



# **The Morningside Initiative**

***Collaborative Development of a Knowledge Management  
Repository to Accelerate Adoption of Clinical Decision  
Support***

**August 28-30, 2007**

## **Acknowledgments**

The authors and participants of the Morningside meeting would like to acknowledge and thank the organizations and participants who have contributed their efforts and expertise to the development of the Knowledge Management Repository concept paper. It is hoped that this plan will assist in moving Clinical Decision Support to the forefront of the National Agenda and assist caregivers in providing the highest level of care and services possible.

Support has been provided by the Telemedicine and Advanced Technology Research Center (TATRC) of the U.S. Army Medical and Materiel Command to make this meeting possible. We would further like to thank the American Medical Informatics Association (AMIA) for its guidance and efforts. Each participating organization has contributed its' support, content and expertise in an on-going and collegial manner. Dr. Robert Greenes, and Meryl Bloomrosen have been involved in, and provided valuable input to, each step of planning and execution of this initiative.

The expertise, perspective, professionalism and effort of all members of the Morningside meeting has been invaluable in the development of the Knowledge Management Repository and concepts contained in this paper for the sharing of clinical decision support resources. Comments and input from the National Coordinator's Office for Health Information Technology, Department of Health and Human Services and AHRQ, were greatly appreciated during the meeting.

The Morningside group would like to thank the following organizations who have submitted Letters of Support for this endeavor: Northwest Permanente and Oregon Health & Science University, Henry Ford Health System, Department of Defense Tri-care Management Activity and the Veteran's Health Administration.

The content submission form was adapted from one developed by Christopher Tsai, M.D., M.P.H., a postdoctoral fellow in the Decision Systems Group, and then refined and edited for use in the knowledge management repository by Mark Graber M.D., Veterans Health Administration and Vipul Kashyap, Ph.D., Partners Health Care.

A special thank you to Rob Sharma, TATRC, Vipul Kashyap, Partners Health Care and Hemant Shah, Henry Ford Health System, along with the individuals of the Technology Working Group who have spent many hours to develop the first demonstration version of the knowledge management repository website.

Content for the Knowledge Management Repository demonstration website has been provided by LTC Nhan Do M.D., for the Department of Defense, Dean F. Sittig, Ph.D., Northwest Permanente and Oregon Health & Science University, Robert N. Enberg M.D., Henry Ford Health System and Brad Doebbeling M.D., Veterans Health Administration. Members of each Committee have contributed their time and expertise and are listed below.

**Moderator:** Robert A. Greenes, MD, PhD, Arizona State University

**Facilitator:** Nancy E. Brown-Connolly R.N., M.S., (TATRC)

**Technology Committee:**

LTC Nhan Do M.D., Tricare Management Activity (TMA), OASD(HA)

Vipul Kashyap Ph.D., Partners Health Care

COL Andre Marinkovich, Tricare Management Activity (TMA), OSD(HA)

LTC Hon S. Pak M.D., Telemedicine and Advanced Technology Research Center (TATRC)

Hemant Shah MBBS , Henry Ford Health System

**Administration Committee:**

Meryl Bloomrosen, MBA, American Medical Informatics Association (AMIA)

Brad Doebbeling, MD, MSc, Veterans Health Administration

Robert N. Enberg M.D., Henry Ford Health System

LCDR Ron Gimbel, Ph.D., FACHE, Uniformed Services University of the Health Sciences (USUHS)

Dean F. Sittig, Ph.D., Northwest Permanente and Oregon Health & Science University

Adam Wright Ph. D., Partners Health Care

**Content Committee:**

COL James Benge, Clinical Information Technology Program Office (CITPO), OASD(HA)

Mark Graber M.D., Veterans Health Administration

Roxane Rusch, Veterans Health Administration

Syed Tirmizi M.D., Veterans Health Administration

**The following people have contributed to the preparation of this document:**

Robert A. Greenes M.D. Ph.D., Arizona State University (ASU)

Meryl Bloomrosen, MBA, American Medical Informatics Association (AMIA)

Nancy E. Brown-Connolly R.N., M.S., Clinical Consultant, Telemedicine and Advanced Technology Center (TATRC)

COL James Benge, Clinical Information Technology Program Office (CITPO), OASD (HA) LTC

Nhan Do M.D., Tricare Management Activity (TMA), OASD(HA)

Brad Doebbeling, MD, MSc, Veterans Health Administration

Robert N. Enberg M.D., Henry Ford Health System

Mark Graber M.D., Veterans Health Administration

Vipul Kashyap Ph.D., Partners Health Care

COL Andre Marinkovich, Tricare Management Activity (TMA), OSD (HA)

LTC Hon S. Pak, Telemedicine and Advanced Technology Research Center (TATRC)

Hemant Shah MBBS , Henry Ford Health System

Dean F. Sittig, Ph.D., Northwest Permanente and Oregon Health & Science University

Syed Tirmizi M.D., Veterans Health Administration

## TABLE OF CONTENTS

	<b>EXECUTIVE SUMMARY</b>	<b>5</b>
<b>A</b>	<b>Background</b>	<b>6</b>
<b>A.1</b>	<b>Introduction</b>	
<b>A.2</b>	<b>The Morningside Initiative</b>	<b>7</b>
<b>B</b>	<b>Organizational Structure</b>	<b>9</b>
<b>B.1</b>	<b>Aim</b>	
<b>B.2</b>	<b>Approach</b>	
<b>B.3</b>	<b>Organizational Structure</b>	<b>10</b>
<b>B.4</b>	<b>Bylaws / operating procedures</b>	<b>12</b>
<b>B.5</b>	<b>Work Processes</b>	
<b>B.6</b>	<b>Decision making and conflict resolution</b>	
<b>B.7</b>	<b>Conflicts of Interest</b>	
<b>B.8</b>	<b>Membership</b>	<b>13</b>
<b>B.9</b>	<b>Communication and Outreach</b>	
<b>B.10</b>	<b>Vendor Policy</b>	
<b>B.11</b>	<b>Potential Challenges &amp; Alternatives</b>	<b>14</b>
<b>C</b>	<b>TECHNICAL/INFORMATICS METHODOLOGY</b>	<b>15</b>
<b>C.1</b>	<b>Aim</b>	
<b>C.2</b>	<b>Approach</b>	
<b>C.2.1</b>	<b>Functional Requirements</b>	
<b>C.2.2</b>	<b>Structuring of Clinical Content</b>	<b>16</b>
<b>C.2.3</b>	<b>Knowledge Sharing</b>	
<b>C.2.4</b>	<b>Knowledge Change and Maintenance</b>	<b>17</b>
<b>C.2.5</b>	<b>Key Role of the Information Model</b>	
<b>C.2.6</b>	<b>Architectural Requirements</b>	
<b>C.2.7</b>	<b>Evaluation</b>	
<b>C.3</b>	<b>Project Plan</b>	<b>18</b>
<b>C.4</b>	<b>Tasks by Year</b>	<b>19</b>
<b>D</b>	<b>CONTENT ACQUISITION AND MANAGEMENT</b>	<b>20</b>
<b>D.1</b>	<b>Aim</b>	
<b>D.2</b>	<b>Approach</b>	
<b>D.2.1</b>	<b>Organization of Knowledge Products</b>	
<b>D.2.2</b>	<b>Functionality to be Provided</b>	<b>21</b>
<b>D.3</b>	<b>Getting Started</b>	
<b>D.3.1</b>	<b>Initial Content Focus: Diabetes Mellitus</b>	<b>22</b>
<b>D.3.2</b>	<b>Operational Tasks</b>	
<b>E.</b>	<b>EVALUATION</b>	<b>23</b>
<b>F.</b>	<b>REFERENCES</b>	<b>24</b>
	<b>Attachments</b>	
	<b>1. List of Attendees</b>	<b>25</b>
	<b>2. Definition of Terms</b>	<b>27</b>
	<b>3. Content Submission Data Fields</b>	<b>28</b>

## **EXECUTIVE SUMMARY**

The Morningside Initiative is a public-private partnership that has evolved from a meeting at the Morningside Inn sponsored by the Telemedicine and Advanced Technology Research Center (TATRC) of the US Army Medical Research and Materiel Command. Participants were subject matter experts in clinical decision support (CDS) and included representatives from the military health system Department of Defense (DoD), the Veterans Health Administration (VHA), Kaiser Permanente, Partners Health Care, Henry Ford Health System (HFHS), Arizona State University (ASU), the American Medical Informatics Association (AMIA), and TATRC.

The Morningside Initiative is a concept developed in response to the AMIA Roadmap for National Action on Clinical Decision Support (CDS) and other considerations and experiences of the participants. The Morningside Initiative represents the unanimous recommendation of participants at the August, 2007, meeting and calls for creating a shared repository of executable knowledge for CDS that would be broadly available to large and small healthcare organizations and practices, and health care system vendors. It is based on the recognition that sharing of clinical knowledge needed for CDS across organizations is currently virtually non-existent, and that, given the considerable investment needed for creating, maintaining and updating authoritative knowledge, which only larger organizations are able to undertake, this is an impediment to widespread adoption and use of CDS. Through the initial collaboration of a small group of key, committed participants, the intent is to develop and refine (1) an organizational framework, (2) a technical approach, and (3) content acquisition and management processes that are effective and can be scaled up to include a broader range of participants and expanded in scope of content and capabilities addressed. The Initiative will serve as a blueprint that would be the basis for a series of next steps in a national agenda for CDS. It is based on the belief that, as in other competitive domains such as genomics, sharing of knowledge can be highly effective.

Participants in the Morningside Initiative believe that a coordinated effort between private and public sectors is needed to accomplish this goal and that a small number of highly visible and respected health care organizations in the public and private sector can lead by example. Efforts to be undertaken represent a deliberate, gradual process, initially involving selected participants for a limited set of tasks, and then expanding the scope and scale as workable approaches are developed and proven.

It is expected that the work proposed here will require participation and support of a number of stakeholders besides the initial participants. An ultimate goal is for a future collaborative knowledge sharing organization to have a business model based on sustainable long-term mechanisms of support, which might be expected to include a combination of organizational subsidies or membership dues, governmental and insurance industry funding, or other mechanisms. The knowledge content would be available to all participants, and fully transparent. For the short term, it is necessary to define sources of funding for the steps outlined. Given that various governmental and private foundation programs and payers are important stakeholders in health care safety and quality improvement, it is hoped that the blueprint embodied in the Morningside Initiative will be useful as a set of potential targets for funding and programs initiated by those stakeholders. As other opportunities for funding arise, in addition, it is hoped that they can be aligned, so as to help advance the overall goal.

This report describes the proposed approaches to organizational structure, technical infrastructure for knowledge management, and development and update of knowledge content resources themselves. The blueprint described are still in quite general form, but are expected to be further elaborated in discussions among the participants and with stakeholders.

## **A. INTRODUCTION**

### **A.1 Background**

Although computer-based clinical decision support (CDS) has been shown on multiple occasions to be highly effective, successful approaches have not been broadly disseminated, and use of CDS remains limited. This is despite the recognized benefit of CDS in fostering patient safety, health care quality, and cost-effectiveness of care, and the practical need for it in such expanding programs as pay for performance and prior authorization for medication or procedure orders. The reasons for slow dissemination and adoption of CDS are multifaceted [1], but major problems are that (1) CDS relies on high quality medical knowledge in executable form, and (2) considerable work on standards, infrastructure, and processes for managing and updating such knowledge and integrating it into applications is required. Neither of these requirements is in place on a widespread basis, and they are very expensive, if not prohibitive, for individual organizations, even large ones, to implement and support. These factors have called for the need for a coordinated agenda to address the above impediments, articulated in a report of the American Medical Informatics Association (AMIA) [2] which had been commissioned by the U.S. Office of the National Coordinator for Health Information Technology (ONCHIT).

One attractive possibility is development of a Web-accessible repository of high quality medical knowledge, in an unambiguous form that can be used as a basis for implementing CDS, and that would be available to all institutions and users. This would avoid the need for each organizational entity to duplicate the effort of creating and maintaining such a repository. Responsibility for managing this communal repository would be by an authoritative body that would determine what knowledge to include, formalize its representation, index it for retrieval, and keep it updated.

The issues and impediments involved and possible approaches are elaborated on in the AMIA Roadmap [1]. There has been little evidence to date that health care organizations, public and private, are willing to share knowledge that they may consider will give them a marketplace advantage. Nevertheless this has been done in other fields, notably in biomedical science, e.g., in terms of contributions to GenBank and other molecular and genetic knowledge bases, despite intense competition among investigators. The primary sharing of clinical knowledge in executable form to date, to the extent that it has occurred at all, has been commercially, by knowledge content providers, or within clinical information system platforms of particular vendors or health care enterprises, or by user groups of a particular vendor.

Standards for representing clinical knowledge are immature. The mechanisms for sharing, how the knowledge would be acquired, reviewed, vetted, curated, represented, and updated, who would be responsible, and how the process would be supported are all largely unanswered. Also not yet determined is how useful such shared knowledge will be to individual organizations, given that the knowledge will need to be adapted to local practices and constraints, workflow processes, and application environments.

In addressing the challenges, the approach to solving the above issues is not so clear that a large-scale effort can be mounted right away. An approach that could be taken to directly address the current impediments would be to bring together a small number of highly visible and respected health care organizations in the public and private sector that can lead by example. Their efforts would be aimed at developing and testing a framework for knowledge sharing that could be extended to a national-level effort if successful. The rationale for this approach is based on two primary considerations:

- (a) Reluctance to share clinical knowledge by institutions could be overcome if high-profile participants have already committed to doing so and seeded the effort with a corpus of useful knowledge content.

- (b) Establishment of tools and methods for knowledge management, creating and representing the content, and working out the organizational and logistical issues could be best done first with a small number of participants, so that the approaches can be refined through that experience, before undertaking a large-scale initiative involving many more participants.

## **A.2 The Morningside Initiative**

In order to explore the above premises in more detail, and to develop a blueprint for detailed action and realize the goal of collaborative knowledge management for CDS, a small group of prominent health care organizations came together for a working meeting at the Morningside Inn, Frederick, MD, August 28-30, 2007, under the sponsorship of the Telemedicine and Advanced Technologies Research Center (TATRC) of the US Army Medical Research and Materiel Command. The purpose was to develop a long-term plan intended to address the challenges by means of a deliberate, gradual process, initially involving selected participants for a limited set of tasks, and then expanding in scope and scale as workable approaches are developed. Participants included representatives of Kaiser Permanente, the Department of Defense (DoD) Tri-Care Management/Health Affairs (TMA/HA), the Veterans' Health Administration (VHA), Partners Health Care, the American Medical Informatics Association, TATRC, Henry Ford Health System (HFHS), and Arizona State University (ASU) (see list of participants in Attachment 1). The meeting was moderated by Robert A. Greenes, MD PhD.

The Morningside Initiative described in this report is the result of that working meeting, and was the unanimous recommendation of participants at the August 2007 meeting. The Morningside Initiative is a plan that arose from the discussion, calling for a collaboration aimed at the general goal of creating a repository of shared knowledge for CDS. The collaboration is to be a prototype of a larger future organization. Through the collaboration, the intent is to develop and refine (1) an organizational framework, (2) technical approach, and (3) content acquisition and management processes that are functional and can be scaled up to include a broader range of participants and expanded in scope of content and capabilities addressed. The Morningside Initiative is a blueprint for action, and is the basis for a series of next steps that are recommended, and which the participants are already beginning.

The rationale for the effort includes the following potential benefits:

- In concert with the nationwide efforts to achieve widespread adoption of interoperable health IT, a collaborative approach will help attain greater proliferation of CDS than any one entity could achieve alone
- Consistent with the DHHS goal of "privatizing" AHIC by forming a public-private entities to achieve the Secretary's HIT goals of an interoperable and transparent process
- Broadens the potential use and application of CDS at the point of care to impact health care decisions throughout the health care system
- Extends the reach/resources of participating entities beyond those possible when working alone
- Such an approach advances and fosters more widespread accessibility of CDS content and interventions
- By leveraging lessons, tactics and approaches used by others, buy-in across local, regional and national entities can be increased
- A collective effort can address CDS topics of prime concern and importance to the national health care system in terms of cost, quality, and access to care
- A national-level resource can facilitate adoption and more effective use of CDS within organizations that might otherwise not have the resources to pursue CDS

- Collaboration and sharing CDS mechanisms helps leverage prior, current and ongoing work; helps individual organizations and entities capitalize on lessons learned and approaches/methods that have been successful, thereby avoiding the need to “reinvent the wheel”
- Availability of the resource can remove or lessen barriers and challenges (in terms of technical, cost, and expertise deficiencies) and thus accelerates the likely adoption and proliferation of CDS
- Professional benefits can accrue to individual investigators for participation (e.g., papers, grant-writing, grant operations and management, leadership)
- Collaborative mechanisms provides participating entities with a level of external validation of their CDS work re: content quality and development approach
- Promotes best practices for developing CDS interventions among and across entities and organizations.

### **What the Morningside Initiative is and is not**

The initiative described here *does not duplicate* the work of evidence-based practice centers, the Cochrane Collaboration, or other efforts to determine best practices and develop guidelines based on meta-analysis and evidence-based medicine. Rather, it takes as its starting point the “operationalized” knowledge that health care provider organizations have already determined to be useful and have implemented in various applications in their systems to provide CDS, typically in the form of decision rules for alerts, reminders, or medication prescribing recommendations, or as order sets. Typically these have been drawn from guidelines, authoritative reviews or other evidence-based medicine sources, but they have been made unambiguous and computable – a process which sounds straightforward but is definitely not – and are able to be formally represented in a language that can be interpreted by computer software.

### **The importance of sharing, standards, and open systems**

The intent of this effort is to establish a means for supporting and maintaining a national-level repository of authoritative knowledge in executable form. The goal is to share the knowledge by making access to it available to all entities that want it. The details of the knowledge will be fully transparent. There may be reasons to require membership or subscription processes in order to access the knowledge, e.g., the need for differentiating between those who are developers, editors, or reviewers, vs. those who are users; the possible need for subscription fees as a means for sustaining the process on a long-term basis; and the potential for misuse of clinical knowledge if content were able to be modified without adequate rules or controls. Guiding principles will be, however, that participation will be available to all, and that fees, if any, will not be a barrier.

Since standards are still somewhat immature, the goal of being able to provide knowledge in standard form is not fully attainable. Nonetheless, the Morningside Initiative will represent knowledge in unambiguous form by using (or developing as needed) conventions for representation that are considered by the team to be the best available, and which will be fully documented. The team will also work with standards development organizations to help accelerate the adoption of standards that are most urgently needed. It is expected that as this effort gains traction it may provide not only a major use case for such standards development, but if the conventions it adopts are well thought out, they may be in a position to influence the direction of the standards development itself. Thus a hope is that by initiating this process, we can drive standards adoption for CDS.

The knowledge bases will be managed using open source tools and non-proprietary data formats, wherever possible. This will avoid licensing fees or vendor dependence, or the delays in waiting for vendors to support particular needed features. Open platforms such as the J2EE framework have proven scalability and performance, and there are growing numbers of open source software products available

for various needs. Also the ability to integrate components from different sources will be increased. This will be particularly true to the extent that standards for data and knowledge representation mature to facilitate interoperability.

#### VISION

The Morningside Initiative is dedicated to developing a collaborative Web-based Knowledge Management Repository that will support the sharing of evidence based medical knowledge in executable form for clinical decision support, in order to improve the health of the community and the quality of health care services.

The Morningside Initiative supports the following Critical Path Tasks identified in the AMIA Roadmap: It creates a mechanism whereby an ongoing forum for dialogue, consensus, and action by CDS stakeholders can be achieved; promotes dissemination and application of best CDS implementation practices through development and promotion of CDS as a means of increasing use of currently available CDS interventions; demonstrate the feasibility, scalability, and value of a collaborative approach to CDS by having specific, standardized tools and best practices publicly available; and provides a forum to analyze and generalize lessons learned from the development of a knowledge management repository and its effects in furthering CDS.

## B. ORGANIZATIONAL STRUCTURE

### B.1 Aim

To create a free-standing self-sustaining organization to accelerate the adoption of CDS through collaboration and sharing.

### B.2 Approach

The Morningside Initiative came out of a meeting that brought together a multi-disciplinary group of medical informaticans, clinicians, health services researchers and others from key organizations committed to stimulating the more rapid spread of CDS. We anticipate that the collaboration will progress in a series of planned stages from the Idea phase, to Incubation (or development) phase, to formation of a stand-alone collaborative.

- a. **The Idea Phase** built over a series of several years of informaticans at major biomedical informatics organizations coming together to propose forming a research collaborative and publishing “A Roadmap for National Action On Clinical Decision Support” [2]. Dr. Robert Greenes developed additional approaches to moving forward in his book, “Clinical Decision Support: The Road Ahead”. [1]. TATRC supported the planning meeting in August, 2007, as described in A.2 above. Participants at the conference came together to develop a shared vision for the collaborative, and identify key organizational, technical and content issues, and prioritize them, in order to develop a working plan for the start-up and first five years of the organization. The results of this collaborative planning process are reflected in this document.
- b. **The Incubation Phase** is anticipated to last 2-3 years, until the collaboration is fully functional, has developed and implemented a successful business plan, and is self-sustaining. During the Incubation Phase, TATRC will sponsor the knowledge management repository and TATRC and AMIA together will provide an organizing infrastructure, act as the lead organizations in any resultant grants or contracts, and provide financial management and operational coordination of activities for the collaboration. The goal of this phase is to foster the

development of the Morningside Initiative into a fully-independent, not-for-profit organization. During this phase we anticipate seeking funding for pilot projects and infrastructure development, with the intent of converting each of the successful pilot projects into multi-year program projects and other grants and otherwise sustainable activities.

First steps in the Incubation phase will be:

1. **Letter of support** from person at each participating entity, capable of committing the organization to working on the Morningside Initiative, supporting the goals, providing the effort of a site representative and one or more individuals to work on identified tasks.
  2. **Donation of initial clinical knowledge content** in the domain(s) selected by the Morningside Initiative, currently targeted at diabetes mellitus.
  3. **Memorandum of Understanding**, committing each entity to specific tasks in relation to the Morningside Initiative. A memorandum of understanding will be developed during the first several months by consensus of the Morningside Initiative Steering Group (see B.3 below).
- c. **The Stand-alone Phase** will start once the organization becomes fully independent and self-sufficient. We expect that this will require approximately three years, depending upon progress and success in working out the business model and obtaining independent funding or revenue from participants. We expect to consider a variety of organizational structures, particularly a not-for-profit organization, such as a 501(c)3 corporation.

### B.3 Organizational Structure

The Morningside Initiative will have an organizational structure as shown in Fig. 1.

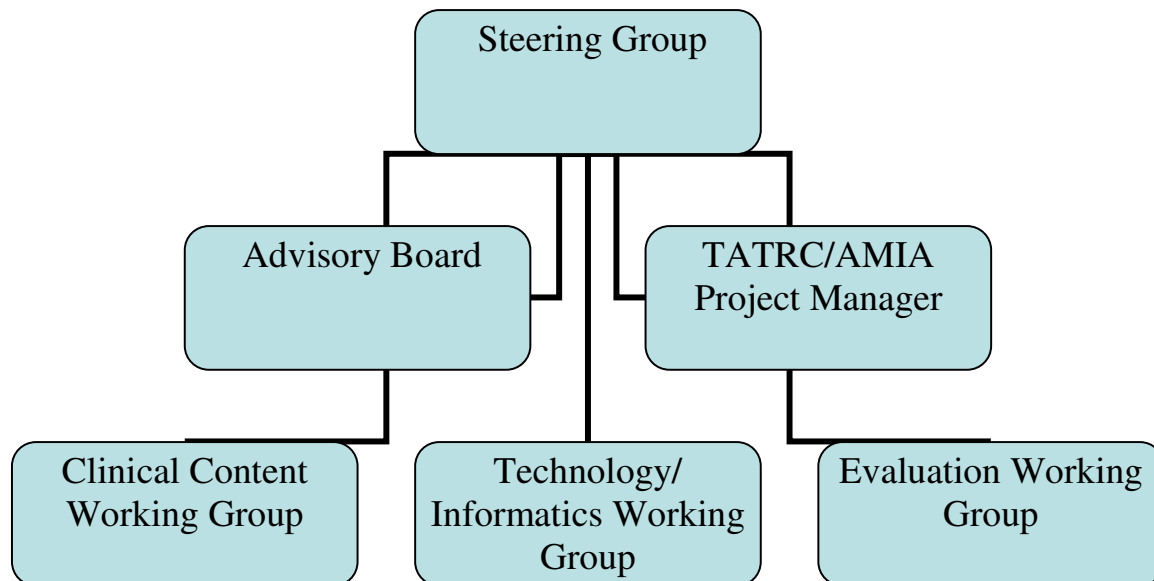


Fig.1. Organizational Structure of the Morningside Initiative

As shown in the figure, the organizational structure of the Morningside Initiative will consist of a Steering Group, an Advisory Board, the Project Manager, the Clinical Content Working Group, the Technology/Informatics Working Group, and the Evaluation Working Group.

## **Steering Group**

The Steering Group is the primary governing body of the Morningside Initiative. The membership of the Steering Group consists of the Executive Director, Steering Group Representatives, and the Project Manager.

- *Executive Director:* The Executive Director chairs the Steering Group and is a voting member. The Executive Director will serve as the final authority and tie-breaker when the Steering Group members are divided about a specific direction or vote. The Executive Director will be chosen by the Steering Group. The Executive Director will convene (in person or virtually) the Steering Group at least quarterly to review all decisions that have been made and their associated outcomes. In person meetings will generally coincide with AMIA meetings. In addition, the Executive Director will be responsible for reporting on the financial viability of the organization at each meeting. The Executive Director will review all new, pertinent evaluation results at each meeting.
- *Steering Group Representatives (SGRs):* Each of the founding organizations, to include Kaiser Permanente, Partners Health Care, the Veterans Health Administration, the Department of Defense, Henry Ford Health System, and Arizona State University, will identify an SGR. That individual will maintain the authority and responsibility to represent his/her organization. Steering Group Representatives have responsibility for coordinating the efforts of their sites, and will serve as liaisons from each site. Each SGR will be responsible for updating the Steering Group on issues related to his/her organization at each quarterly meeting. In addition, representatives will be responsible for attending three quarters of all Steering Group meetings. Failure to participate in these meetings will constitute grounds for SGR dismissal and replacement. SGR members may be added from time to time based on criteria to developed by the Steering Group.

## **Project Manager**

A designated Project Manager (TATRC and AMIA) is responsible for project administration, including the management of financial and funding issues. The Project Manager will advise the Executive Director and representatives and assist the Executive Director in the management of Steering Group meetings, but will not be a voting member.

## **Advisory Board**

The Advisory Board will be comprised of subject matter experts from across the disciplines of biomedical informatics and clinical medicine with specific expertise in clinical decision support and/or evidence-based practice. The Advisory Board exists to advise the Steering Group in the development of grant proposals, selection of disease/condition content areas, conflict resolution, transition, and long-term sustainability. The Advisory Board is advisory in nature and has no voting rights. The Advisory Board will meet periodically.

## **Working Groups**

There are three operational working groups to assist the Steering Group in carrying out activities of the collaborative. These are:

- *Clinical Content Working Group:* Responsible for drafting policy and procedures associated with receiving, validating, posting and updating content. This includes advising the Steering Group on prioritization of future diseases/conditions to be featured in the collaborative as well as other content-related issues.

- **Technology/Informatics Working Group:** Responsible for developing and/or adopting, terminology, ontologies and knowledge representation format. Responsible also for development and oversight of the knowledge sharing environment to include all hardware, software and security requirements. The group will also serve as subject matter expert advisors to the Steering Group on related issues.
- **Evaluation Working Group:** Responsible for development and execution of an evaluation framework which focuses on both the evaluation of processes related to development and the impact of content on clinical practice. The group will also serve as subject matter expert advisors to the Steering Group on all issues related to evaluation.

Members of the working groups serve at the invitation of the Steering Group.

#### **B.4 Bylaws / operating procedures**

Bylaws will be developed after reviewing efforts in biotechnology and openEMR as well as other private-public collaboratives to determine the most useful approach to operations and sustainability in both the short and long term. Bylaws will be voted on by members of the Steering Group.

#### **B.5 Work processes**

The Morningside Initiative is principally a virtual organization, made up of its members. As such, most activities of the collaborative will take place via email, teleconference and through the knowledge management and repository tools developed for the project. The full membership of the collaborative will meet in person as defined for each organizational element above.

#### **B.6 Decision making and conflict resolution**

As a voluntary, collaborative organization, decision making will be by consensus where possible. Morningside Initiative members agree to attempt conflict resolution at the lowest level of the organization. When this is not possible, the Steering Group will become the definitive arbiter. When consensus cannot be achieved, a vote of the membership may be taken, with the Executive Director and site representative of the founding sites having veto authority, until other bylaws are adopted.

#### **B.7 Conflicts of Interest**

Members of the Steering Group, the Working Groups, and the Advisory Board will be requested to identify all conflicts of interest associated with participation, development, management, and updating of material. Representatives must recuse themselves from voting on issues with which they have a conflict of interest.

#### **B.8 Membership**

Membership would be by invitation, although individuals and organizations interested in becoming members can petition the Steering Group for membership.

#### **Categories of Membership, Rights and Obligations of Members**

1. *Contributors* are organizations with proven excellence in development or use of CDS who are interested in contributing CDS content will be considered for membership. Each content contributor

is responsible for uploading their content using the appropriate CDS input template, assigning the appropriate descriptive metadata elements (tags), ensuring that the uploaded content is correct, updating each content item on a yearly basis, and submitting all supporting documentation (e.g., references, evidence-based guidelines from which the content was created, usage data, and quality outcomes achieved). In return for their contribution, contributors will be entitled to download content in a manner to be determined.

2. *Adopters* are organizations interested in using CDS content in the absence of making a content contribution. Adopters will pay an appropriate membership fee. They will also be required to upload their yearly usage statistics for each piece of content they downloaded along with any clinical process or outcome data they collect. In addition, they will be required to assign a “quality” score to all content they download along with any local modifications they made to the content before they used it.
3. *Advisors* are individuals with significant expertise in CDS, project evaluation, clinical knowledge or data sharing. They will be invited for membership in the Advisory board by the Steering Group.
4. *Research Affiliates* are individuals interested in working with the MIC, or using its content or resources. They are encouraged to submit a short proposal to the MIC Steering Group. If the proposed research project in any way involves human subjects, those proposing will be required to submit proof of approval of their research protocol by their local Institutional Review Board (IRB). In some instances it may be necessary to submit their study for IRB approval to one or more of the MIC member organizations as well. Following completion of their study, they will be required to submit a project report along with any publications that result from their use of the resource. Research affiliates should acknowledge use of the resource in any publication or presentation
5. *Site Staff* may be employed by each site – for example, developers, knowledge engineers or subject matter experts to develop and refine content to be shared or to implement content downloaded from the knowledge management repository. They will not be considered members but will have access privileges to the repository and tools as appropriate to their roles.

### *New Member Policy*

Individuals or organizations seeking to become members will request membership through the Steering Group. In addition, and will be required to meet all the eligibility criteria for all membership categories in which they wish to participate.

## B.9 Communication and Outreach

One of the key goals of the Morningside Initiative is to increase knowledge about and adoption of clinical decision support. As such, one of the main functions is dissemination, which will be accomplished through:

- Direct communication with members
- Presentations at national meetings of informatics organizations, medical specialty societies and related organizations
- Publications in academic journals
- Outreach programs to sites with limited CDS content (in the form of, for example, a starter package of CDS content)

## B.10 Vendor Policy

In the early phases, all member organizations will be provider organizations, so vendor relations will not be of concern. However, later in the lifecycle, the organization will need to interact with two kinds of vendors: content vendors and clinical system vendors. Anticipating this, delineation of strategies for involving vendors and developing mutually beneficial processes and procedures shall be a priority.

## B.11 Potential Challenges & Alternatives

There are multiple challenges as examples:

- *Source of the contribution within organizations.* Large provider organizations often have system-wide, regional, and local content sources. It is likely that system-wide content is based on substantial review and agreement within the organization. Such content is likely to reflect issues of national importance and high cost. In contrast, locally derived content may have been the result of a less intense review process. Thus its review and usage may vary from extensive to minimal and raises questions to be addressed about how to validate or prioritize it. In general, the approach will be to ask the contributing organization to develop a process for review of contributions before they are submitted.
- *Permissions.* That a contribution may come from different levels of an organization raises the issue of appropriate permission for use. It is likely that organizational leadership will be reluctant to allow local sites to contribute content in the absence of review. This may have the effect of restricting important contributions for risk management concerns.
- *Incorporating the lessons learned from other sharing collaboratives.* A review of the experience with IMKI, Sage, Arden, and InterMed suggests that an identifiable business reason for collaboration is essential in order to make progress involving sustained commitment by participants. Goals and priorities need to be carefully determined to ensure that member entities are truly supportive of them.
- *Overcoming internal policies and internal barriers.* Content development is difficult and in most instances content has been developed with great effort. Accordingly, there is a natural hesitation to share, to give away, something so difficult to obtain. Further, many leaders feel that their own content gives their institution a competitive advantage. Finally, there have been many failed efforts to share and few successful efforts. A mitigating strategy is based upon two principles:

(a) articulating the value proposition that collaborative sharing leads to better, more highly validated, and more efficiently developed content; and (b) demonstrating that the value of the content, as opposed to the knowledge upon which it is based, rests upon the format in which it is made available, and the ease of adaptation to institutional needs.

- *Organizational inertia.* The environment in which health care delivery organizations operate is exceedingly complex, patient care demands are increasing, the compliance and regulatory obligations are bewildering, and resources are limited. Given these pressures, even the most enthusiastic potential contributors will have many competing demands on their time and attention. The Morningside Initiative will need to maintain interest and momentum of its participants.

## C. TECHNICAL/INFORMATICS METHODOLOGY

### C.1 Aim

To develop the technical infrastructure and knowledge management tools along with resources to support collaborative knowledge development, maintenance and dissemination of CDS.

### C.2 Approach

The key technical capability required to achieve the above aim is a knowledge management repository (KMR) with characteristics addressed in this section.

#### C.2.1 Functional Requirements

The key functions supported by the KMR are geared towards three objectives:

- (1) Enabling business processes and policies related to clinical content for the stakeholder organizations, to provide a significant value proposition and differentiation in the healthcare market
- (2) Enhancing the utility of the KM Repository by introducing Web 2.0 functionalities for rating, feedback, collaboration and usage tracking
- (3) Creating a community around clinical knowledge management for development and dissemination of best practices and tools for knowledge management for CDS

A high-level list of functions is as follows:

- **Sharing:** to allow users to share various types of clinical knowledge such as guidelines, rules, order sets and templates across various institutions, disciplines and domains of healthcare.
- **Search and Retrieval:** to allow users to search and retrieve different types of knowledge artifacts using full-text keyword-based search and various types of metadata.
- **Comparison:** to enable a user to compare the same or similar knowledge across various institutions. For instance, it will be useful to compare an order set for diabetes across various sites in the Kaiser Permanente, VHA, DoD, Henry Ford Health System and Partners networks.
- **Structuring and Tagging:** to allow a user to decompose clinical knowledge, e.g. a guideline, into “chunks” such as goals, definitions, risk factors, patient characteristics. Knowledge may also be tagged with metadata, which is independent of the knowledge content, to reflect the use scenarios such as the application in which it was used and the organization which created it.
- **Knowledge Repository Management:** to enable maintaining the consistency of the repository’s content as changes and updates are made to the content.

- **Quality Rating:** to enable rating of the quality of the clinical knowledge artifacts, as determined by a review panel or by the feedback from a broader user community.
- **Collaboration:** to facilitate collaboration by the users, synchronously or asynchronously, to author, modify, tag and evaluate various pieces of content by blogging, exchanging messages with each other and using authoring tools.
- **Adaptation:** to facilitate adapting selected clinical knowledge by users to their specific needs.

### C.2.2 Structuring of Clinical Content

This is a crucial piece of functionality supported by the KMR and enables the decomposition of unstructured clinical content such as a textual rendering of a clinical guideline. This may be implemented manually, by providing a set of forms and templates, as well as by developing algorithms to auto-populate the forms. The resulting form of the knowledge that is created should not only be intuitive to read by humans but should also facilitate the process of transforming the knowledge into an executable specification. The template forms/tool created for this purpose should be based upon an underlying information model. Since we anticipate a wide variety of stakeholders and users, the tool will be architected to support multiple information models that are likely to change and evolve over time. Finally, the template tool will also support the collaborative tagging process which allows a community of users to define new tags and values. These tags can be incorporated into the information model as they become widely used.

### C.2.3 Knowledge Sharing

This is another critical function of the KMR that fulfills a broad set of requirements over and above the structuring and tagging functionality discussed in the previous section. Some features that address knowledge sharing which we propose to implement in the KMR are:

- The ability to upload both structured and unstructured content: This will include the capability to transform the uploaded content from its native format into the Knowledge Repository's format based on the underlying information model for that type of knowledge. We will also facilitate integration of the upload functionality into the knowledge authoring tools used by the stakeholder organizations, via a plugin architecture.
- The ability to control access to the content based on various criteria, such as the type of knowledge being accessed along with the role and the organization of the user
- Subscription and notification functionality to allow users to subscribe to the topics of their interest, specified by them by a criteria set, to be notified each time any knowledge meeting the criteria gets uploaded or modified. In another scenario, a user may be notified when the knowledge submitted by him/her is impacted by changes to a related piece of knowledge made by another user on the KMR.

#### C.2.4 Knowledge Change and Maintenance

Healthcare is characterized by changing knowledge, for instance, change in the normal ranges of blood pressure value. We will implement the following functionality to handle knowledge changes and maintain the knowledge in the repository in a consistent state.

- The ability to update and version a piece of knowledge is a crucial one and will be implemented on the KMR. This will enable a user to look at previous versions of a knowledge artifact and even view the differences between the various versions. No knowledge artifact will be deleted from the KMR though a status attribute may be set to indicate that it may no longer be in use and will be archived in the system.
- Changes in Knowledge typically impact other pieces of knowledge that depend on it, for instance, if the definition of “normal blood pressure” changes, all clinical guidelines that reference the concept of “normal blood pressure” are impacted. The ability to perform impact analysis of these changes and to notify the users whose knowledge artifacts may have been impacted by these changes will be implemented in the KMR.
- Provenance is an important aspect of knowledge change and the KMR will maintain information related to who, what, when, where and why a particular piece of knowledge was changed. A detailed history and audit trail will be maintained including information such as who accessed the knowledge and how often.

#### C.2.5 Key Role of the Information Model

The information models for the different types of knowledge content are a critical component of the KM Repository as they determine the structure and tagging of the various pieces of knowledge uploaded into the portal. They also determine the criteria on which the content can be searched, retrieved and compared. We intend to bootstrap an initial Information Model quickly based upon sample diabetes-related content contributed by the stakeholders. In subsequent iterative cycles, the Information Model or Models will be expanded based upon new content and requirements identified as we continue to enhance and upgrade the KMR. Some of the requirements and considerations for developing the information models are:

- Alignment of the information models with the available standards when applicable
- The information models developed will be as generic as possible, to enable incorporation of diverse content requirements by designing appropriate subclasses and by re-use of components.
- The information models developed will attempt to capture the inherent structure and semantics of the knowledge uploaded into the KM Repository.
- The information models will be designed to support a variety of functional requirements such as:
  - The ability to search and compare based on criteria that are independent of the content, e.g., the organization and the date on which the piece of knowledge was submitted.
  - The ability to support versioning of knowledge and to review and track the evolution of a piece of knowledge over time.

- The ability to ask provenance related questions such as Who? What? When? Where? and Why?
- The ability to support the rating of quality of various pieces of knowledge based on various criteria.
- The ability to identify the pieces of knowledge that are impacted when another piece of knowledge is changed.
- The ability to specify the information required to invoke the executable knowledge available in the KM Repository, e.g., input and output parameters and QoS criteria.

### C.2.6 Architectural Requirements

The functionality discussed in the sections above helps us identify certain requirements on the architecture for the KMR. Some of those requirements are:

- As discussed in the previous section, information models are a critical component of the architecture. Therefore the system should be able to support:
  - multiple information models
  - evolving information models
- The system should permit integration of various KMR functions into tools and systems used by client systems

### C.2.7 Evaluation

The KMR toolset will include tools to collect various types of metrics to help evaluate the functionality of the system, as described in section E.

## **C.3 Project Plan**

The overall approach (per the current prototype) is as follows:

- The database schema is home grown and will develop – technology is MySQL database engine
- Full text search engine is Lucene
- Database search – User Interface JSP
- The combined technology stack is MySQL + Tomcat + Lucene

<b>Functionality</b>	<b>Application Architecture</b>	<b>Technology</b>
Upload + Tagging (Attribute Value pairs)	Repository <ul style="list-style-type: none"> <li>• Initial Database Schema based on GEM+ClinicalGuidelines.gov+ISO 11179</li> </ul>	Public Wikipedia
Full text search	Server	Sharepoint
Database Search (Attribute-based Search)	User Interfaces	Sharepoint + SQL Server
		MySQL + Tomcat + Lucene

### C.4 Tasks by year

Year 1	Year 2	Year 3
<ul style="list-style-type: none"> <li>• Product/Tool Evaluation</li> <li>• KM Portals/Forums Evaluation               <ul style="list-style-type: none"> <li>– e.g., Sermo.com, Guidelines.gov</li> </ul> </li> <li>• Upgrade Architecture</li> <li>• Expand Content Areas</li> <li>• Upgrade Information Model/Schema</li> <li>• Notification on Upload (based on Subject areas of Interest)</li> <li>• Implement Template-based Tagging Tools               <ul style="list-style-type: none"> <li>– Automatic Model Driven Templates</li> </ul> </li> <li>• Evaluation               <ul style="list-style-type: none"> <li>– Usage Stats</li> <li>– Performance/Scalability Metrics</li> <li>– Stickiness</li> <li>– Usability Testing</li> </ul> </li> <li>• Access Control</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced Tagging               <ul style="list-style-type: none"> <li>– Use Standard Vocabularies concepts as values of tags</li> <li>– Use of Ranges as values of Tags</li> </ul> </li> <li>• Support for Navigating Vocabularies/Taxonomies (Browsing/Tagging)</li> <li>• User driven tags and values + Blogging Aspects</li> <li>• Instant Messaging Support</li> <li>• Support for Upload of Structured Content</li> <li>• Support for Content Specific constructs in the Information Model</li> <li>• Quality Rating + Blogging Aspects</li> <li>• Comparison Functionality</li> <li>• KM Repository + Authoring Tool Integration</li> <li>• Evaluation               <ul style="list-style-type: none"> <li>– Usage Stats</li> <li>– Stickiness</li> <li>– Performance/Scalability</li> <li>– Interoperability</li> <li>– Usability Testing</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Autotagging/Auto-population/Chunking</li> <li>• Guidelines for Use of Knowledge               <ul style="list-style-type: none"> <li>– Prioritization of Decision Support Criteria</li> </ul> </li> <li>• Version Control, Audit Trails, Provenance</li> <li>• Publish/Subscribe, Notification</li> <li>• Impact Analysis</li> <li>• Evaluation               <ul style="list-style-type: none"> <li>– Usage Stats</li> <li>– Scalability/Performance</li> <li>– Stickiness</li> <li>– Interoperability</li> <li>– Accuracy of Autotagging</li> <li>– Accuracy of Impact Analysis</li> <li>– Usability Testing</li> </ul> </li> </ul>
Year 4	Year 5	
<ul style="list-style-type: none"> <li>• “Promotion” of User Driven Quality Criteria into the Information Model</li> <li>• Customization/Adaptation Features (transform capabilities to executable or different forms useful for different systems)</li> <li>• Grid Services/Distributed Computing               <ul style="list-style-type: none"> <li>– Guidelines Interface</li> <li>– Capability to call EMR Interfaces (Prototype)</li> <li>– Web part integration into EMR</li> </ul> </li> <li>• Impact Analysis and Remediation</li> <li>• Evaluation               <ul style="list-style-type: none"> <li>– Usability Testing</li> <li>– Usage Statistics</li> <li>– Scalability/Performance</li> <li>– Stickiness</li> <li>– Interoperability</li> <li>– Accuracy of Impact Analysis and Remediation</li> <li>– Usability Testing</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Using ontologies for better tagging, search and comparison</li> <li>• Knowledge Authoring               <ul style="list-style-type: none"> <li>– Blogging aspects of Knowledge Authoring</li> <li>– IM aspects of Knowledge Authoring</li> </ul> </li> <li>• Service Oriented Architecture:               <ul style="list-style-type: none"> <li>– Directory Services, Standardized Service Descriptions and Interfaces, etc.</li> <li>– Tagging as Service</li> <li>– Impact Analysis and Remediation as a Service</li> </ul> </li> </ul>	

## D. CONTENT ACQUISITION AND MANAGEMENT

### D.1 Aim

To provide a set of authoritative, unambiguous, regularly updated medical knowledge in a form that can be readily adopted (and adapted as necessary) for delivery in the form of CDS, in a set of domains of interest and importance to participants.

### D.2 Approach

Evidence-based clinical decision support by definition requires knowledge that reflects the best current understanding of clinical issues and processes. Evidence-based knowledge has been viewed as a pyramid that categorizes the perceived ‘quality’ of evidence: The broad base is the existing medical research literature, with current studies having more value than older ones, RCTs having higher quality than other research approaches, etc. Higher levels of the pyramid include ever-more refined distillations of the base layer, including meta-analyses and distillations, critical reviews of best evidence, and formal evidence-based syntheses such as the Cochrane reviews.

Using these knowledge sources, organizations construct and derive products that allow the knowledge to be translated into practice. These products include organization-specific guidelines, decision rules, order sets, alerts/reminders, and a variety of other CDS constructs.

To be useful in CDS, these resources must be available, customized to the local application, and ideally incorporated into the clinical workflow process. The Morningside Initiative will seek to facilitate the overarching goal of improved CDS by providing that focuses on these latter, executable constructs, linked to and tied to the source knowledge from which they were derived.

We envision all content to be organized, searchable, discussable, and regularly updated. The conduct of the content management process will be overseen by the Clinical Content Working Group (CCWG), as described in Section B.3.

#### D.2.1 Organization of knowledge products

The Morningside Initiative plans to categorize all submitted knowledge into a descriptive array that will allow future users to find helpful content. We propose five orthogonal dimensions to allow this categorization:

1. The specific disease or disorder for which the content applies
2. The stage of the clinical spectrum of care to which the content applies (wellness maintenance, screening/prevention, ambulatory, acute illness episodes/inpatient issues, chronic disease management)
3. The stakeholders who might use the content (patients, clinical providers, their organizations, researchers, performance improvement specialists)
4. The type of application/use or product form, including both strictly medical resources, as well as resources we describe as non-medical (see lists below) that might also be useful to frontline providers in delivering the best possible medical care
5. The level of evidence (pyramid designation), if appropriate

## Content Inventory

### Non Medical

- Workflow Integration and process
- Subject matter experts
- Resources
- Case Management
- Best devices
- Technology assessment

### Medical

- Order Sets
- Order Checks
- Consult Agreements/Template
- Scorecards
- Calculators
- Trackers
- Alert/Reminders
- Content Sensitive Hyperlink
- Policy Evidence Update Alerts with Alert Status Designation

All submitted content must be accompanied by a form that specifies these parameters, and a variety of other information that will be used for versioning and maintenance purposes. (See Submission Form, Attachment 3)

### D2.2 Functionality to be provided

- **Search** will allow users to identify relevant tools in two ways: by the orthogonal categories described above, and by free text search. (See technical development, section C)
- **Moderated discussion** will be allowed and encouraged. Discussion forums will be created for each specific knowledge type, of two different forms. First, a Web 2.0 mechanism (see section C) will allow users to place comments and pose questions, and interact with other users. Second, a forum will be created to allow general discussion and comment for further development on the KMR functionality.
- **Updating** is a key function. All submitted content will be ‘versioned’, categorized, and appropriately tagged at the time of submission. The oversight committee will designate appropriate automatic expiration dates for each content type, at which time the content resource will be archived. Updates will also be encouraged for any regular, scheduled reviews, when any errors are discovered and corrected, and whenever content resources are revised in response to emerging new evidence and findings (e.g., the newly recognized cardiac risks of rosiglitazone, or the recent revisions to the endocarditis prophylaxis guidelines).
- **Consulting and support services** - A possible future activity would include the ability to provide services to small institutions and vendors in implementing and adopting CDS content and tools.
- **Content scope** - Initially vetting, rating, or evaluation of submitted content is not proposed, other than to ensure that the appropriate information has been provided in accordance with the rules of submission. The premise is that the content all arises from operational usage at one or more participating organizations’ sites, and has already been vetted. It is expected that the Web 2.0-type interactions of users will provide a means of community rating of the content, which will be helpful to other users. Eventually, an editorial and review process is expected to evolve.

- **Identifying future content areas** - Diabetes mellitus has been chosen as a demonstration focus, as noted in Section D.3 below, mainly because of its prominence as a health problem in all populations, and because the initial participating organizations all have existing content related to this condition. The KMR in future years will work to expand its knowledge resources to many other conditions. A prioritization scheme for evaluating candidate conditions is shown below, and these criteria will be applied by the CCWG.

Prioritization of Additional Topics Beyond Diabetes	
High Volume	Costs
High Risk	Practicality
Preventive Measures	Amputation Rates
Chronic Disease	Visual Impairment
Mental Health	Infrequent Care Management
Performance Measures	Utilization Rates

### D.3 Getting started

#### D.3.1 Initial content focus: Diabetes Mellitus

As a first step, the initial participating organizations seek to seed the KMR with their own knowledge content, focusing on diabetes as a use case. This is recommended based on the following factors:

- (a) Prevalence and importance of diabetes in the population, growing as it is with the increasing obesity of the population
- (b) Degree of maturity of diabetes knowledge
- (c) Potential benefit of widespread use of CDS in diabetes management, enhancing the ability to measure an impact of our efforts, and
- (d) The fact that all of the participating organizations already have efforts going in diabetes decision support, as a result of which this is a good starting point for refining and improving collaborative knowledge management practices.

#### **D.3.2 Operational Tasks**

The founding members will be asked to take specific steps to operationalize this proposal in the initial incubation phase, as discussed in Section B.2, namely;

1. **Letter of support** from each participating entity, capable of committing the organization to participation.
2. **Donation of initial clinical knowledge content** in diabetes mellitus.
3. **Memorandum of Understanding** by each participating entity.

The CCWG will also develop, in conjunction with the initial participating organizations, processes to inventory the KMR and decision support products, and obtain organizational approval to share these to the repository.

Each participating organization will also need to establish or designate existing internal committees and/or individuals to manage the organization's participation, and to serve on various committees.

## **E. EVALUATION**

Evaluation of efforts will need to be conducted with both internal and external stakeholders for validation of the concept. A key measure of success will be the amount and usefulness of the content that is accessed through the KMR. This reflects both how much useful content is contributed and updated/maintained over time, and the extent to which content is downloaded by both other members and non-member user institutions, and incorporated into actual CDS applications. This will require instrumenting and measuring the content management activity itself, as well as follow up and assessment of recipient use of content.

Another aspect of evaluation will be ongoing feedback and reports from the Advisory Board regarding its assessment of activities, the challenges and its success in addressing them.

The group identified the following categories and processes for measurement. This is in the initial phase of development.

- Organizational value proposition; proliferation, impact on development cost, usage by type of content
- Development of feedback mechanisms for reporting and evaluation
- Administrative functions; quarterly reporting; process modeling
- Content availability and submission by category
- Success of organizational structure (build knowledge management repository and share content)
- Adequacy of the business model and trajectory to self-sustaining operation

It is anticipated that parameters and metrics used in the evaluation of the system will increase as the system evolves in terms of content and functionality. Some of the evaluations we plan to perform are:

- The usability of the system and its various tools
- The scalability of system performance with increase in the complexity and the number of users. To evaluate scalability, we will have metrics for throughput, response time, availability and whether the system shows graceful degradation with increase in complexity and usage
- The flexibility of the system to accommodate multiple information models and terminologies
- Conformance to various applicable standards. The system should be able to interoperate with the tools and systems used internally within the user organizations and dedicated client tools. A key

metric in this context will be conformance to various standards. This will be an evolving process as noted in section A, as we expect to help drive the adoption of standards.

- Security and privacy. Issues here will mainly involve ensuring that the CDS knowledge base is tamper-proof. Audit trails of logins and usage, password identification and provider role-based access privileges will be monitored.

Methods for the conduct of evaluations and review of results will be delineated in the early part of the incubator phase. Evaluation will be an ongoing activity.

## **F. REFERENCES**

- [1] Greenes, R A., ed. (2006) *Clinical Decision Support: The Road Ahead*. New York: Elsevier.
- [2] Osheroff, J., Teich, J., Middleton, B., Steen, E., Wright, A. and Detmer, D. (2006). *A Roadmap for National Action on Clinical Decision Support*. Report. Bethesda, MD, American Medical Informatics Association

**ATTACHMENT 1**

**Attendee List  
 Knowledge Sharing Initiative  
 AUG 28-30**

<b>NAME</b>	<b>ORGANIZATION</b>	<b>Contact Information</b>
Meryl Bloomrosen	Meryl Bloomrosen Associate Vice President American Medical Informatics Association	4915 St. Elmo Avenue Suite 401 Bethesda, Maryland 20814 301 657-1291 301 657-1296 (fax) ww.amia.org <a href="mailto:meryl@amia.org">meryl@amia.org</a>
Robert Kolodner	(HHS/ONC)	Day 1
Charles Friedman PhD	(HHS/ONC) Senior Advisor to the National Coordinator Office of the National Coordinator for Health Information Technology Department of Health and Human Services	1&2
Robert Mayes	AHRQ Senior Advisor	<a href="mailto:mayas@ahrq.hhs.gov">mayes@ahrq.hhs.gov</a>
Benge, James, Col,	citpo OASD(HA)	<a href="mailto:James.Benge@ha.osd.mil">James.Benge@ha.osd.mil</a>
P. Jon White, MD	AHRQ Health IT Director Agency for Healthcare Research and Quality	540 Gaither Road Rockville, MD 20850 301-427-1171 <a href="mailto:jonathan.white@ahrq.hhs.gov">jonathan.white@ahrq.hhs.gov</a>
LTC Nhan Do M.D.	DoD	<a href="mailto:Nhan.Do@tma.osd.mil">Nhan.Do@tma.osd.mil</a>
LCDR Ron Gimbel, Ph.D., FACHE	DoD Assistant Professor Preventive Medicine & Biomedical Informatics F. Edward Hébert School of Medicine - Room A2008 Uniformed Services University of the Health Sciences	<a href="mailto:rgimbel@usuhs.mil">rgimbel@usuhs.mil</a> USUHS 4301 Jones Bridge Road Bethesda, MD 20814-4799 rgimbel@usuhs.mil (301) 295-3077 - Phone (301) 295-0752 - Fax (540) 825-5382 - Home Office
COL Andre Marinkovich	DoD	<a href="mailto:Gregory.Marinkovich@tma.osd.mil">Gregory.Marinkovich@tma.osd.mil</a>
Dean F. Sittig Ph.D.	Kaiser Director, Applied Research in Medical Informatics Northwest Permanente, PC 3800 N. Interstate Ave. (CHR@WIN) Portland, OR 97227 W: 503-335-6316	<a href="mailto:Dean.F.Sittig@kp.org">Dean.F.Sittig@kp.org</a>
Dr. Adam Wright	Partners HealthCare Clinical Informatics R&D	<a href="mailto:awright5@partners.org">awright5@partners.org</a>
Dr. Vipul Kashyap	Senior Medical Informatician Clinical Informatics R&D, Partners HealthCare System Phone: (781)416-9254 Cell: (617)943-7120	<a href="mailto:vkashyap1@partners.org">vkashyap1@partners.org</a>
Syed Tirmizi M.D.	(VHACO) Director, Health & Medical Informatics, Office of Chief	<a href="mailto:syed.tirmizi@va.gov">syed.tirmizi@va.gov</a> (202) 262-2779

**The Morningside Initiative**  
**Collaborative Development of a Knowledge Management Repository**

	Health Informatics Officer	
Dr. Mark Graber	Chief, Medical Service Northport VA Medical Center, Northport, NY	<a href="mailto:Mark.graber@va.gov">Mark.graber@va.gov</a>
Roxane Rusch	Clinical Quality Specialist Office of Quality and Performance	<a href="mailto:Roxane.rusch@va.gov">Roxane.rusch@va.gov</a> 206-764-2369
Brad Doebbeling, MD, MSc	Director, VA HSR&D Center of Excellence on Implementing Evidence-based Practice Director, IU Center for Health Services and Outcomes Research Regenstrief Institute, Inc., Indianapolis Phone: 317-988-4493 Fax: 317-988-3222	Brad Doebbeling, MD, MSc <a href="mailto:bdoebbel@iupui.edu">bdoebbel@iupui.edu</a> (317) 988-4493 Assistant: Anne Marie Johnson <a href="mailto:amj5@iupui.edu">amj5@iupui.edu</a>
Robert A. Greenes, MD, PhD	Ira A. Fulton Chair and Professor, Department of Biomedical Informatics Arizona State University Arizona Biomedical Collaborative, 425 N. 45th St. Phoenix, AZ 85004-2157 tel: 602-827-2548	<a href="mailto:Greenes@asu.edu">Greenes@asu.edu</a> Admin Associate: Patricia Hutton tel: 602-827-2537 cell: 602-275-4908 email: <a href="mailto:patra@asu.edu">patra@asu.edu</a>
Robert N. Enberg M.D.	Henry Ford Medical Director, IT Henry Ford Health System One Ford Place, 3C Detroit, MI 48202 313 874 9534	<a href="mailto:RENBERG1@hfhs.org">RENBERG1@hfhs.org</a>
Hemant Shah, MBBS	Henry Ford Medical Informaticist	<a href="mailto:Hshah2@hfhs.org">Hshah2@hfhs.org</a>
LTC Hon S. Pak MD	TATRC	<a href="mailto:pak@tatrc.org">pak@tatrc.org</a>
Nancy E. Brown-Connolly	TATRC	<a href="mailto:connolly@tatrc.org">connolly@tatrc.org</a>

## ATTACHMENT 2

### DEFINITION OF TERMS

- 1. Clinical Knowledge Management** - Continuum of activity related to making medical information available throughout its lifecycle, across the continuum of care and, across populations of wellness and illness, so that can be brought to bear when needed in the health care delivery system. In the context used here we focus on the management of knowledge in a formalized representation that is unambiguous and capable of being executed by computer. Further, we focus on the knowledge management done at a national level external to particular health care delivery organizations. Knowledge management in this setting must include aspects relating to the acquisition of knowledge from participating organizations or other sources as well as its dissemination to various organizations or entities. Functions encompassed include acquisition, classification, representation, editing and update, versioning, and dissemination.
- 2. Knowledge Repository** - a compendium of knowledge. As used here, the knowledge repository is a national-level resource consisting of various knowledge content resources. Knowledge management capabilities enable the repository to be built, updated, organized, and searched.
- 3. Clinical Decision Support** - The ability to provide advice to facilitate decisions by providers or patients, ideally patient specific and delivered at the time of need. Computer-based clinical decision support (CDS) is intended to facilitate patient care by reducing errors, improving quality, and enhancing cost-effectiveness.
- 4. Open Access / Open Source** - An approach to making software and information technology resources available to the community in which there are minimal restrictions. Open access usually suggests that there are no limitations to ability to retrieve and view the resource. Open source means that the resource can not only be viewed but can be used in a variety of ways. There are various versions of open source licensing, with differing degrees of restriction, and there are differing modes of community participation in the development and refinement of open source resources.

### **ATTACHMENT 3**

#### **Content Submission Form Data Fields- Knowledge Management Repository**

- a. Product title
- b. Filename
- c. Version
- d. Date
- e. Purpose
- f. Explanation
- g. Decision type (see menu)
- h. Knowledge representation (see menu)
- i. Level of evidence
- j. Tool type (See menus)
- k. Potential users (see menu)
- l. Lab results notification type (see menu)
- m. Order set type (see menu)
- n. Clinical specialty (see menu)
- o. Disease/Disorder involved
- p. Clinical venue (see menu)
- q. Source (see menu)
- r. Contact person

# Resource Submission Template: Knowledge Management Collaborative

Resource Title

ID #

Filename

Version

Submission/Revision Date

Purpose

Explanation

Clinical Venue

Users

Clinical Specialty

Care Continuum

Disease\Condition

Decision Type

Knowledge Representation

Tool Type 1

Tool Type 2

Lab Results Type

Order Set Type

Source

Contact Person

Hospital

phone

Signature Initiative

email