Interoperable Clinical Practice Guidelines

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“Knowing is not enough; we must apply. Willing is not enough; we must do”

-Goethe
Other Guidelines Implemented

- Uncomplicated Urinary Tract Infection in Women
- Otitis Media
- Pharyngitis
- Sinusitis/Upper Respirator Infection
- Asthma
- Depression
- Lipid Management
Percent of Patients within Target at Study End Who Exceeded Target at Baseline

- Group A: 41%
- Group B: 37%
- Group C: 55%

Graph 4
<table>
<thead>
<tr>
<th>Interventions</th>
<th>Group A (N=396)</th>
<th>Group B (N=331)</th>
<th>Group C (N=356)</th>
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<tbody>
<tr>
<td>Academic Detailing</td>
<td>X</td>
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<tr>
<td>Risk Lists</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Team Time</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Automatic Letters</td>
<td></td>
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<td>X</td>
</tr>
</tbody>
</table>

Table 1
### Risk Report: TANGALOS, ERIC G.

- **GlyHgb Result**: 9.3
- **GlyHgb Date**: 6 months
- **LDL Result**: 130
- **LDL Date**: 12 months
- **Blood Pressure (Sys)**: 130
- **Blood Pressure (Dia)**: 85

<table>
<thead>
<tr>
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<th>Physician</th>
<th>Appt. Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-201-612</td>
<td></td>
<td>Robert</td>
<td>Robert</td>
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#### Appointment Information

<table>
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</thead>
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<tr>
<td>12/01/01</td>
<td>7:50</td>
<td>Dr. E. G. Tangalos</td>
<td>GE40 PER DR/WAS NOV</td>
</tr>
<tr>
<td>1/05/02</td>
<td>7:45</td>
<td>Dr. E. G. Tangalos</td>
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</tr>
<tr>
<td>1/21/02</td>
<td>8:00</td>
<td>Dr. E. G. Tangalos</td>
<td>RP20 1/28</td>
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<td>1/28/02</td>
<td>10:20</td>
<td>Dr. E. G. Tangalos</td>
<td>GEN 1/21</td>
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<thead>
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<tbody>
<tr>
<td>1-604-567</td>
<td></td>
<td>Lyle</td>
<td></td>
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#### Appointment Information

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<td>4:00</td>
<td>Heidi dyk</td>
<td>KUPP AFT</td>
</tr>
<tr>
<td>3/11/02</td>
<td>4:00</td>
<td>Hygiene</td>
<td>KUPP AFT</td>
</tr>
<tr>
<td>3/11/02</td>
<td>4:45</td>
<td>Dr. L. I. Kupp</td>
<td>CK AFT HYG</td>
</tr>
<tr>
<td>5/04/02</td>
<td>8:00</td>
<td>Dr. E. G. Tangalos</td>
<td>GME/MAY OR JUNE</td>
</tr>
</tbody>
</table>

### Gardner, Lyle

- **GlyHgb Result**: 7.5
- **GlyHgb Date**: 4/6/2001
- **LDL Result**: 68
- **LDL Date**: 6/8/2000
- **Blood Pressure**: 130 \ 68

#### Appointment Information

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Physician</th>
<th>Appt. Note</th>
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<tr>
<td>2-556-264</td>
<td></td>
<td>Curtis</td>
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#### Appointment Information

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<th>Time</th>
<th>Physician</th>
<th>Appt. Note</th>
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<tbody>
<tr>
<td>12/14/2000</td>
<td>115</td>
<td>Dr. E. G. Tangalos</td>
<td>GME/SITE</td>
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<tr>
<td>10/31/2000</td>
<td></td>
<td>Dr. E. G. Tangalos</td>
<td>GMESITE/WAS DEC</td>
</tr>
<tr>
<td>10/31/2000</td>
<td></td>
<td>Dr. E. G. Tangalos</td>
<td>GMESITE/WAS DEC</td>
</tr>
</tbody>
</table>
Diabetes

• Population Management
  • Patient reminders
  • Physician reminders

• Proactive Care

• Integrated Management Guidelines

• Utilize a Team Approach
# Real-Time Reporting for Physician

## Diabetes Provider Specific and Site Report

### Diabetes Provider Specific and Site Comparison

April 19, 2000

<table>
<thead>
<tr>
<th></th>
<th>Resident, NW Clinic</th>
<th>Family Clinic Northwest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of patients:</td>
<td>5</td>
<td>213</td>
</tr>
<tr>
<td>Patients with Gly/Hgb in last 6 months</td>
<td>4 (80%)</td>
<td>131 (52%)</td>
</tr>
<tr>
<td>Patients with Gly/Hgb &lt; 9.3 (HbA1C &lt; 6.0)</td>
<td>4 (80%)</td>
<td>160 (75%)</td>
</tr>
<tr>
<td>Patients with LDL in last 12 months</td>
<td>5 (100%)</td>
<td>159 (75%)</td>
</tr>
<tr>
<td>Patients with LDL &lt; = 130</td>
<td>4 (80%)</td>
<td>150 (70%)</td>
</tr>
<tr>
<td>Patients with BP &lt; 130/&lt;55</td>
<td>1 (20%)</td>
<td>74 (35%)</td>
</tr>
<tr>
<td>Patients with Microalbumin in last 12 months</td>
<td>1 (20%)</td>
<td>107 (50%)</td>
</tr>
<tr>
<td>Patients with Eye Exam in last 12 months</td>
<td>2 (40%)</td>
<td>122 (57%)</td>
</tr>
</tbody>
</table>

[Print the Form] [Cancel]
Provides a ‘Snapshot’ for Visit Planning

### Chronic Disease Registry

**Chronic Disease Registry ****DIABETES TEST VERSION****

#### File View Show Maintenance Reports Sort Appointments

**Patient List (N=2987)**

<table>
<thead>
<tr>
<th>Patient Information</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinic Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age: 69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Primary Provider / Area**

- Resident, AGIM
- Area Medicine

**Last Recorded Vital Signs**

- Blood Pressure: 104 / 56
- Blood Pressure Date: 09/17/1999
- Weight: 162.0 K.g. on: 09/17/1999

**Last Lab Results**

<table>
<thead>
<tr>
<th></th>
<th>Date</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Glucose(P)</td>
<td>05/25/1999</td>
<td>172</td>
</tr>
<tr>
<td>Hb.Glycosyl(RBC)</td>
<td>05/25/1999</td>
<td>9.7</td>
</tr>
<tr>
<td>Hba1c</td>
<td>Calculated</td>
<td>8.3</td>
</tr>
<tr>
<td>Ratio of Alb/Creat</td>
<td>04/27/1998</td>
<td>5</td>
</tr>
<tr>
<td>Cholesterol(S)</td>
<td>07/26/1999</td>
<td>187</td>
</tr>
<tr>
<td>Triglycerides(S)</td>
<td>07/26/1999</td>
<td>425</td>
</tr>
<tr>
<td>HDL Chol(S)</td>
<td>07/26/1999</td>
<td>33</td>
</tr>
<tr>
<td>LDL, Calculated</td>
<td>07/26/1999</td>
<td>NAC</td>
</tr>
<tr>
<td>Creatinine</td>
<td>05/25/1999</td>
<td>1.5</td>
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</tbody>
</table>

**Miscellaneous**

- Last Eye Exam: 11/21/1995

Note: Eye exam date is filled from billing data and due to lag times may not always be current.
Sorting and Filtering Capabilities
Identify Patients
Chronic Disease Registry

• PC Based Tool to assist providers in:
  • Proactive Disease Management
  • Visit Planning
  • Real-time data feedback
Diabetes
HbA1c < 8.0 % or Gly Hgb < 9.7 mg/dl
Goal 90%.

Sample
1998-99  n = random sample of 60 patients per quarter
2000-02  n = Registry; all patients in population

Confidential-Review Organization Data.
Acute Care

Chronic Care

Preventive Care

End of Life Care
Indicate in the boxes below the last date (mo./yr.) each test was completed (or refused), and if applicable, use the following codes to indicate status: \(N=\text{neg/normal} ; \ AB=\text{abnormal} ; \ R=\text{refused} \) and \(E=\text{completed elsewhere and results (N/AB)}\)
Preventive Services
Services Complete
Goal 90%

Note: Percentage of appropriate (age and sex defined) services for the population which were completed.
Preventive Services

• Lipid Screening
• Immunizations
• Cancer Screening
  • Breast
  • Cervical
  • Colon
• Tobacco Cessation
• Blood Pressure Evaluation
Acute Care

Chronic Care

Preventive Care

End of Life Care
Planned Care Model
Generations of Activities

• First Generation
  • Based on patient coming to the office, any reason.

• Second Generation
  • Population Based
  • Dentistry Model
Focus Group Leaders

Planned Care Model
Robert Stroebel, MD

Acute Illness
Greg Bartel, MD

Physician Liaison Mayo Rochester
Rob Stroebel, MD

Physician Liaison MHS
Mark Nyman, MD

Mayo Clinic Rochester - Primary Care
Area General Internal Medicine
Community Internal Medicine
Community Pediatrics and Adolescent Medicine
Family Medicine Baldwin
Kasson Family Practice
Kenyon Family Practice
Urgent Care Center
Mayo Family Clinic Northwest

Mayo Clinic Rochester - Specialty Care
Allergy and Outpatient
Infectious Diseases
Emergency Medical Services
Endocrinology
General Internal Medicine
Hypertension
Pulmonary
Peds Allergy

Mayo Health System
Albert Lea
Austin
Cannon Valley
Decorah
Fairmont
Franciscan Skemp
ISJ - Mankato, Northridge,
Madelia
Lake City
Luther Midelfort (Eau Claire)

Mayo Clinic Rochester - Specialty Care
Allergy and Outpatient
Infectious Diseases
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Endocrinology
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ICSJ Guideline Program

- Over 50 guidelines developed
- Evidence-based development & maintenance
- Each site chooses 4 guidelines to implement
- Results and approaches shared yearly
- New member programs, change management, consensus building, QI
- Web and pocket-guide access
Institute for Clinical Systems Improvement (ICSI)

- Not for profit organization
- 39 participating medical groups
- 5 sponsoring health plans
- Coordinates guideline & technology assessment
  - Development
  - Maintenance
- Forum implementation ideas
Critical Elements of Mayo’s Program

• Leadership support
• Collaboration
  • External
  • Internal
• Clinical Site Guideline Implementation Teams
• Continuous Quality Improvement Methods
• Physician/Patient specific measures
• Healthcare Policy & Research
What is Disease Management?

Carve-Out Model:
Care for patients with chronic illness is provided by contracts with disease-management companies.

Primary Care-Based Disease Management:
Teams work to assist primary care MD in treating patients with chronic illness.

Bodenheimer T. Disease Management-Promises and Pitfalls.
NEJM. 1999.340(15) 1202-1205
What is Disease Management?

“...a systematic, population-based approach to identify persons at risk, intervene with specific programs of care, and measure clinical and other outcomes.”

Mayo Clinic’s Disease Management Strategies Program
Ramifications

Back Surgery

Ratio of HRR Rate of Back Surgery Procedures to U.S. Average (1994-95)

- 1.30 to 2.59 (62)
- 1.10 to < 1.30 (67)
- 0.90 to < 1.10 (87)
- 0.75 to < 0.90 (48)
- 0.43 to < 0.75 (42)
- Not Populated
Ramifications

• Blind Spots in Knowledge in the 1980s
  • Examples:
  • Only 27% of Family Practitioners were aware of the need to monitor hemoglobin A1C for diabetic control.
  • Only 39% of Obstetricians used a trial of labor in certain women who had previous C-section.

Miller, GA

The magic number seven, plus or minus two: some limits on our capacity for processing information.

Transfer of Research to Practice

- **Negative results**: 18% (Dickersin, 1987)
- **Negative results**: 46% (Koren, 1989)
- **Lack of numbers**: 35% (Balas, 1995)
- **Inconsistent indexing**: 50% (Poynard, 1985)

**Original research**
- **Submission**: Variable
- **Acceptance**: 0.5 year (Kumar, 1992)
- **Publication**: 0.6 year (Kumar, 1992)

**Bibliographic databases**
- 0.3 year (Poyer, 1982)
- 6.0-13.0 years (Antmen, 1992)

**Review, paper, textbook**
- 9.3 years

**Implementation**

Balas EA and Boren SA, 2000
Literature Impossible to Review

• Problems with Passive Diffusion of Knowledge
  • To read everything of potential biomedical importance, physicians would need to read 6000 articles per day.

    General physicians would need to read 19 articles a day 365 days a year.
Why Electronically Supported Guidelines?
Surge in Biomedical Research Production

Published Articles Indexed in MEDLINE

Years


800,000 1,000,000 1,200,000 1,400,000 1,600,000 1,800,000 2,000,000

Balas EA and Boren SA, 2000
“A collaborative project to develop a universal framework for encoding and disseminating electronic clinical guidelines”

Robert M. Abarbanel, MD, PhD
Project Overview

- An R&D consortium to develop the technology infrastructure to enable computable clinical guidelines, that will be shareable and interoperable across multiple clinical information system platforms

- Scope: 3 year, $18 M, multi-site, collaborative project

- Funded in part by: NIST Advanced Technology Program
Overview

Partners

Apelon
IDX
Intermountain Healthcare
Mayo Clinic
Stanford Medical Informatics
University of Nebraska Medical Center
Project Approach

Standards-based **Sharable Active Guideline Environment**

- Ultimate goal: An infrastructure that will allow execution of standards-based clinical practice guidelines across heterogeneous CIS platforms.
- Focus is on the goal of **active deployment** of guideline knowledge within the workflow of clinical information systems.
- Employ (and extend where necessary), best available informatics standards and controlled terminologies.
- Build on an invaluable foundation of earlier research and effort.
- Close collaboration with leading Standard Development Organizations: HL7, SNOMED, LOINC, others.
Goal of Interoperable Guidelines

Standards-based
Standard information models, medical terminologies, controlled resources, data formats

Sharable
Encoded guidelines can be disseminated to, and executed in, heterogeneous clinical systems

Active
Guideline logic and contents are instantiated within the workflow of the clinical information system

Guideline

Environment
The National Institute of Standards and Technology (NIST), an arm of the U.S. Department of Commerce, funds “high risk” research through its Advanced Technology Program (ATP).

The mission of the NIST/ATP program is “To accelerate the development of innovative technologies for broad national benefit through partnerships with the private sector”.

NIST/ATP projects must entail research that ‘leads to significant national benefits.’

The SAGE project is partially funded by NIST/ATP Cooperative Agreement Number 70NANB1H3049
SAGE Main deliverables

- **An interoperable guideline model** – A computable knowledge representation “format” for encoding the content and logic of executable clinical practice guidelines.

- **A guideline workbench** – A software tool for authoring, encoding, and maintaining guidelines in the format of the SAGE guideline model.

- **A guideline deployment system** – Software that “decodes” the content of electronic guidelines and surfaces that content via functions of the local clinical information system.

- **Controlled resources** – Specification of a common layer of information models and terminologies to mediate guideline content.
Imagine if SAGE technology were in place today . . .

- Guidelines would be routinely encoded in a standard, computable format, and would be widely available for downloading.

- Healthcare organizations would be able to import proven guidelines, and execute them via their local clinical information systems.
Project Approach

Taxonomy of Guidelines

Level 1: Original text guideline
Level 2: Structured markup
Level 3: Scrubbed “markup” (disambiguated)
Level 4: Codified “markup” (vocabulary standards)
Level 5: Knowledge “markup” (structured knowledge)
Level 6: Context “markup” (specify clinical setting)
Level 7: Executable form (deployable knowledge)
Project Approach

Taxonomy of Guidelines

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Level 6: Context “markup” (specify clinical setting)
Level 7: Executable form (deployable knowledge)
Some challenges

- An interoperable model
- Deployment concepts – including architecture
- Can a provider USE the guidelines?
- Guideline “file” format
Interoperable Guideline Model

A standard computable “specification” for representing and encoding the content and logic of clinical practice guidelines
Interoperable Guideline Model

A standard computable “specification” for representing and encoding the content and logic of clinical practice guidelines

Type 2 Diabetes

Evaluation If Needed

Needs Stabilization?

yes

Initial stabilization for outpatients requiring immediate insulin treatment

no

Recommend self-management program:
Nutrition therapy
Physical Activity
Education for self-management
Foot care

Set individualized treatment goals:
Glycemic control: HbA1c < 7%
Lipid levels: LDL < 130 mg/dl
BP control: BP < 130/85 mm Hg
ASA unless contraindicated
Tobacco cessation if indicated

Are Treatment Goals Met?

no

Treatment goals not met:
• Modify treatment based on appropriate guideline and/or
• See Glycemic Control Algorithm and/or
• Consider referral to diabetes health team or specialists

yes

See Ongoing Management Algorithm for maintaining treatment goals and complication prevention

Type 2 Diabetes Guideline Flow Diagram, courtesy of Institute for Clinical Systems Improvement (ICSI)
A standard computable “specification” for representing and encoding the content and logic of clinical practice guidelines.

**Type 2 Diabetes Evaluation**

**Needs Stabilization?**
- **yes**
  - Recommend self-management program:
    - Nutrition therapy
    - Physical Activity
    - Education for self-management
    - Foot care
  - Set individualized treatment goals:
    - Glycemic control: HbA1c < 7%
    - Lipid levels: LDL < 130 mg/dl
    - BP control: BP < 130/85 mm Hg
    - ASA unless contraindicated
    - Tobacco cessation if indicated

**Are Treatment Goals Met?**
- **no**
  - Treatment goals not met:
    - Modify treatment based on appropriate guideline and/or
    - See Glycemic Control Algorithm and/or
    - Consider referral to diabetes health team or specialists

- **yes**
  - See Ongoing Management Algorithm for maintaining treatment goals and complication prevention

**Treatment Goals Not Met?**
- **yes**
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**Treatment Goals Not Met?**
- **no**
  - Treatment goals not met:
    - Modify treatment based on appropriate guideline and/or
    - See Glycemic Control Algorithm and/or
    - Consider referral to diabetes health team or specialists

**Initial stabilization for outpatients requiring immediate insulin treatment**

**Type 2 Diabetes Guideline Flow Diagram**, courtesy of Institute for Clinical Systems Improvement (ICSI)

**Protégé Guideline Model Knowledge Base**, Courtesy Stanford Medical Informatics
A standard computable “specification” for representing and encoding the content and logic of clinical practice guidelines

Type 2 Diabetes

Evaluation If Needed

Initial stabilization for outpatients requiring immediate insulin treatment

Are Treatment Goals Met?

See Ongoing Management Algorithm for maintaining treatment goals and complication prevention

Set individualized treatment goals:
- Glycemic control: HbA1c < 7%
- Lipid levels: LDL < 130 mg/dl
- BP control: BP < 130/85 mm Hg
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Recommend self-management program:
- Nutrition therapy
- Physical Activity
- Education for self-management
- Foot care

Treatment goals not met:
- Modify treatment based on appropriate guideline and/or
- See Glycemic Control Algorithm and/or
- Consider referral to diabetes health team or specialists

Initial stabilization for outpatients requiring immediate insulin treatment

AD

Type 2 Diabetes Guideline Flow Diagram, courtesy of Institute for Clinical Systems Improvement (ICSI)
Interoperable Guideline Model

A standard computable “specification” for representing and encoding the content and logic of clinical practice guidelines

- Clinical content (criteria, actions)
- Patient status and eligibility
- Decision logic
- Clinical sequencing and workflow
- Guideline goals and intentions
- Guideline evidence and references
- Associated controlled terminologies
- Query and expression languages

Type 2 Diabetes Guideline Flow Diagram, courtesy of Institute for Clinical Systems Improvement (ICSI)
Guideline content encoded using standard terminologies and information models.

Local EMR concepts mapped to standard models for execution.

Data queries and decision logic represented using standard expression language.

SAGE Guideline Model Concepts

- Guideline Recommendation Sets
- Metadata
- Context
- Decisions
- Actions
- Route

Expression Language

Common Layer of Terminologies and Information Models

- Patient Data Model (Virtual Medical Record)
- Care Workflow Model
- Medical Ontologies
- Health Care Organization Model

Binding

Clinical Information System

Applications

EMR

SAGE Guideline Execution Engine

Standards-based API
Guideline Deployment Concepts

- Guideline goals
- Guideline context
- Guideline actions
- Guideline decisions

“SAGE” Engine

Guideline Execution Services

Queries

EMR data

Events

CIS Actions

CIS Patient EMR

CIS Rule Execution System

CIS Order Entry

Local CIS Resources

Local Clinical Information System
Guideline Deployment

Step 1: Guideline setup

Step 2: Guideline-based care
Cardiac monitoring continuous (Order)

Label:
Cardiac monitoring continuous

Order Start Date/time:

Department Responsible For Order:

Order Stop Date/time:

Nurse Or Lab Draw:

Service Code:

Order Frequency:
Continuous

Order Priority:
Routine

Order Repetitions:

Condition:
Vital signs q4 hours
Cardiac monitoring continuous

Admission order set ischemic stroke no tPA (Order_Set)

Episode Of Care:
Admission to hospital

Condition:
Admission orders ischemic stroke w/ tPA
ED evaluation of suspected stroke
Ischemic stroke admit skilled rehab
Ischemic stroke discharge from hospital
Ischemic stroke rehab discharge orders

Order Instance:
Admission diagnosis: CVA
Admit to hospital
Vital signs q4 hours
Cardiac monitoring continuous

Make and output q shift
Oxygen by nasal prongs to keep
Pulse oximetry continuous
Seizure precautions
Skin assessment daily
Suction as needed
Foley catheter continuous drain
Neuro checks q4 hours
PT and OT consult
Social work consult
Speech consult
Usability Lab Evaluation

- Done using scenarios and prototypes
- Performed at Mayo Usability Laboratory
Usability Lab Evaluation

- Done using scenarios and prototypes
- Performed at Mayo Usability Laboratory
Use Case Prototyping
- Guideline scenario “storyboarding”
- Usability evaluation; use case analysis

Guideline Model Requirements

Iterative Guideline Model Specification

Continuing Model Refinement

Guideline Workbench Requirements

Iterative Workbench Design and Development

Deployment System Requirements

Deployment System Architecture Design

Iterative Deployment Architecture Development

End-to-end SAGE Integrated Testing

2002

2003

(timeline approximate)

Aug 03

2004

Jan 04
Jun 04
Nov 04

SAGE Project Plan Overview

Controlling Resources (Phase 1)

Controlled Resources (Phase 2)
Requirements Analysis

Work Cycle

1. Select initial “generic” guidelines
2. Define/storyboard specific scenarios
3. Model and evaluate user interactions (Mayo Usability Laboratory)
4. Document use cases
5. Perform UML Modeling
### Selected Exemplar Guidelines

<table>
<thead>
<tr>
<th>Exemplar Guideline</th>
<th>Clinical Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diabetes Management</strong> (DBM)</td>
<td>Chronic disease monitoring and treatment. Acute exacerbation of chronic disease.</td>
</tr>
<tr>
<td></td>
<td>Chronic disease as a comorbidity.</td>
</tr>
<tr>
<td><strong>Immunizations</strong> (IMM)</td>
<td>Routine health maintenance, in both outpatient and inpatient settings.</td>
</tr>
<tr>
<td><strong>Community Acquired Pneumonia</strong> (CAP)</td>
<td>Emergency room evaluation and diagnosis. Outpatient treatment of acute disease.</td>
</tr>
<tr>
<td></td>
<td>Inpatient and ICU treatment of acute disease. Follow-up of acute disease.</td>
</tr>
<tr>
<td><strong>Total Joint Replacement</strong> (TJR)</td>
<td>Surgical guideline. Comprehensive pre-op workup, inpatient plan of care, and post-op outpatient management.</td>
</tr>
</tbody>
</table>
Markets for SAGE technologies

- Guidelines.com
- Guideline technology company
- Clinical trials management
- Other markets?
SAGE is about

- Solving technological problems
- Creating infrastructure
- Influencing Standards
- Making a market
Is the SAGE project developing guideline content?

No. While we are fully characterizing and encoding a small set of guidelines to be used in our R&D work, the main objective of the SAGE project is to enable a technology infrastructure for encoding and wide-spread dissemination of active guideline content.

Is the project developing an IDX-specific solution?

No. We are using IDX Carecast as our prototyping CIS environment during the project; however, our goal is a universal infrastructure that will allow activation of guideline content in multiple HIS vendor systems.

Where is more information on the SAGE project?

Our project web site www.sageproject.net/ is just coming online and will provide increasing detailed project updates in the near future.
Step 1: Collect the Evidence

Guideline author collects source material required for the guideline. This may include textbooks, research papers, textual guidelines, paper-based flowcharts.
Step 2: Build the Guideline

Use a “guideline workbench” to encode electronic versions of guidelines.

The workbench provides assistance, such as highlighting logical inconsistencies or workflow ‘dead ends.’ It also provides access to standard vocabularies.
Step 3: Publish the Guideline

The encoded guideline will be stored on a website and managed by a not-for-profit, or a commercial organization.

Type 2 Diabetes Evaluation: If Needed

- Needs Stabilization? yes
  - no
  - Recommend self-management program: Nutrition therapy, Physical Activity, Education for self-management, Foot care
  - Set individualized treatment goals:
    - Glycemic control: HbA1c < 7%
    - Lipid levels: LDL < 130 mg/dl
    - BP control: BP < 130/85 mm Hg
    - ASA unless contraindicated
    - Tobacco cessation if indicated

- Treatment goals not met:
  - Modify treatment based on appropriate guideline
  - See Glycemic Control Algorithm
  - Consider referral to diabetes health team or specialists

- Are Treatment Goals Met?
  - yes
    - See Ongoing Management Algorithm for maintaining treatment goals and complication prevention
Step 4: Download the Guideline

Clinical practice specialists in a specific healthcare delivery organization would ‘download’ the guidelines.

www.guidelines.com
Step 5: Develop Local Consensus

Upon local approval of the guideline, it may need to be adapted prior to deployment.

This may entail substantive changes to clinical content.
Step 6: Import the Guideline

The guideline will be imported into the local C.I.S.

- Clinical pathways
- Problem-linked order sets
- Expert systems
- Flowcharts
Step 7:
Guidelines in Practice

After upload, guideline(s) are deployed.

Surveillance:
Is this patient a candidate?

Selection by Clinician

Activation
Guideline instantiated for patient

Recommendations for tests

Drug-dose guidance

Standard Order-sets

Discharge planning

START:
Guideline deployed…
Step 8: Evaluating the Guidelines

Guideline impact must be evaluated.

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Activation date</th>
<th>Accept?</th>
<th>Result?</th>
</tr>
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<tbody>
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<td>CCF – 403 – ICSI#B2</td>
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<td>16-Aug-03</td>
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<td>N</td>
</tr>
</tbody>
</table>
Step 9: Consolidated feedback to central library

Guideline evaluations will be reported to the ‘central’ organization.
Thank You

www.sageproject.net