

Guideline Management

- Standards and Formats
- Guidelines and DSS
- Updating DSS

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Sydney
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14:00-17:00

Overview

- GEM Hierarchy
- Distinguishing characteristics
- MORO
- GEM Polisher implementation model
 - Action palette
 - Associated beneficial services (ABS)

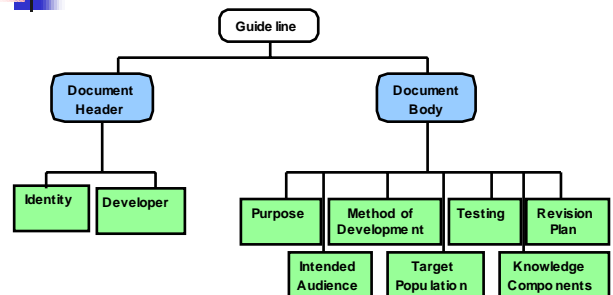
GEM

Guideline
Elements
Model

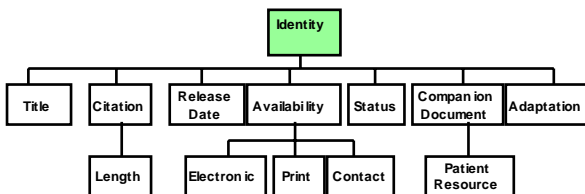
- Knowledge model for guideline documents
 - Multi-level hierarchy (>100 elements)
- Models heterogeneous information contained in guidelines
- Conceived and developed in XML
- GEM DTD adopted as a standard (ASTM E2210-02)

Shiffman, et al. JAMA 2000

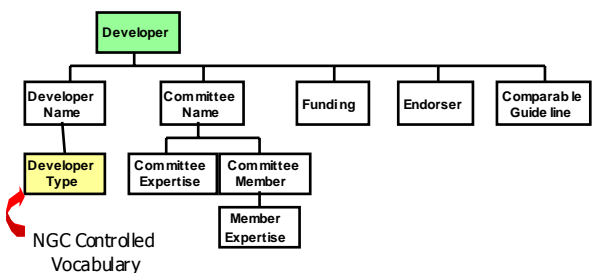
GEM: Top Levels



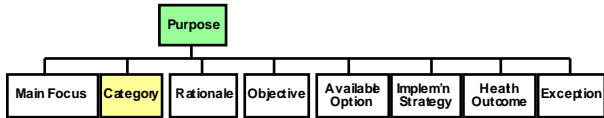
Identity



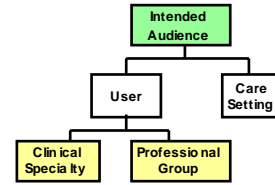
Developer



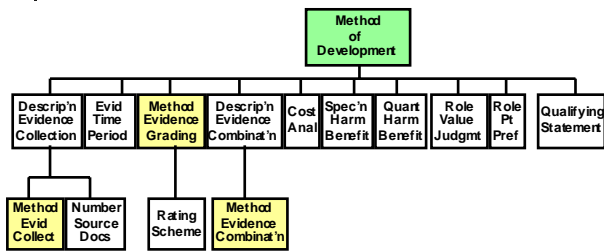
Purpose



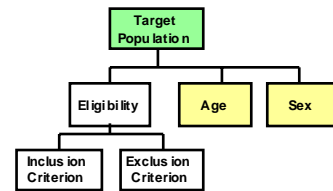
Intended Audience



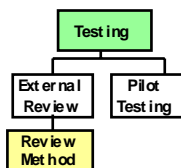
Method of Development



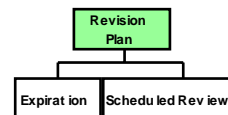
Target Population



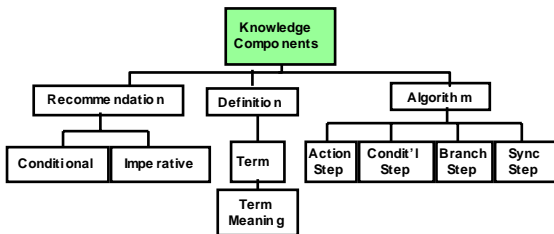
Testing



Revision Plan



Knowledge Components



Diagnosis and Evaluation of the Child With Attention Deficit/Hyperactivity Disorder (AAP-2002)

IF Age 6-12 years **AND**
 (Inattention **OR**
 Hyperactivity **OR**
 Impulsivity **OR**
 Academic underachievement **OR**
 Behavior problems)
THEN
 Clinicians should initiate evaluation for ADHD.

Benign prostatic hyperplasia (AHCPR-1994)

IF prostatism **AND**
 (hematuria **OR**
 urinary tract infection **OR**
 renal insufficiency **OR**
 history of urolithiasis **OR**
 history of urinary tract surgery)
THEN
 upper urinary tract imaging is recommended

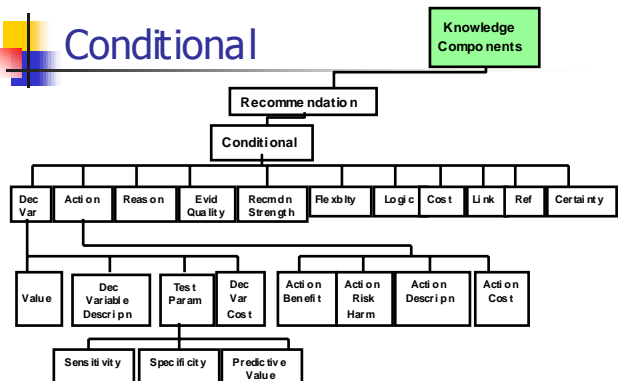
Unstable angina (AHCPR-1994)

- Patients should be instructed in the proper use of sublingual NTG tablets.

Unstable angina (AHCPR-1994)

- Anti-ischemia medicine should be begun and titrated to dosages that are adequate to relieve symptomatic ischemia without excessive bradycardia or hypotension.
- Patients should be encouraged to participate in monitoring the success of medication in relieving their pain.

Conditional



GEM Benefits

- Meets criteria for successful guideline model
 - Reusable throughout lifecycle (MORO), comprehensive, expressively adequate, flexible, comprehensible, sharable
- Open XML standard facilitates tool development
- Markup is easier than programming

GEM Limitations

- Must rely on extrinsic systems to apply the model
- Flawed guidelines can be well represented
- Likely not comprehensive
- Markup requires training and practice
- Mechanisms for sequencing linked recommendations are rudimentary

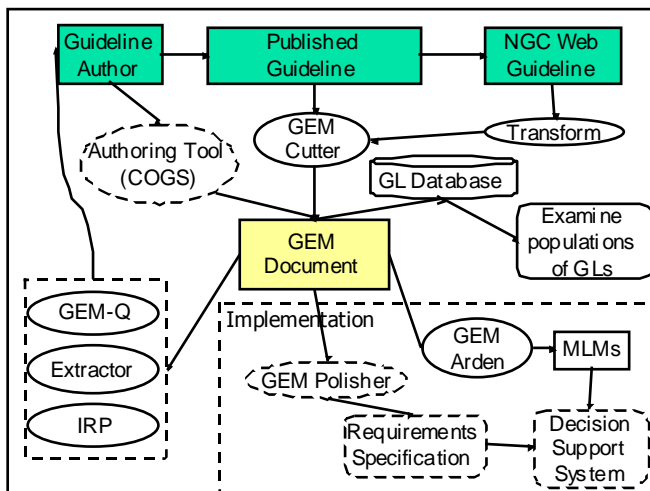
Knowledge reuse

- Reutilization of existing knowledge base constructs...in significantly different contexts

Musen M. Comp Biomed Research 1992;25:435-67

MORO

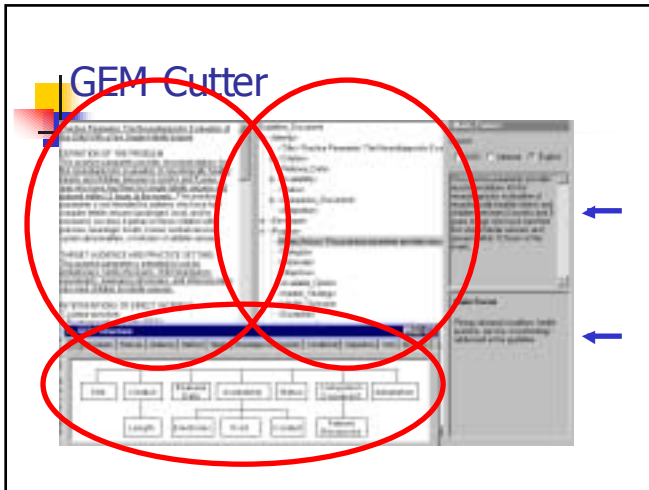
- Markup Once, Reuse Often



Markup Once Reuse Often



- Markup with GEM Cutter Editor



Markup Once Reuse Often



- Markup with GEM Cutter Editor
- Guideline quality appraisal with GEM-Q

Appraisal Instrument for Clinical Guidelines

25. Is there an explicit statement of how the patient's preferences be taken into account in applying the guideline?
Empty (GEM Tag: `////role.patient.preference`)

26. Do the guidelines describe the conditions to be detected, treated, or prevented in unambiguous terms?
 This guideline addresses the available evidence for the appropriate initial treatment of acute otitis media. Questions addressed include the decision to use antibiotics and the evidence as to which antibiotics demonstrate efficacy in this disease
 (GEM Tag: `////main.focus`)

GQAQ Report Card

GQAQ Criterion	Criterion met ?
A. Guideline Development and Format	
A 1. Purpose of the guideline is specified	✗
A 2. Rationale and importance of the guideline are explained	✓
A 3. The participants in the guideline development process and their area of expertise are specified	
Developer Name	✗
Committee Name	✓
Committee Expertise	✓
Committee Member	✗
Member Expertise	✗

Markup Once Reuse Often



- Markup with GEM Cutter Editor
- Guideline quality appraisal with GEM-Q
- Feedback to developers with Extractor

Feedback to developers

Decision Variable	Values	Decidable?
Age	<6m, 6m-2yr, >2yr	
Attend day care	Y, N	
Recently treated with abx	Y, N	
Severe illness	Y, N	
Followup can be assured	Y, N	
Action		Executable?
Amoxicillin 45 mg/kg/d in 2 divided doses		
Observation is appropriate		

Markup Once Reuse Often



- Markup with GEM Cutter Editor
- Guideline quality appraisal with GEM-Q
- Feedback to developers with Extractor
- Implementation with Gem Polisher

Implementation Process



Published Guide



Computer-Based
Guideline Implementation

Dynamic creation of forms

Gershkovich P. Proc AMIA 2001

<input type="checkbox"/>	When Noncompliance is A Concern
<input type="checkbox"/>	Suspected UTI
<input type="checkbox"/>	Assessed As Toxic, Dehydrated, Or Unable To Retain Oral Intake
<input type="checkbox"/>	Unexplained Fever
<input type="checkbox"/>	Assessed As Not Being Sick Or As To Require Immediate Antimicrobial Therapy
<input type="checkbox"/>	Assessed As Being Sufficiently Ill To Warrant Immediate Antimicrobial Therapy

Select Value

Age	[not asked]
Expected Clinical Response	[not asked]
The Uropathogen	[not asked]
Has A Culture	[not asked]
Leukocyt Esterase	[not asked]

Recommendation 4 - conditional - 1

Decision Variable	Value
Leukocyte Esterase	positive result - free
White Turb	positive turb
Definite Or Its Unspec (Un-specified) Specimen	present - free
White Blood Cells In A Properly Specimen	more than 3 - free

Suggested Action: - Any of the following are suggested (although not diagnostic) of UTI

GEM - Arden Mapping

GEM Element -->	Arden Syntax
<conditional>, <imperative>	Maintenance Title
<objective>	Library Purpose
<reason>, <evidence.quality>	Explanation
<reference>	Citation
	Knowledge
<decision variable>, <value>	Evoke
<logic>	Logic
<action>, <directive>	Action

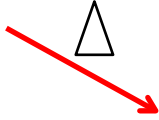
Modeling Implementation with GEM Polisher

Guideline
Elements
Model

Implementation Metadata



Published Guideline



Computer-Based Clinical Decision Support System

Implementation steps

Selection (GL & Rec)

Data Preparation

- (Markup)
- Atomization
- De-abstraction
- Disambiguation
- Verification of completeness
- Explanation

Workflow integration

- Origins and insertions (Sittig, Jenders, Osheroff)
 - Define action types
 - Assoc'd Beneficial Svcs
 - Development of requirement specification
- Encoding, Interface design, Testing

Polisher: Data Preparation

- Atomize
- De-abstract
- Disambiguate
- Verify completeness
- Assemble rule logic

Atomize

- If the patient's asthma is not optimally controlled with the initial Step 3 therapy, and medications are used correctly, additional step 3 therapy is recommended...

<decision.variable> medications are used correctly
</decision variable>

<decision.variable>medication use
 <value>correct</value>
</decision variable>

Deabstraction

Medications are used correctly

{ Adheres to regimen
 Good inhaler technique

{ Uses spacer
 Slow inhalation thru mouth
 Repeat after 1-4 minutes

Disambiguate: Severity Classification

	Symptoms
Severe Persistent	Continual symptoms; Frequent exacerbations
Moderate Persistent	Daily symptoms; Exacerbations $\geq 2X/wk$; Exacerbations affect activity
Mild Persistent	Symptoms $> 2X/wk$ and $< 1X/d$; Exacerbations may affect activity
Mild Intermittent	Symptoms $\leq 2X/wk$; Exacerbations brief, intensity may vary

Disambiguate: Exacerbation

Frequency	Severity	Duration
<ul style="list-style-type: none"> Frequent ≥2X/wk 	<ul style="list-style-type: none"> May affect activity Affect activity Intensity may vary <p>**Patients at any level of severity can have mild, moderate or severe exacerbations</p>	<ul style="list-style-type: none"> May last days Brief (from a few hours to a few days)

Verify

- Observation of a child with AOM without treating with antibiotics is appropriate for selected children based on diagnostic certainty, child age, illness severity, and certainty of follow-up.

Verify

DV	Mod	Values
Certainty of followup	2	Can be assured; cannot be assured
Age	3	<6 mo; 6 mo - 2 yrs; ≥2 yrs
Illness severity	2	Non-severe (mild otalgia and fever <39); Severe
Diagnostic certainty	2	Uncertain; certain (MEE + rapid onset + sx ME inflam'n)

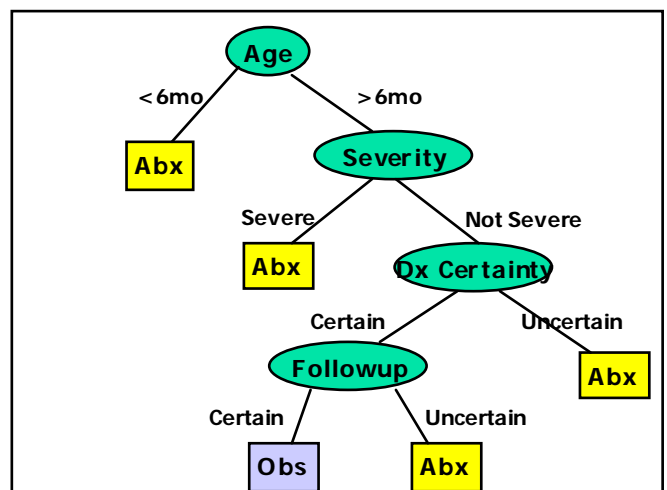
II Mod = Number of combinations (2x3x2x2=24)

DT Verification

	1	2	3	4	5	...	18	...	24
Certainty of followup	C	C	C	C	C	C	...	...	UC
Age	<6m	<6m	<6m	<6m	6-23	≥2	...	...	≥2
Illness severity	Sev	Sev	NSev	NSev	Sev	NSev	...	...	NSev
Diagnostic certainty	C	UC	C	UC	C	C	...	...	UC

DT Verification

	1	2	3	4	5	...	18	...	24
Certainty of followup	C	C	C	C	C	C	...	...	UC
Age	<6m	<6m	<6m	<6m	6-23	≥2	...	...	≥2
Illness severity	Sev	Sev	NSev	NSev	Sev	NSev	...	...	NSev
Diagnostic certainty	C	UC	C	UC	C	C	...	...	UC
Obs						X			
No Obs	X	X	X	X	X				X



Assemble Rule

- Aspirin is effective in reducing the risk for stroke in patients with TIA and minor stroke. (ACP)

~~IF (TIA) AND (MINOR STROKE) THEN ASA~~

IF (TIA) OR (MINOR STROKE) THEN ASA

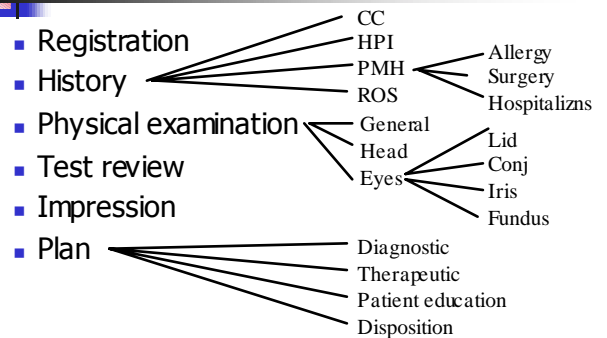
Polisher: System/Workflow Integration

- Origins and insertions
 - Trigger event designation
- Action classification
- Add associated beneficial services
- Requirement specification

Identify Origins and Insertions

- Origin of Decision Variables: sources for information necessary to fire rules
- Insertion of Actions: component of workflow where recommended action is to be delivered

Stages of Clinical Workflow



Origin and insertion of data

- | | | |
|--------------------------|---|----------------------|
| Prostatism | ← | Impression, history |
| Hematuria | ← | History, test review |
| UTI | ← | History, test review |
| Renal insufficiency | ← | History, test review |
| Hx urolithiasis | ← | History |
| Hx urinary tract surgery | ← | History |
-
- | | | |
|---|---|------|
| Recommendation re upper urinary tract imaging | → | Plan |
|---|---|------|

Can we define a set of generic guideline actions and the services that are likely to be needed to fulfill them?

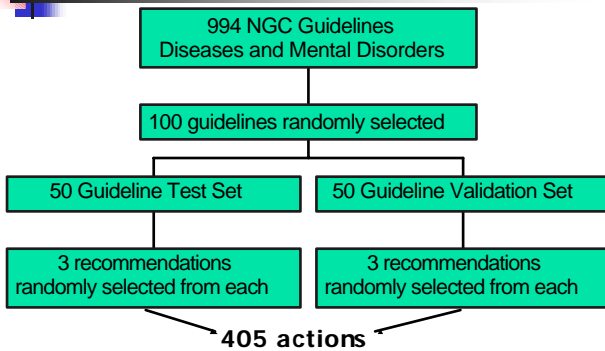
Identifying Actions in Published Guidelines

994 NGC Guidelines
Diseases and Mental Disorders

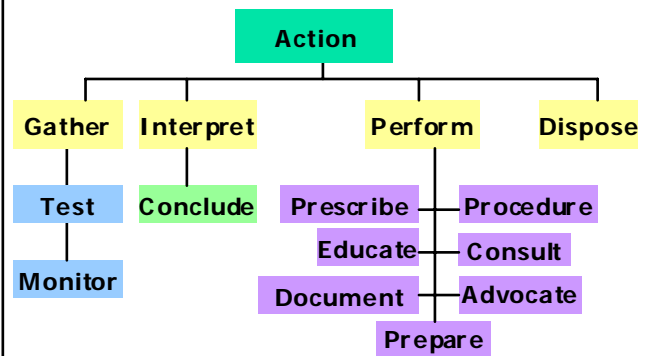
NGC Inclusion Criteria

- Contains "systematically developed statements..."
- Produced by medical specialty associations; professional societies, public or private organizations, government agencies; or health care organizations or plans
- Based on a systematic review of scientific evidence
- English language
- Current, i.e., developed, reviewed, or revised within the last five years.

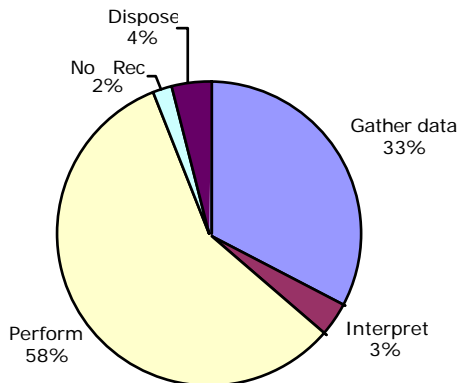
Identifying Actions in Published Guidelines



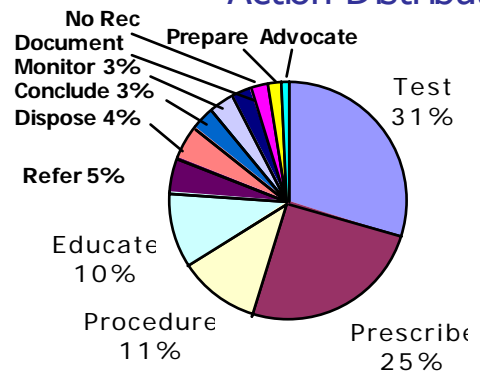
Guideline Action Classifier (N=405)



Major Action Categories



Action Distribution



An action palette of...



- **Reusable** components
- For design and development
- Of workflow integrated
- Decision support

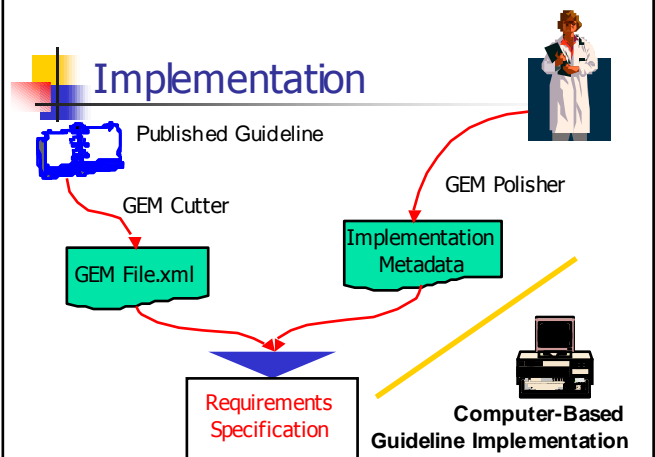
Associated Beneficial Services-Likely to be called on to fulfill actions

- **Test** action
 - Generate test order
 - Provide necessary pt info
 - Prompt follow-up of test results
- **Prescribe** action
 - Generate prescription
 - Transmit (fax, electronic transfer)
- **Educate** action
 - Handout editor
 - Language translation manager

ABS for Referral/Consultation

- Retrieve/report identifiers for pt, referring physician, consultant
- Type of service requested; justified?, approved?
- Create/transmit clinical summary : pertinent hx, recent tests, include problem list, allergies, medications
- Appointment scheduling, prioritization, notification

Implementation



Implementation steps

- | | |
|---|---|
| <ul style="list-style-type: none"> ■ Selection (GL& Rec) ■ Data Preparation <ul style="list-style-type: none"> ■ (Markup) ■ Atomization ■ De-abstraction ■ Disambiguation ■ Verification of completeness ■ Explanation | <ul style="list-style-type: none"> ■ Workflow integration <ul style="list-style-type: none"> ■ Origins and insertions ■ Define action types ■ Assoc'd Beneficial Svcs ■ Development of requirement specification ■ Encoding, Interface design, Testing |
|---|---|

Review

- GEM Hierarchy
- Distinguishing characteristics
- Comparisons
- POLISHER implementation model
 - Action palette
 - Associated beneficial services (ABS)



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<http://ycmi.med.yale.edu/GEM>