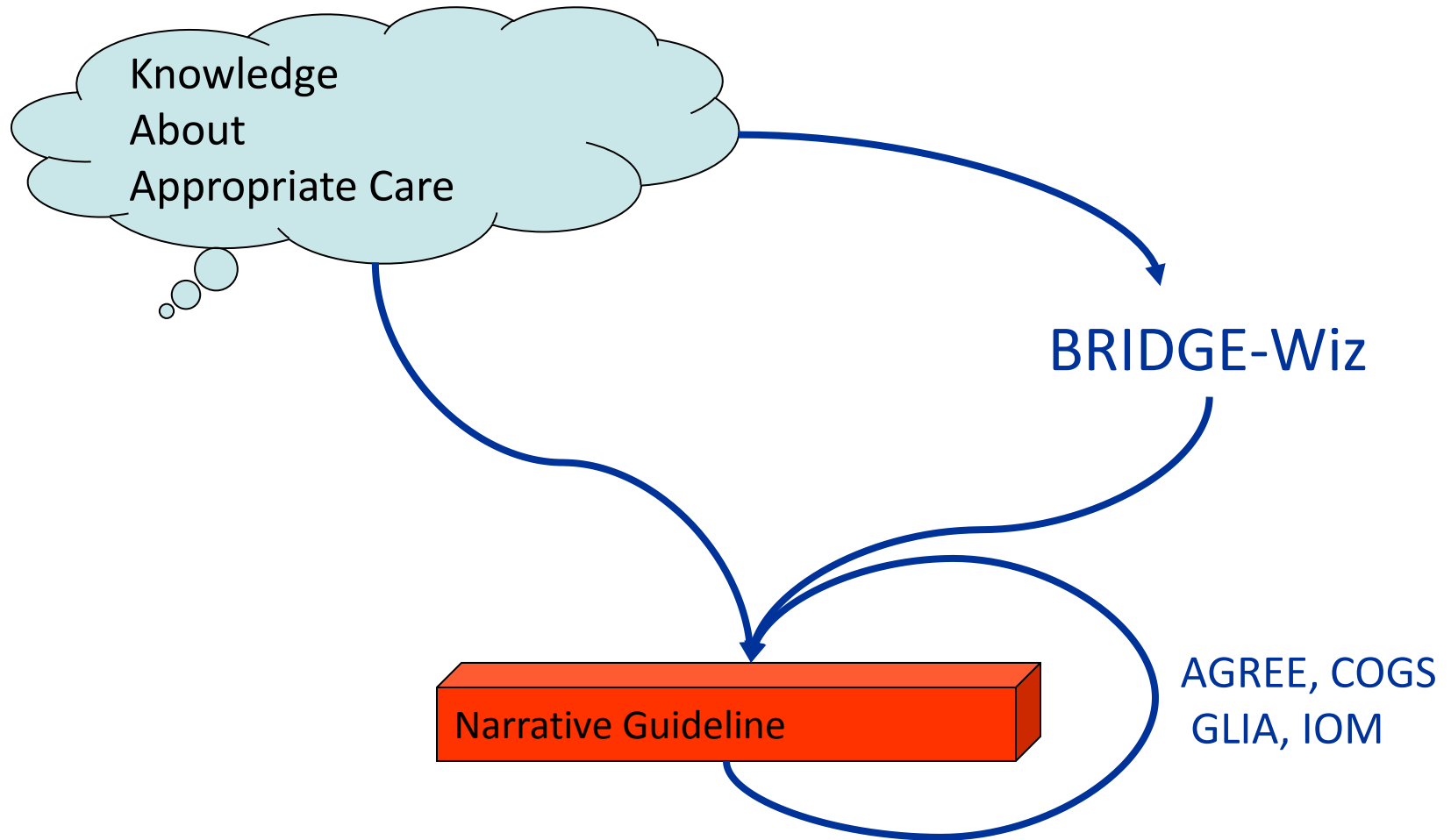
- Knowledge engineers at 3 sites
- Individually create CDS from guidelines for immunization and for workup of breast mass
- Test: Submit standardized patients to CDSs
- Outcome: **Different recommendations** were given **for the same patient**



Patel JAMIA 1998

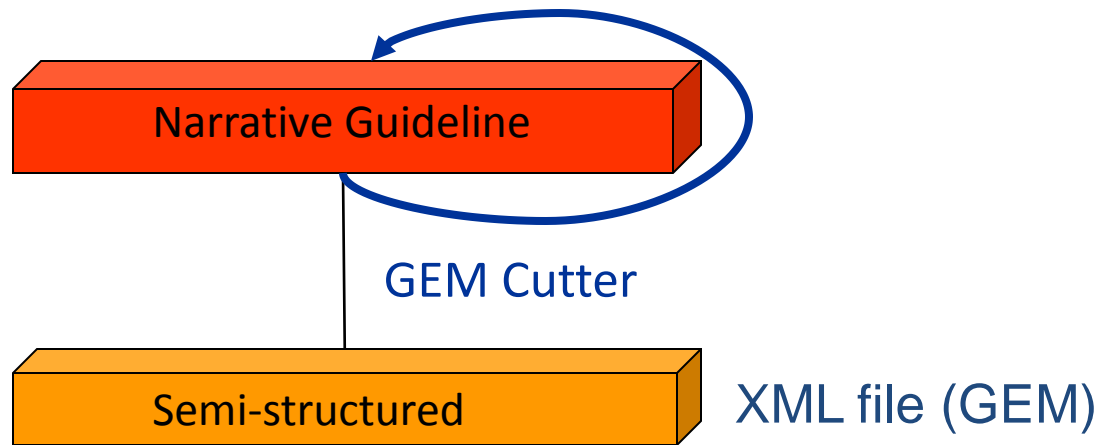
Ohno-Machado JAMIA<sup>14</sup> 1998

# Narrative Guideline

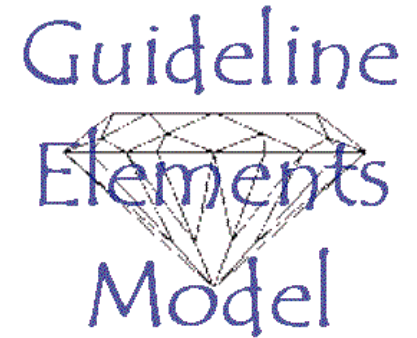




# Narrative to Semi-Structured



# XML and GEM



- XML allows user to define his/her own “tags”
  - `<Title>Gone With The Wind</Title>`
  - `<Author>Margaret Mitchell</Author>`
  - `<EligibilityCriterion>gross hematuria</EligibilityCriterion>`
  - `<EvidenceQuality>Grade B</EvidenceQuality>`
- Human readable, machine processable
- GEM (the Guideline Elements Model) is set of 167 tags
- Has undergone standardization 3 times (latest 2012)

# GEM Provides Bins



Developer

Purpose

Method of Development



Intended Audience

Target Population

Recommendations

# Markup Guideline

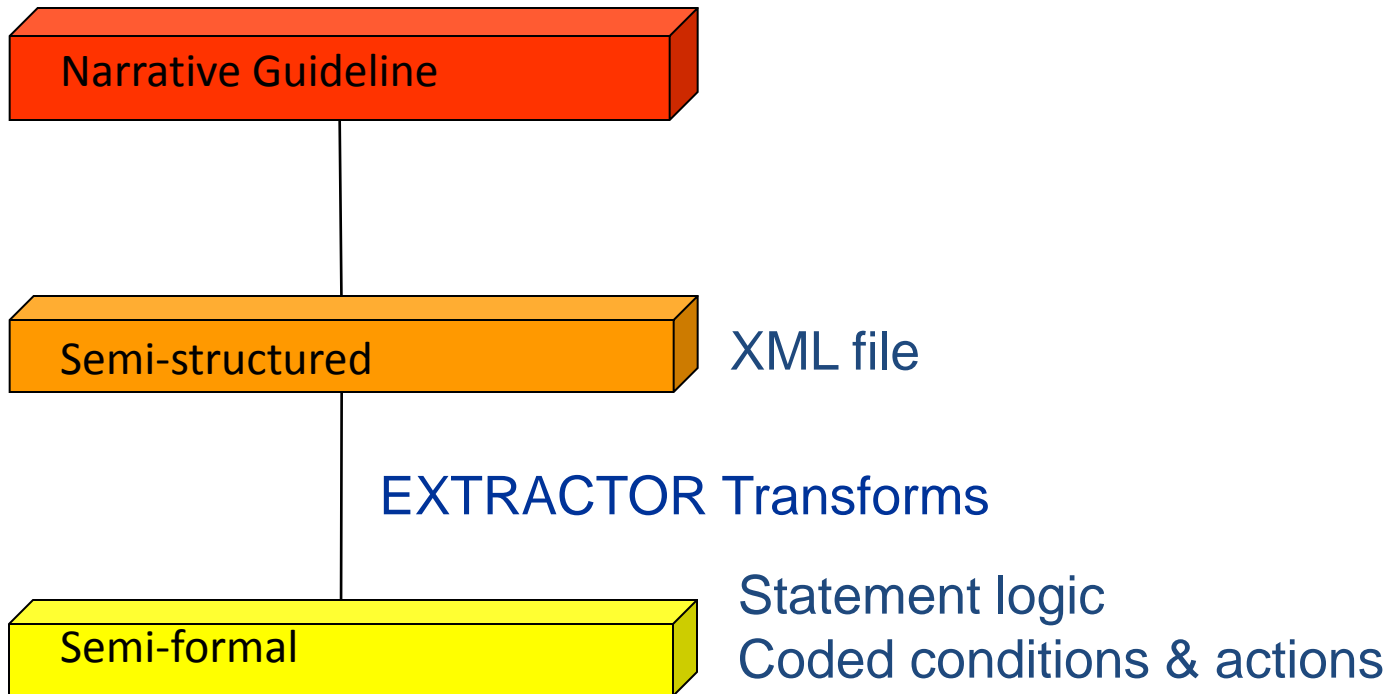
- GEM Cutter
  - Parses guideline text into components of the Guideline Elements Model
  - Creates an XML file
  
- Available at <http://GEM.med.yale.edu>

# GEM Cutter

The screenshot displays the GEM Cutter software interface, which is used for processing and structuring clinical practice parameters. The interface is divided into several panes:

- Left Pane:** Contains the text of a practice parameter titled "Practice Parameter: The Neurodiagnostic Evaluation of the Child With a First Simple Febrile Seizure". It includes sections for "DEFINITION OF THE PROBLEM", "TARGET AUDIENCE AND PRACTICE SETTING", and "INTERVENTIONS OF DIRECT INTEREST".
- Center Pane:** Shows a tree view of the document's metadata, including fields like <Title>, <Citation>, <Release\_Date>, <Availability>, <Status>, <Companion\_Document>, <Adaptation>, <Developer>, and <Purpose>. The <Main\_Focus> field is currently selected.
- Right Pane:** Features a "Source" section with radio buttons for "N/D", "Inferred", and "Explicit" (which is selected). Below this is a text area containing the main focus text: "This practice parameter provides recommendations for the neurodiagnostic evaluation of neurologically healthy infants and children between 6 months and 5 years of age who have had their first simple febrile seizures and present within 12 hours of the event."
- Bottom Pane:** Titled "GEM Structure", it shows a hierarchical diagram of the metadata fields. The fields are organized as follows:
  - Title
  - Citation (with a sub-field Length)
  - Release Date
  - Availability (with sub-fields Electronic and Print)
  - Status (with a sub-field Contact)
  - Companion Document (with a sub-field Patient Resources)
  - Adaptation

# Semi-Structured to Semi-Formal



# EXTRACTOR: Rules

Human-readable statement logic

## Recommendation

### Pharmacologic Issues for Children 0–4 Years of Age

**Conditional:** If there is no clear response within 4–6 weeks, the therapy should be discontinued and alternative therapies or alternative diagnoses considered {Rec\_14: Cond\_18 }

**IF**

no clear response within 4–6 weeks

**THEN**

therapy should be discontinued

alternative therapies or alternative diagnoses considered

Decidable	Vocab
Executable	Vocab

**Evidence Quality:** Evidence D

**Strength of Recommendation:** The Expert Panel recommends

**Reason:** treatment of young children is often in the form of a therapeutic trial

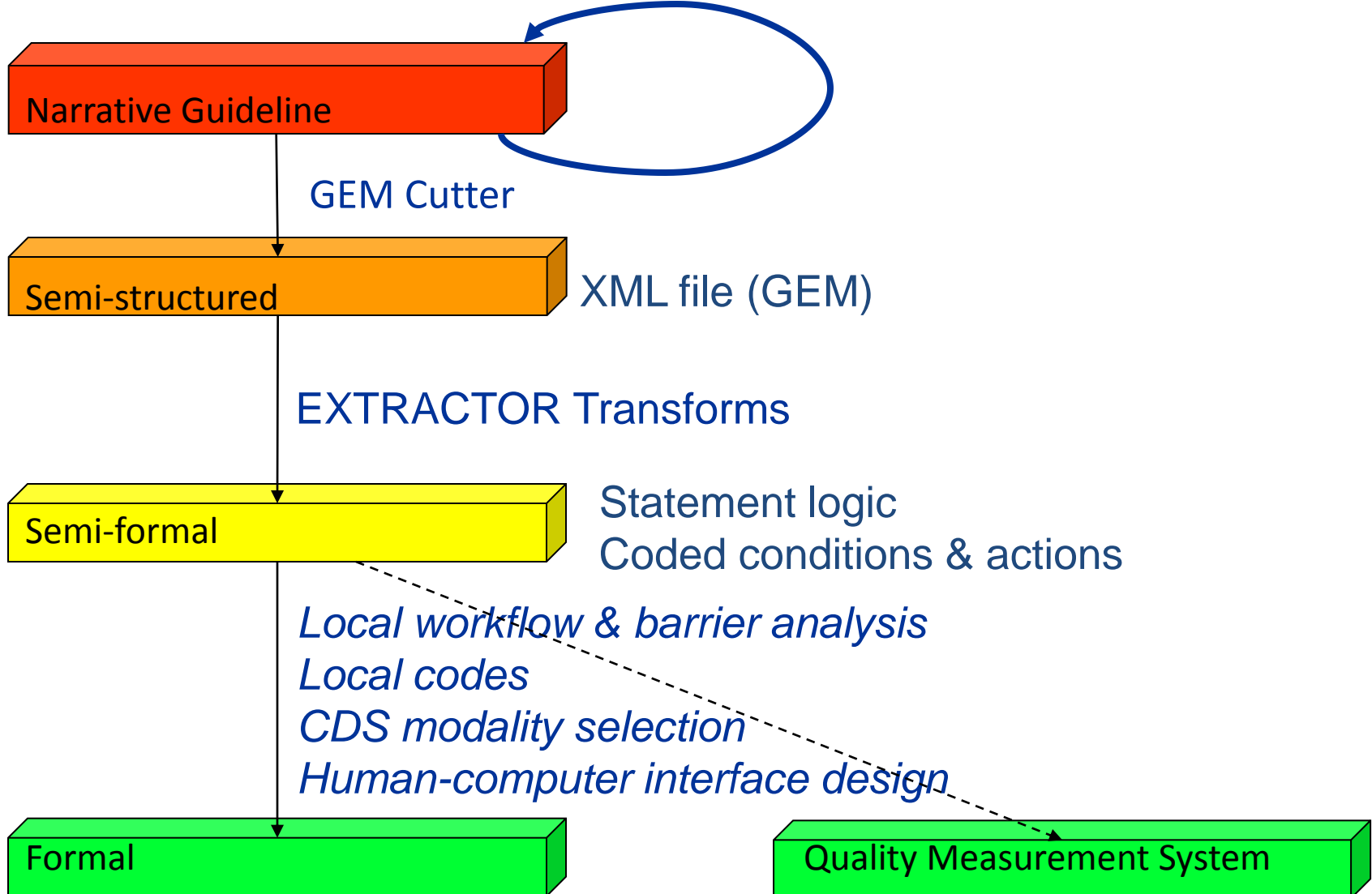
**Logic:**

# Map Recommendations to Controlled Vocabulary

Recommendation	Language	Action Type		
<b>Monitoring Signs and Symptoms of Asthma</b>	<b>Imperative:</b> Consider long-term daily peak flow monitoring for: — Patients who have moderate or severe persistent asthma (Evidence B). — Patients who have a history of severe exacerbations (Evidence B).	<b>Monitor</b>		
Codable Components	Fully-Specified Concept Name	Concept ID	SNOMED ID	CTV3 ID
Peak flow monitoring	<a href="#">Peak expiratory flow rate monitoring (regime/therapy)</a>	<a href="#">401004000</a>	P0-00975	XaIxD
Moderate persistent asthma	<a href="#">Moderate persistent asthma (disorder)</a>	<a href="#">427295004</a>	F-04F3F	XUfiW
Severe persistent asthma	<a href="#">Severe persistent asthma (disorder)</a>	<a href="#">426656000</a>	F-04F40	XUfiX
Severe exacerbations	<a href="#">Exacerbation of asthma (disorder)</a>	<a href="#">281239006</a>	D2-00076	Xa1hD



# GEM Cutter-Extractor



How much knowledge transformation  
can be performed centrally?

# Designing CDSS

# Palette of CDS Interventions



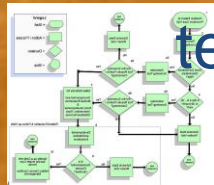
Documentation  
template



Alert



Reminder



Algorithm



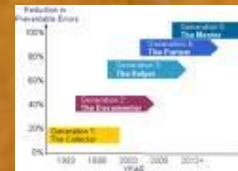
Order  
Facilitator



Infobutton

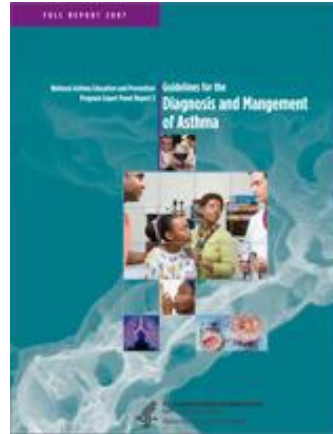


Calculator



Flowsheet

# Example: Asthma Guideline to CDS



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

# Guideline defined 2 dimensions

**FIGURE 4-3b. ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN CHILDREN 5-11 YEARS OF AGE**

Components of Control		Classification of Asthma Control (5-11 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week but not more than once on each day	>2 days/week or multiple times on ≤2 days/week	Throughout the day
	Nighttime awakenings	≤1x/month	≥2x/month	≥2x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting beta <sub>2</sub> -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	Lung function • FEV <sub>1</sub> or peak flow • FEV <sub>1</sub> /FVC	>80% predicted/ personal best  >80%	60-80% predicted/ personal best  75-80%	<60% predicted/ personal best  <75%
Risk	Exacerbations requiring oral systemic corticosteroids	0-1/year	≥2/year (see note)	
		Consider severity and interval since last exacerbation		
	Reduction in lung growth	Evaluation requires long-term followup.		
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		
Recommended Action for Treatment  (See figure 4-1b for treatment steps.)		<ul style="list-style-type: none"> <li>• Maintain current step.</li> <li>• Regular followup every 1-6 months.</li> <li>• Consider step down if well controlled for at least 3 months.</li> </ul>	<ul style="list-style-type: none"> <li>• Step up at least 1 step and</li> <li>• Reevaluate in 2-6 weeks.</li> <li>• For side effects: consider alternative treatment options.</li> </ul>	<ul style="list-style-type: none"> <li>• Consider short course of oral systemic corticosteroids,</li> <li>• Step up 1-2 steps, and</li> <li>• Reevaluate in 2 weeks.</li> <li>• For side effects, consider alternative treatment options.</li> </ul>

# Guideline Matrix (I)

**FIGURE 4-3b. ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN CHILDREN 5-11 YEARS OF AGE**

Components of Control		Classification of Asthma Control (5-11 years of age)		
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Impairment	Symptoms	≤2 days/week but not more than once on each day	>2 days/week or multiple times on ≤2 days/week	Throughout the day
	Nighttime awakenings	≤1x/month	≥2x/month	≥2x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting beta <sub>2</sub> -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	Lung function			
	• FEV <sub>1</sub> or peak flow	>80% predicted/ personal best	60-80% predicted/ personal best	<60% predicted/ personal best
	• FEV <sub>1</sub> /FVC	>80%	75-80%	<75%
Risk	Exacerbations requiring oral systemic corticosteroids	0-1/year	≥2/year (see note)	
		Consider severity and interval since last exacerbation		
	Reduction in lung growth	Evaluation requires long-term followup.		
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		
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herine Flanagan

**CLASSIFYING COMPONENTS OF ASTHMA SEVERITY AND INITIATING TREATMENT**

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

Assessment for:  Control  Severity

----- Intermittent ----- Mild ----- Persistent ----- Severe

**Impairment**

Cough due to asthma  None  ≤2 days/wk  >2 days/wk  Daily  All Day

Wheezing  None  ≤2 days/wk  >2 days/wk  Daily  All Day

Chest tightness  None  ≤2 days/wk  >2 days/wk  Daily  All Day

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 not Daily  Several times per

Lung Function  
FEV<sub>1</sub> or peak flow  FEV<sub>1</sub>>80% predicts  <-----  <-----  FEV<sub>1</sub>=60-80% prec  FEV<sub>1</sub><80% predicts

FEV<sub>1</sub>/FVC  >85%  <-----  >80%  =75-80%  <75%

**Impairment Classification: Moderate**

**Risk**

Acute/ER visit(s) due to asthma  0  1 in last year  2 in last year  3 in last year  ≥4 in last year

Hospitalizations due to asthma  0  1 in last year  2 in last year  3 in last year  ≥4 in last year

Exacerbations requiring oral systemic corticosteroids  0-1/year  ≥2/year

AND  Risk Factors for persistent asthma

**Medication Adverse Effect**

Treatment-related adverse effects

Thruah  
 Palpitations  
 Jitteriness  
 Sleep Disturbances  
 Decreased Growth  
 Other

**Comments**

**Risk Classification: Low**  
**Asthma Severity Classification: Moderate Persistent**

Next Form (Ctrl+PgDn) Close

# Guideline Matrix (II)

**Asthma Control: Katherine Flanagan**

CLASSIFYING COMPONENTS OF ASTHMA SEVERITY AND INITIATING TREATMENT

Is patient currently on controller medication?  yes  no

Has this patients severity been classified?  yes  no

Assessment

**Prompts for documentation**

Visit Type  
 Well Child  
 Asthma

Impairment

	Intermittent	Mild	Moderate	Severe
<input checked="" type="checkbox"/> HPI	<input type="radio"/> None	<input type="radio"/> <=2 days/wk	<input type="radio"/> >2 days/wk	<input checked="" type="radio"/> Daily
<input checked="" type="checkbox"/> Cntrl/Sev	<input type="radio"/> None	<input type="radio"/> <=2 days/wk	<input checked="" type="radio"/> >2 days/wk	<input type="radio"/> Daily
<input checked="" type="checkbox"/> Inhaler/Env	<input type="radio"/> None	<input checked="" type="radio"/> <=2 days/wk	<input type="radio"/> >2 days/wk	<input type="radio"/> Daily
<input checked="" type="checkbox"/> PE	<input type="radio"/> None	<input checked="" type="radio"/> <=2 days/wk	<input type="radio"/> >2 days/wk	<input type="radio"/> Daily
<input checked="" type="checkbox"/> Asmt	<input checked="" type="radio"/> None	<input type="radio"/> <=2x/month	<input type="radio"/> 3-4x/month	<input type="radio"/> >1x/wk
<input checked="" type="checkbox"/> Tx Plan	<input type="radio"/> None	<input type="radio"/> <-----	<input type="radio"/> Mild	<input checked="" type="radio"/> Moderate
<input checked="" type="checkbox"/> Action Plan	<input checked="" type="radio"/> None	<input type="radio"/> <=2 days/wk	<input type="radio"/> >2 days/wk but not	<input type="radio"/> Daily
<input checked="" type="checkbox"/> Asmt/Plan	<input type="radio"/> FEV>80% predict	<input type="radio"/> <-----	<input type="radio"/> <-----	<input checked="" type="radio"/> FEV=60-80% prec
	<input type="radio"/> >85%	<input type="radio"/> <-----	<input checked="" type="radio"/> >80%	<input type="radio"/> =75-80%

Impairment Classification: **Moderate**

Exacerbations requiring oral systemic corticosteroids  0-1/year  
 2-3 in last year  3 in last year  >=4 in last year  
 2-3 in last year  >=4 in last year  
 >=2/year

AND  Risk Factors for persistent asthma

Treatment-related adverse effects

Medication Adverse Effect

- Thrush
- Palpitations
- Jitteriness
- Sleep Disturbances
- Decreased Growth
- Other

Comments

**Real-time calculation and display**

Risk Classification: **Low**

Asthma Severity Classification: **Moderate Persistent**

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



# Guideline Matrix (III)

Asthma Assessment: Katherine Flanagan

<b>Visit Type</b> <input type="checkbox"/> Well Child <input checked="" type="checkbox"/> Asthma	<b>Decision Support - Today</b> Severity Class: <b>Moderate Persistent</b> Impairment: <b>Moderate</b> Risk: <b>Low</b>	<b>Control Classification</b> Control Class: Impairment: Risk: Previous Step:	<b>Severity Classification</b> Severity Class:
--	--	---	---

**Provider Assessment - Today**

Current level of control is:  Well Controlled  Not Well Controlled  Very Poorly Controlled

Inhaler Technique:  Correct  Incorrect  N/A

Adherence:  N/A

Prompts for Assessments

Display of Relevant Past Information

**Advice**

Severity Classification: **Moderate Persistent** Recommended therapy is **Step 3 or 4**

--- Regular follow up every 1 - 6 months ---

Alert

**Intermittent Asthma** **Persistent Asthma: Daily Medication**

Step 1  Step 2  Step 3  Step 4  Step 5  Step 6

Step Comments/Reason for Step Change:

SABA PRN	Cromolyn, LTRA, Nedocromil	OR Medium-dose ICS	Preferred: Medium-dose ICS+LABA, or COMBO  Alternative: Medium-dose ICS+LTRA	Preferred: High-dose ICS+LABA, or COMBO  Alternative: High-dose ICS+LTRA	Preferred: High-dose ICS+LABA, or COMBO+ oral systemic corticosteroid  Alternative: High-dose ICS+LTRA + oral systemic corticosteroid  Consult Asthma Specialist
	Consider consultation	Consult Asthma Specialist	Consult Asthma Specialist	Consult Asthma Specialist	

Information Access

# Guideline Matrix (IV)

ASTHMA MEDICATION: Katherine Flanagan

Visit Type	Problems	Medications	Allergies
<input type="checkbox"/> Well Child <input checked="" type="checkbox"/> 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

Order Set

Selected Treatment Step : 3

<input checked="" type="checkbox"/> HPI <input checked="" type="checkbox"/> Cntrl/Sev <input checked="" type="checkbox"/> Inhaler/Env <input checked="" type="checkbox"/> PE <input checked="" type="checkbox"/> Asmt <input checked="" type="checkbox"/> Tx Plan <input checked="" type="checkbox"/> Action Plan <input checked="" type="checkbox"/> Asmt/Plan	<p><b>Quick-Relief</b></p> <p>Short acting B-2 agonist</p> <p>ALBUTEROL NEBS .083% Q4 hrs PRN</p> <p><input type="button" value="NEW ORDER"/> <input type="button" value="REFILL"/></p>
	<p><b>Long Term Control Preferred</b></p> <p>1. Low-dose inhaled steroid</p> <p>PULMICORT 0.25 MG BID</p> <p><input type="button" value="NEW ORDER"/> <input type="button" value="REFILL"/></p> <p>or</p> <p>LTRA</p> <p><input type="button" value="NEW ORDER"/> <input type="button" value="REFILL"/></p> <p>or</p> <p>2. COMBO:</p> <p><input type="button" value="NEW ORDER"/> <input type="button" value="REFILL"/></p> <hr style="border-top: 1px dashed red;"/> <p>3. Medium-dose inhaled steroid</p> <p><input type="button" value="NEW ORDER"/> <input type="button" value="REFILL"/></p>

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)

# Guideline Matrix (V)

Customizable Handout

PED Asthma Treatment Plan: Katherine Flanagan

Visit Type:  Well Child  Asthma

Current Classification: Moderate Persistent

[Print Action Plan\\_Med Auth](#)

[Print Return to Clinic Form](#)

Clinic Name/Number to add to Action Plan: \_\_\_\_\_

Provider: \_\_\_\_\_

Asmt  
Tx Plan  
Action Plan  
Asmt/Plan

Select Button to Generate Plan for each Zi: [Generate New Plan for Zones](#) [Copy Previous Plan to Zones](#)

**Green Zone - GO!**

Continue Well Program Preventive Plan

Plan: Well Program

PULMICORT 0.25 MG/2ML SUSP (BUDESONIDE (INHALATION)) 0.25 MG/ML nebulized twice a day

**Yellow Zone - CAUTION!**

Plan: Albuterol 2 puffs via spacer or 1 vial via nebulizer up to every four hours. ADD the following medication(s) to the above Well Program

If you are in the YELLOW Zone or are experiencing symptoms (COUGH/WHEEZE)

\* If results last less than 4 hours, Call your PRIMARY CARE PROVIDER.  
\* If you are requiring Albuterol every 4 hours for longer than 2 days, Call your PRIMARY CARE PROVIDER.

**Red Zone - DANGER**

Plan Follow this plan

If you ARE NOT having difficulty breathing.

\* Albuterol 4 puffs via spacer or one vial via nebulizer now and call your Primary Care Provider for further plan  
Call your PRIMARY CARE PROVIDER.

If you ARE having difficulty breathing (Nostrils Flaring, Difficult Talking, Breathing Faster, Rib Cage Sinks in while Breathing, Lethargy)

\* Albuterol 4 puffs via spacer or one vial via nebulizer now  
\* GO Directly to the EMERGENCY ROOM or Call 911

**Medication Authorization Form - First Med**      **Medication Authorization Form - 2nd Med**

Personnel to Administer: \_\_\_\_\_

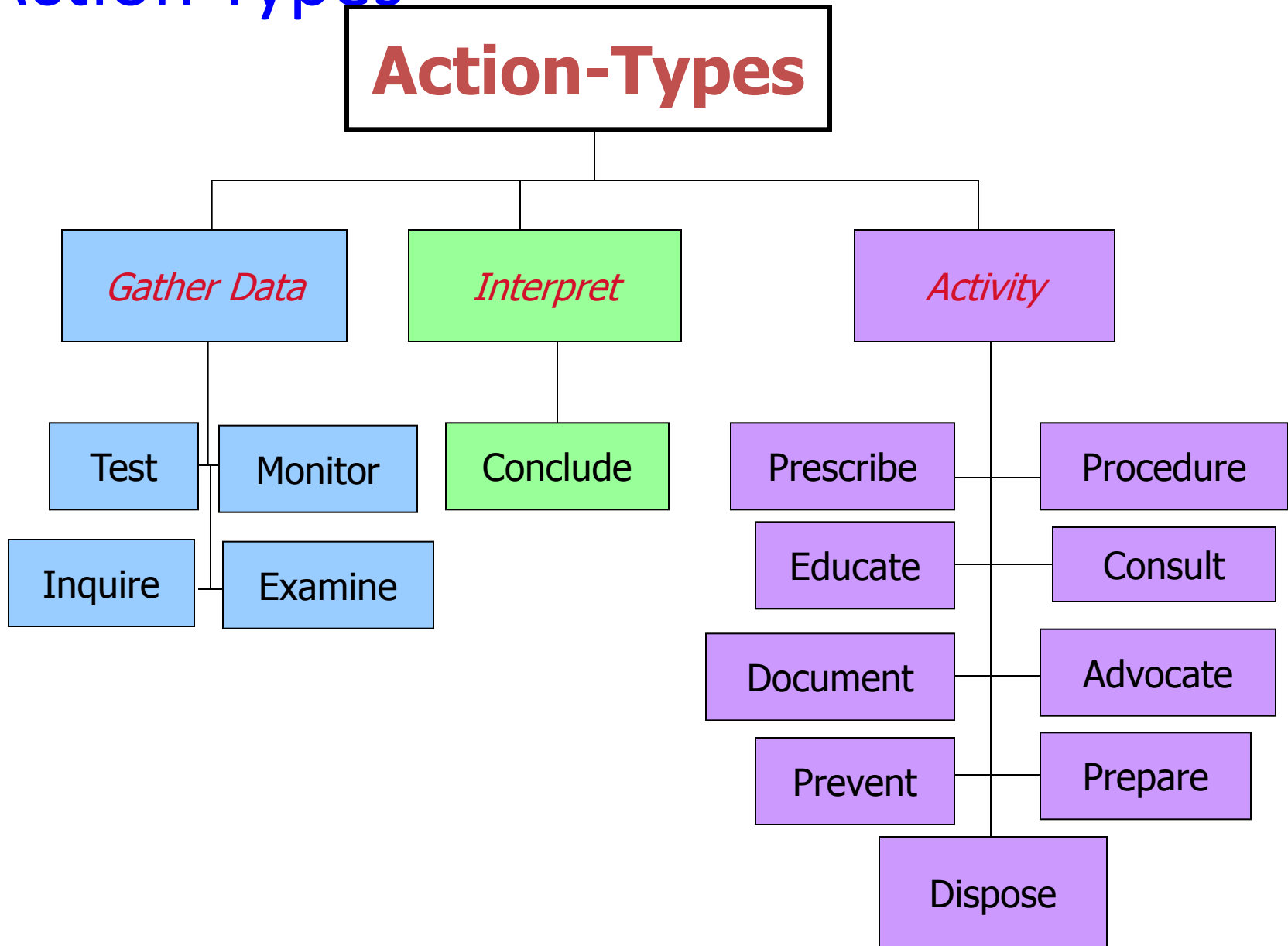
Drug: \_\_\_\_\_ Dose: \_\_\_\_\_ Rte: \_\_\_\_\_

Total # doses in 24 hour: \_\_\_\_\_ # doses at home: \_\_\_\_\_

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

Medication Authorization

# Action Types



# Test

Function	Dyslipidemia	Adrenal Biopsy
Display test information for clinicians/pts	√	√
Display indications	√	√
Present test options/alternatives		√
Recent results from same/related test	√	
Test costs	√	√
Assist scheduling	√	√
Requirements for pt preparation, collection of specimen	√	√
Interpretation aids		
Sensitivity, specificity, PV	√	√
Reasons for FP, FN	√	√
Normal values for age/race/gender	√	
Tickler follow-up system	√	√
Coding: CPT, LOINC codes	√	√

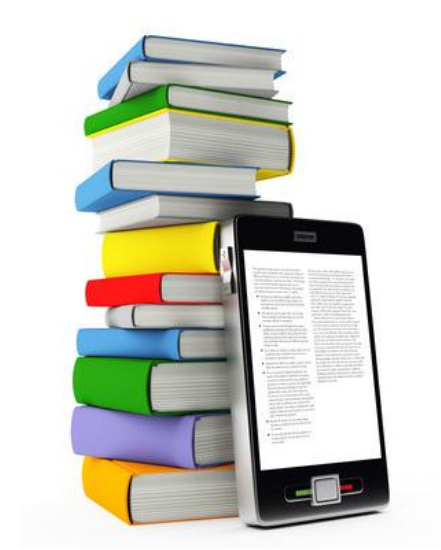
# Prescribe

Function	Anti-hypertensive	Docetaxel	Seizure
Present drug information Clinician (e.g., indications, on-formulary?) Patient (how-to-take, common side-effects)	√ √	√ √	
Display safety alerts Drug-allergy Drug-drug interaction Drug-food interaction	√ √ √	√ √	√ √
Dosage calculation assistance by weight/BSA		√	√
Corollary orders	√	√	√

# Perform Procedure

Function	CIN-1 Excision	Intubation	Laparoscopic surgery
Indications / Contraindications	√	√	√
Informed consent (shared decision-making)	√	√	√
Relevant anatomy & physiology	√	√	√
In-network providers Need for pre-approval	√	√	√
Labs requirement prior to procedure	√	√	√
Patient preparation	√	√	√
Follow up exam & test(s)	√	√	√
CPT and diagnosis codes	√	√	√

# Summary



- Improving practice
- 4 steps in Knowledge Transformation
- CDS is more than alerts
- Action-types facilitate CDSS design



## GuideLines Into DEcision Support (GLIDES)



- Agency for Healthcare Research and Quality
- Yale Center for Medical Informatics

### Introduction to GLIDES

The objective of the GLIDES project is the development, implementation and evaluation of demonstrations that advance understanding of how best to incorporate clinical decision support (CDS) into the delivery of healthcare. The project was performed by Yale University School of Medicine under contract to the US Agency for Healthcare Research and Quality (AHRQ). Yale collaborated with a wide range of guideline developers and implementers including the ECRI Institute, the American Academy of Pediatrics (AAP), the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS), the American Urological Association (AUA), the American Society of Clinical Oncology (ASCO), Children's Hospital Of Philadelphia (CHOP), Geisinger Health System, Alliance of Chicago, and Nemours. This site provides more information about GLIDES 40 methods, software tools, and experience.

- Calendar
- Contact Us
- Yale Phonebook

# Thank You!

<http://ycmi.med.yale.edu>  
[richard.shiffman@yale.edu](mailto:richard.shiffman@yale.edu)

# Component Sources

Health Informatics Svcs

**GEM**

Identity

Developer

Purpose

Audience

Method

Knowledge

Testing

Revision

Identity	Title	■	■	■	■	■	■	■	■	GEM
	Citation	■	■	■	■	■	■	■	■	
	Release Date	■	■	■	■	■	■	■	■	
	Availability	■	■	■	■	■	■	■	■	
	Contact Status	■	■	■	■	■	■	■	■	
Developer	Companion Document	■	■	■	■	■	■	■	■	GEM
	Adaptation	■	■	■	■	■	■	■	■	
	Developer Name	■	■	■	■	■	■	■	■	
	Committee Name	■	■	■	■	■	■	■	■	
Purpose	Funding	■	■	■	■	■	■	■	■	GEM
	Endorser	■	■	■	■	■	■	■	■	
	Comparable Guideline	■	■	■	■	■	■	■	■	
	Health Practices	■	■	■	■	■	■	■	■	
	Category	■	■	■	■	■	■	■	■	
	Target Population	■	■	■	■	■	■	■	■	
	Rationale	■	■	■	■	■	■	■	■	
	Objective	■	■	■	■	■	■	■	■	
	Available Options	■	■	■	■	■	■	■	■	
	Implementation Strategy	■	■	■	■	■	■	■	■	
Audience	Health Outcomes	■	■	■	■	■	■	■	■	GEM
	Exceptions	■	■	■	■	■	■	■	■	
	Care Setting	■	■	■	■	■	■	■	■	
Method	Clinician Users	■	■	■	■	■	■	■	■	GEM
	Evidence Collection	■	■	■	■	■	■	■	■	
	Evidence Time Period	■	■	■	■	■	■	■	■	
	Evidence Grading	■	■	■	■	■	■	■	■	
	Combining Evidence	■	■	■	■	■	■	■	■	
	Specification of Harm/Benefit	■	■	■	■	■	■	■	■	
	Quantification of Harm/Benefit	■	■	■	■	■	■	■	■	
	Value Judgment	■	■	■	■	■	■	■	■	
	Patient Preference	■	■	■	■	■	■	■	■	
	Qualifying Statement	■	■	■	■	■	■	■	■	
	Cost Analysis	■	■	■	■	■	■	■	■	
	Knowledge	Recommendation	■	■	■	■	■	■	■	
Conditional (decision variable)		■	■	■	■	■	■	■	■	
Action		■	■	■	■	■	■	■	■	
Logic		■	■	■	■	■	■	■	■	
Reason		■	■	■	■	■	■	■	■	
Strength of Recommendation		■	■	■	■	■	■	■	■	
Evidence Quality		■	■	■	■	■	■	■	■	
Testing	Cost	■	■	■	■	■	■	■	■	GEM
	Certainty	■	■	■	■	■	■	■	■	
	Algorithm	■	■	■	■	■	■	■	■	
	Eligibility	■	■	■	■	■	■	■	■	
	Definition	■	■	■	■	■	■	■	■	
Revision	External Review	■	■	■	■	■	■	■	■	GEM
	Pilot Testing	■	■	■	■	■	■	■	■	
	Expiration Date	■	■	■	■	■	■	■	■	
Scheduled Review	■	■	■	■	■	■	■	■	GEM	

# Decision Variables

## Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma Full Report 2007

### Decision Variables

0–4 Years of Age Rec_1: Cond_1: DV_1
four or more episodes of wheezing in the past year that lasted more than 1 day and affected sleep Rec_1: Cond_1: DV_2
parental history of asthma Rec_1: Cond_1: DV_3
a physician diagnosis of atopic dermatitis Rec_1: Cond_1: DV_4
evidence of sensitization to aeroallergen Rec_1: Cond_1: DV_5
evidence of sensitization to foods Rec_1: Cond_1: DV_6
4 percent peripheral blood eosinophilia Rec_1: Cond_1: DV_7

# Actions

The Expert Panel recommends daily long-term control therapy

Rec\_5: Cond\_5: Act\_5

therapy should be stepped up if necessary to achieve control

Rec\_6: Cond\_6: Act\_6

Patient adherence and technique in using medications correctly should be assessed and addressed as appropriate

Rec\_7: Cond\_7: Act\_7

Other factors that diminish control of asthma impairment should be addressed as possible reasons for poor response to therapy and targets for intervention (

Rec\_7: Cond\_7: Act\_8

a step up in treatment may be needed

Rec\_7: Cond\_8: Act\_9

review adherence to medications and control of environmental exposures

Rec\_8: Cond\_9: Act\_10

# Test!

- *“All adults and adolescents with chronic kidney disease should be evaluated for dyslipidemias.”*
- *“The finding of an isolated adrenal mass on ultrasonography, CT scan, or FDG-PET scan requires biopsy to rule out metastatic disease if the patient is otherwise considered to be potentially resectable.”*

# Prescribe:

- *“Antihypertensive therapy (with either hydralazine or labetalol) should be used for treatment of diastolic blood pressure levels of 105/110 mm Hg or higher.”*
- *“In anthracycline-naive patients for whom anthracyclines are contraindicated, treatment with single-agent docetaxel 100 mg/m<sup>2</sup> over one hour every 3 weeks is recommended”*
- *“... if seizures continue, within 30 minutes: Give fosphenytoin in a dose of 18 mg/kg phenytoin equivalent (PE) IV, up to 150 mg/min with electrocardiography (ECG) monitoring...”*

# Perform Procedure:

- *“Excisional modalities are preferred for patients who have recurrent biopsy-confirmed CIN-1 after undergoing previous ablative therapy.”*
- “Orotracheal intubation guided by direct laryngoscopy is the emergency tracheal intubation procedure of choice for trauma patients.”
- Laparoscopic surgery is recommended as an acceptable option for the treatment of stage I, II, or III colon cancer and should be considered an alternative to conventional open surgery for colon cancer in specified patients.