Use Case Summary

Use Case Name:	Computable Knowledge
Sponsor:	TBD
Date:	March 25, 2019

Executive Summary

This brief section highlights the purpose for the use case and its value. The executive summary gives a description of the use case's importance while highlighting expected positive impact.

In recent years, healthcare delivery has become increasingly complex. The widespread introduction of electronic health record (EHR) systems and the growth in high-quality biomedical knowledge has created new opportunities and new challenges.

Experts in the fields of "Machine Learning" and "Artificial Intelligence" now routinely develop computer algorithms based on analyses of population health data. Trusted computer algorithms are already being used to drive best practices, often by segmenting individual patients into various risk groups. These algorithms provide decision support in the form of statistical predictions and risk scores which can help healthcare to improve care, ultimately resulting in better health outcomes.

The Computable Knowledge use case deploys computer algorithms to provide more timely and actionable messages and reports. Integrating these computer algorithms into the existing statewide health information network leverages current capabilities to make clinical decision support widely available and consistent across sites of care, allowing greater coordination among care teams.

Purpose of Use Case: The Computable Knowledge use case allows computable biomedical knowledge algorithms and evidence-based message tailoring algorithms to be applied to health information already flowing through the Michigan Health Information Network Shared Services (MiHIN), enabling more informative and timely reports and messages to be delivered to care team members.

Overview

This overview goes into more details about the use case.

Need for This Use Case

Demands on physician time have been increasing steadily over the years and, with it, clinician burnout. The average length of time physicians spend with a patient is approximately 20 minutes.[1] However, for every hour spent in face-to-face contact with patients, two hours are spent on administrative tasks.[2] Physicians and other healthcare professionals must balance the demands of their busy schedule with the priority of providing high-value patient care.

The complexity of patient care has been increasing as well. New medical knowledge is being learned every day, much of it providing specific insights into how to improve patient care, individualize treatments to improve outcomes, and communicate health information effectively. The idea of learning from every patient is now being actively pursued by provider organizations around the country.[3]

It would take a healthcare professional approximately 620 hours to evaluate the literature published on just primary care each month.[4] There are only about 700 hours in a given month. Clearly it is impossible to keep up with all published literature, however physicians are expected to maintain a thorough knowledge of emerging treatments, trends, and best practices.

More complete, consistent, timely, and actionable information help address these demands. In the age of EHRs, there is an opportunity to leverage health information infrastructure to provide timely, actionable clinical decision support information automatically by applying computable biomedical knowledge (CBK).

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[1] Meredith K. Shaw, et al., "The Duration of Office Visits in the United States, 1993 to 2010," The American Journal of Managed Care (October 2014), accessed January 8, 2019, http://www.ajmc.com/journals/issue/2014/2014-vol20-n10/the-duration-of-office-visits-in-the-united-states-1993-to-2010

[2] Christine Sinsky, MD, et al., "Allocation of Physician Time in Ambulatory Practice: A Time and Motion Study in 3 Specialties," Annals of Internal Medicine (December 6, 2016), accessed January 8, 2019, http://annals.org/aim/article-abstract/2546704/allocation-physician-time-ambulatory-practice-time-motion-study-4-specialties

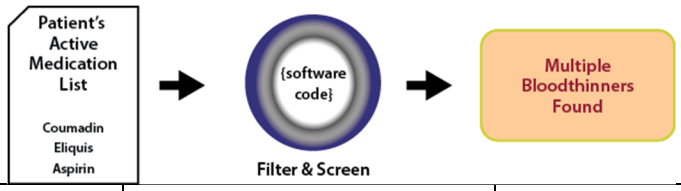
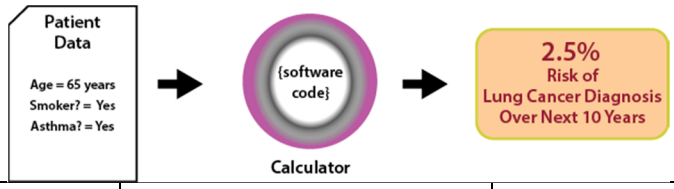
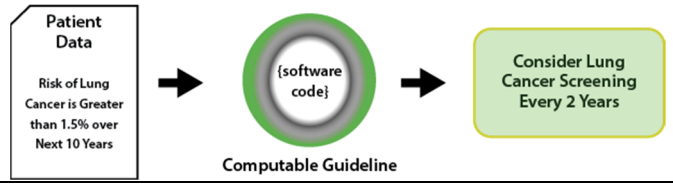
[3] LP Lowes, et al., "Learn from Every Patient Study Group," Developmental Medicine & Child Neurology, (February 2017: 59, 2):183-91, J. Frankovich J, et al, "Evidence-based medicine in the EMR era," N Engl J Med. (November 2011, 10;365,19):1758-9, and RL Schilsky "Finding the evidence in real-world evidence: moving from data to information to knowledge," Journal of the American College of Surgeons (January 1, 2017: 224, 1):1-7.

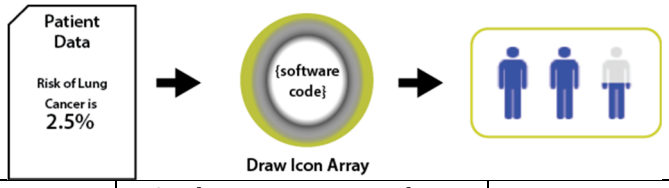
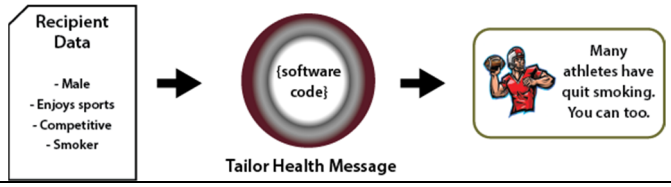
[4] Brian S. Alper, MD, "How much effort is needed to keep up with the literature relevant for primary care," Journal of the Medical Library Association (October 2004, 92,4): 429-437, accessed January 8, 2019, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC521514/

Using open-source technology developed for this purpose, CBK can now be managed and more easily deployed in the form of digital "Knowledge Objects" which hold computer algorithms arising primarily from analyses of population health data. Other objects can be used to screen and filter information in ways that may help improve care. For instance, one currently in use screens a patient's active medication list and recognizes when a patient has been prescribed a combination of medications known as the "Triple Threat." (These medications – an opioid, a benzodiazepine, and a muscle relaxant – when combined put the patient at an elevated risk for respiratory depression.) This knowledge object recognizes and flags this medication combination for further follow up by healthcare providers within established workflows, such as medication reconciliation.

Knowledge Objects

There are several different types of knowledge objects. The example below shows hypothetical examples of messaging which could be produced by each type of knowledge object:

<table>
<tr><th>Type of Knowledge Objects</th><th>Input</th><th>Service Performed</th><th>Output</th></tr>
<tr><td rowspan="2">Filter and Screen</td><td>Data file</td><td>Finds particular values, patterns, or trends</td><td>Highlights what is or is not found</td></tr>
<tr><td colspan="3">Example:
 
</td></tr>
<tr><td rowspan="2">Calculation and Scoring</td><td>Individual features about as person or thing</td><td>Calculates number using a mathematical formula</td><td>Numeric result</td></tr>
<tr><td colspan="3">Example:
 
</td></tr>
<tr><td rowspan="2">Recommendation and Interpretation</td><td>Facts about a patient case</td><td>Apply health guideline knowledge of best practices</td><td>Written recommendation or instruction</td></tr>
<tr><td colspan="3">Example:
 
</td></tr>
</table>

<table>
<tr><th>Type of Knowledge Objects</th><th>Input</th><th>Service Performed</th><th>Output</th></tr>
<tr><td rowspan="2">Visual Presentation</td><td>Image parameters</td><td>Apply communication best practices to render images of interest</td><td>Visual display or image</td></tr>
<tr><td colspan="3">Example:
 
</td></tr>
<tr><td rowspan="2">Message Tailoring</td><td>Individual features about a message recipient</td><td>Apply communication best practices to generate messages</td><td>Individualized, evidence-based multimedia messages</td></tr>
<tr><td colspan="3">Example:
 
</td></tr>
</table>

Many organizations already apply CBK to patient data within their workflows. The outputs of applying CBK to patient data can be used by those performing direct patient care, as well as support staff, such as care coordinators, to more effectively deliver care. However, existing CBK tends to be isolated within an organization and its health IT systems and may not be informed by all the available patient data from other sources. This use case is focused on algorithms that can be reused and shared.

Improvements to these algorithms are partially informed by the outcomes reported by organizations using them. As such, MiHIN will work with participating organizations to determine how valuable outcome metrics can be reported and used to improve the algorithms.

Impact of the Use Case

This use case leverages the existing statewide infrastructure required to widely deploy CBK, creating a shared service across the state. This results in:

- Timelier messages for clinical decision support
- More informative and timely population health reports
- An expanding library of cutting-edge algorithms, with corroborating information to build and maintain trust, for all participating organizations
- Understanding the impact of information interventions across care teams at participating organizations

Participation in the Computable Knowledge use case provides access to the associated use case scenarios. Each use case scenario includes one or more knowledge objects which focus on a specific topic, for instance the topic of managing opioid use.

Diagram

This diagram shows the information flow for this use case.

A generalized data flow is shown below, however, data flows may vary somewhat between each use case scenario under the Computable Knowledge use case. Each data flow focuses on providing actionable information through the most appropriate channel at the right point in the recipient's workflow.

For additional information on data flows, see the available use case scenarios.

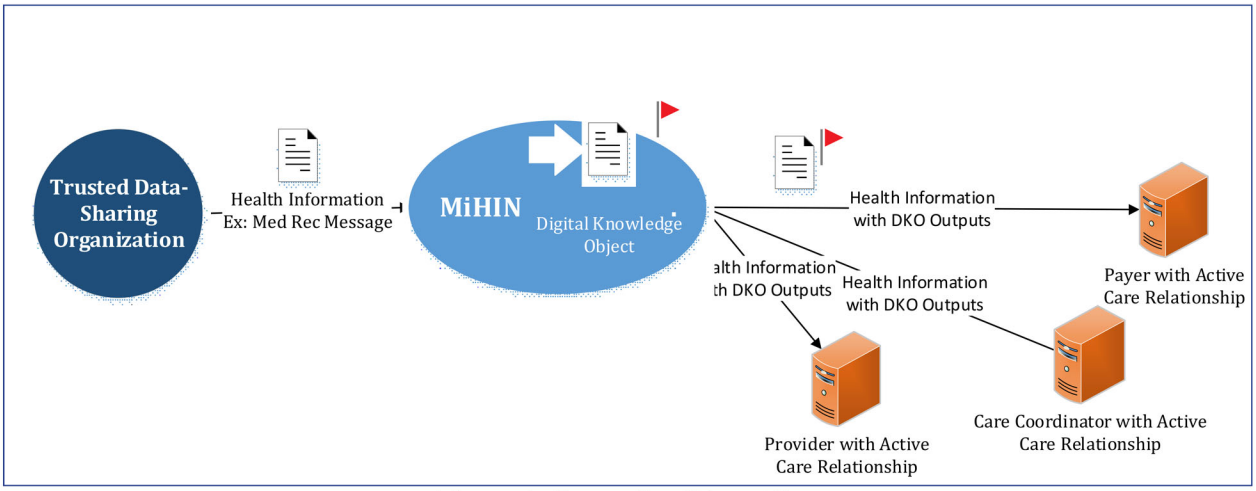


Figure 1: Generalized Data Flow

1. In this example, an organization sends a "Medication Reconciliation" message to MiHIN
2. MiHIN applies the available digital knowledge objects to the Medication Reconciliation message and appends the outputs to the message as an enrichment
3. MiHIN sends enriched Medication Reconciliation message to participating organizations with an active care relationship

Regulation

This section describes whether this use case is being developed in response to a federal regulation, state legislation or state level administrative rule or directive.

Legislation/Administrative Rule/Directive:

☐ Yes

☒ No
☐ Unknown

Meaningful Use:

☒ Yes
☐ No
☐ Unknown

* This use case may support meaningful use activities for certain knowledge objects and users

Cost and Revenue

This section provides an estimate of the investment of time and money needed or currently secured for this use case.

This will be determined at a later time.

Implementation Challenges

This section describes the challenges that may be faced to implement this use case.

Wherever possible, MiHIN's use cases leverage existing infrastructure within the existing network. Most of the use case scenarios will require that participants are also participating in other use cases such as Admission, Discharge, Transfer (ADT) Notifications or Medication Reconciliation.

Vendor Community Preparedness

This section addresses the vendor community preparedness to readily participate in the implementation of this use case.

Wherever possible, outputs from the objects will be appended to messages already flowing through MiHIN or leverage other existing infrastructure such as Direct Secure Messaging accounts or MiHIN's own Diretto service (more information is available online here- https://mihin.org/services/diretto/).

Support Information

This section provides known information on this support for this use case.

Political Support:

☐ Governor
☐ Michigan Legislature
☐ Health Information Technology Commission
☐ Michigan Department of Health and Human Services or other State of Michigan department
☐ CMS/ONC
☐ CDC
☒ MiHIN Board

Other: University of Michigan Department Learning Health Sciences

Sponsor(s) of Use Case

This section lists the sponsor(s) of the use case

- TBD

Metrics of Use Case

This section defines the target metrics identified to track the success of the use case.

- Percentage of relevant Transitions of Care messages (for example, Admission, Discharge, Transfer Notifications and Medication Reconciliation) with an enrichment z-segment.
- Number of organizations participating in at least one use case

Other Information

This section is provided to give the sponsor(s) an opportunity to address any additional information with regard to this use case that may be pertinent to assessing its potential impact.

This use case establishes the legal and technical infrastructure required for use of the knowledge objects which provide decision support information.

In order to gain value from this use case, participants should select different use case scenarios in which to participate. As additional objects are developed and integrated by MiHIN, new scenarios will be created, and others may be updated.

Knowledge objects will be grouped into scenarios by the topic they address. For instance, the Opioid Assistance Scenario contains more than one digital knowledge object and can provide results in more than one opioid-related scenario.