HealthBoard Patient Monitoring Tool:

AN ONLINE APPLICATION SUPPORTING PATIENT-CENTERED MEDICAL HOME PRACTICE AND FACILITATING PREVENTIVE HEALTHCARE

EXECUTIVE OVERVIEW

The United States is on an explosive path respecting healthcare costs. Unless the model for how healthcare is administered, i.e., restricted, or how healthcare is provided is significantly changed, the system will not be sustainable.* Of particular interest toward addressing this impending crisis is the concept of "Medical Home." In traditional practice doctors aim for minimizing, or reversing illness—after its discovery. Conversely, medical home practice focuses on patient-centered protocols and preventive health. Medical home practice promotes integrated healthcare services that consider mind and body along with illness prevention through good health practices. This is an expansive opportunity toward the healthcare ideal: better healthcare and lower costs to provide it. In order for this to be achieved new tools are necessary to involve the patient in the process. PIIM, the Parsons Institute for Information Mapping, is leading the way in healthcare toolset and interface development that will support next-generation healthcare infomatics. One example is HealthBoard. This (primarily) online tool will allow healthcare providers and healthcare recipients to engage together toward health monitoring and improvement. Patients, through a network of other patients, healthcare providers, and resources will be able to map and see the benefits of healthy lifestyle change. By clearly rewarding data collection through improved health and greatly reducing costs, HealthBoard is an ideal way to implement the concepts of Medical Home, and be a critical tool in the arsenal to reverse the dangerous spiral of high costs and ill health within the nation.

*David M. Walker, "MEDICARE: New Spending Estimates Underscore Need for Reform," *Testimony: Before the Committee on the Budget, House of Representatives* (United States General Accounting Office)

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A typical screen showing the patient portal interface of HealthBoard. This is one of several view options that support the preventive care aspects of the Medical Home model. Here patients are provided with a dashboard that represents a picture of their health. The system rewards data input for the patients, better informs their healthcare providers, and lowers the cost of healthcare provision.

Note: Actual interface utilizes a black ground. This image has been modified for print purposes.

Here a nutrition module (through a widget view) is displayed. Utilizing the latest developments in nutrition guidelines, the visual gives the "big picture" in terms of type of food intake, nutrition, total calories, etcetera—by such methods patients can see trends in their eating habits including the subsequent benefit, or detriment, of such choices over time.

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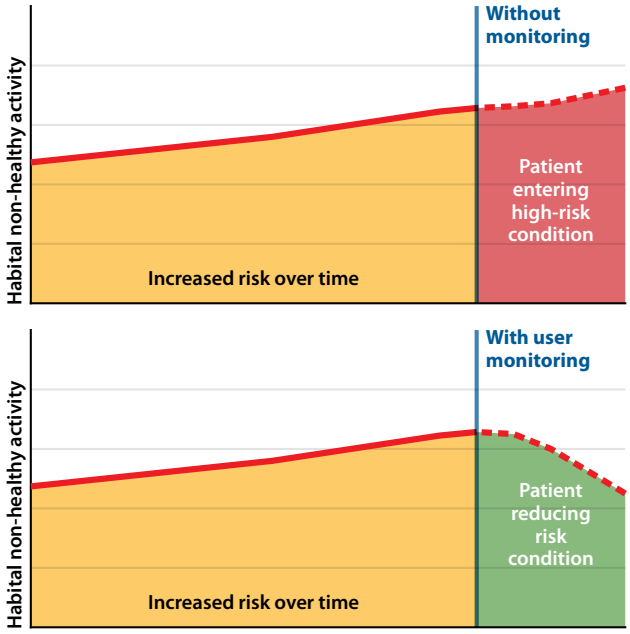
STAKEHOLDERS IN HEALTHBOARD

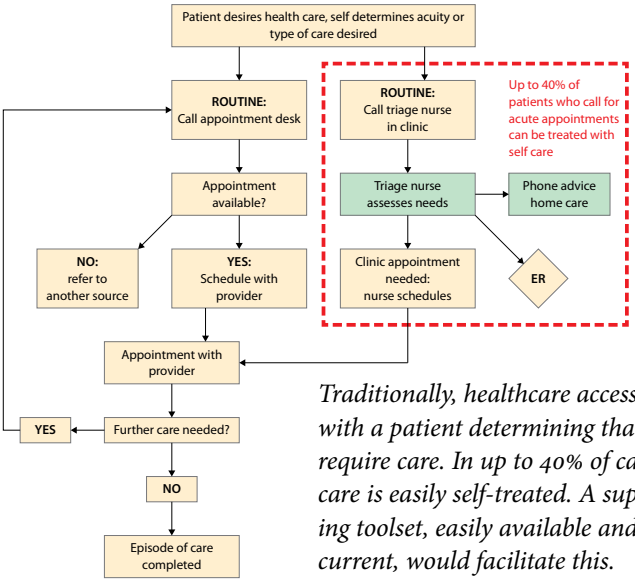
The Parsons Institute for Information Mapping (PIIM) is in the process of completing a program for the Telemedicine and Advanced Technology Research Center (TATRC), the U.S. Department of Defense (DoD), supporting the design and prototyping of a visual dashboard for a Patient Centered Medical Home (PCMH). This program encompasses Graphic User Interface (GUI) design, User Experience Design (UXD), engineering, and assessment/user-feedback activities. The title of the system is HealthBoard. This information tool, accessed online and designed for simultaneous professional (healthcare provider) and non-professional (healthcare recipient) use, acts as an integrated communication component by aggregating and displaying complex information into a single, easy-to-use visual display. HealthBoard becomes an extension of the healthcare facility by aggregating and displaying patient information from multiple data sources. The information can be composed into views that are specifically geared to the type of clinical staff viewing the information. In such manner the system can access one or more data repositories, gather relevant information on a patient from each repository, determine the type of clinical staff utilizing the data, and then generate a dynamic, real-time display of the data specifically tailored to that staff person and his/her needs. At the consumer side such data can be compiled in a non-personal way to allow healthcare recipients to understand their health status, as well as their goals toward healthfulness.

ABOUT MEDICAL HOME

Originally, the term medical home referred to a centralized place of healthcare data and healthcare provision. The key concept is coordination and integration of healthcare provision with the patient *at the center* of such a model. In essence the patient is the center node within a network of provision, and supported by the data that facilitates such healthcare provision. By sharing the knowledge across all facilities and entities (specialists, clinics, hospitals, and even family members of the targeted recipient) the goal was to provide effective care through integrated knowledge and communication. Physicians could realize a shared savings through the non-duplication of information and data collection; but this was to be greatly enhanced by improved healthcare and, ultimately, the reduction of late-state treatment in hospitals, etc. As the idea of medical home has advanced, providers realized that pushing healthcare decisions back to the source—the



A healthcare monitoring tool, such as HealthBoard, provides visible feedback. Visualization tools demonstrate benefits provide incentive for improvement. Just as providers have relied on methods for "seeing" change, recipients will also profit from such opportunities. Behind the design scenes PIIM investigates and generates many diagrams to determine best practice, workflow, and alternate outcomes.



Traditionally, healthcare access begins with a patient determining that they require care. In up to 40% of cases care is easily self-treated. A supporting toolset, easily available and kept current, would facilitate this.

Flow chart is adapted from Robert Manaker, LTC and Jon Pearse, LTC, "Primary Care Management: Five Years of Lessons Learned Using a Enrollment Model," (PowerPoint document presented at the 2000 Tricare Conference, Washington D.C., 2000).

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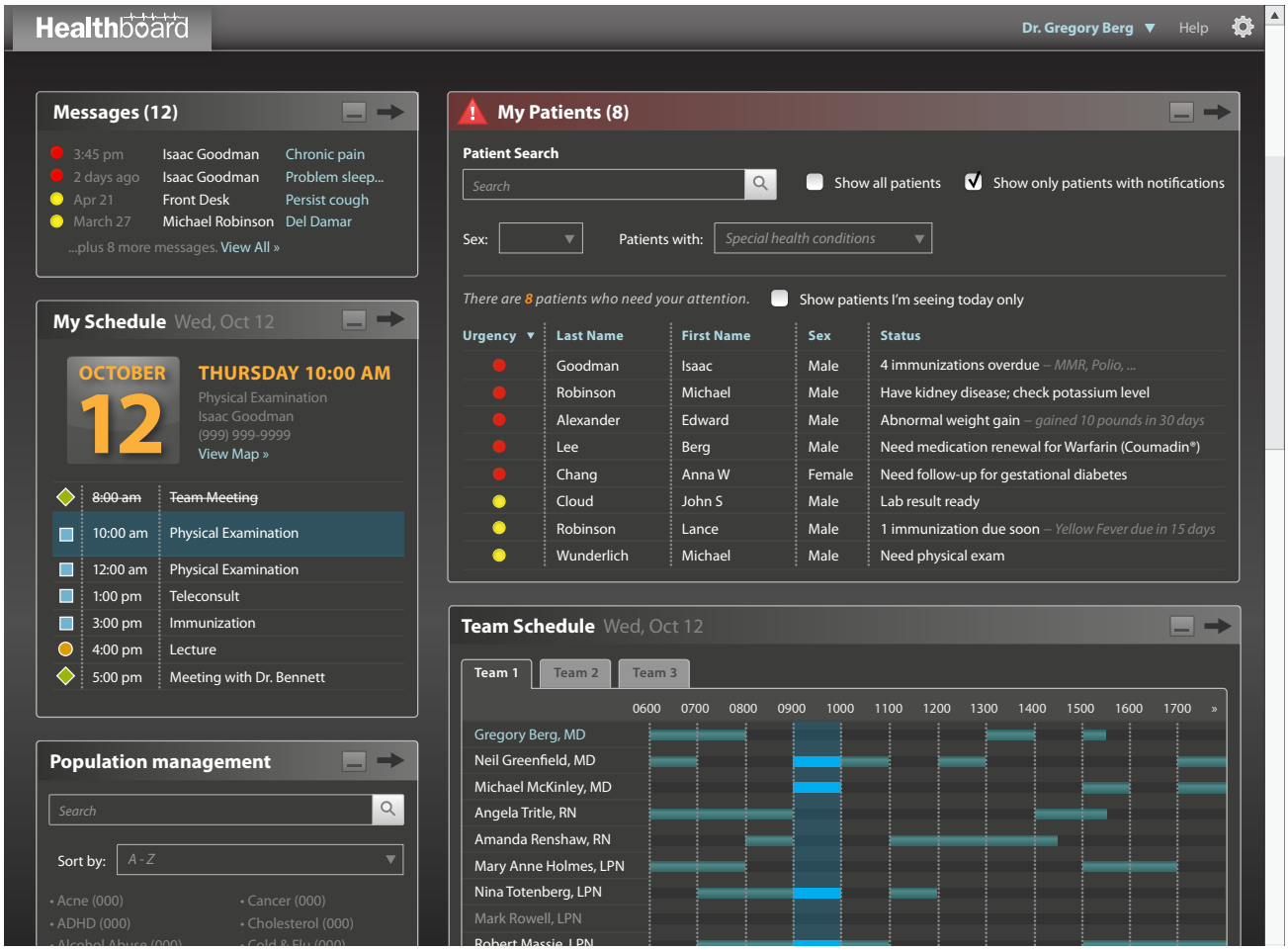

The HealthBoard tool is designed for the healthcare recipient, the healthcare administrator, and the healthcare provider. This view shows a provider's screen with a list of patients, individual schedules, and medical home team collective schedules.

recipient, would be the real cost-saver. However, this cost saving is matched to something much more important, better patient health.

The U.S. government, under Tricare, has been a leader and advocate of the possibilities for medical home activities. "The Patient-Centered Medical Home (PCMH) Branch was created in 2010 to manage and provide oversight of the Military Health System's PCMH implementation, primary care transformation and NCQA recognition efforts. The PCMH is a team-based model based on the premise that the best healthcare begins with a strong primary care foundation, accompanied by quality and resource efficiency incentives. Patients in a PCMH have a personal provider, who along with his/her team, provides continuous, accessible, family-centered, comprehensive, compassionate and culturally-sensitive health care in order to achieve the best outcomes. The PCMH section collaborates closely with the Services in implementation efforts, policy development and the formal recognition process." (from the Tricare website)

Telemedicine and Advanced Technology Research Center (TATRC) has actively engaged in leveraging the medical home concept. PIIM was chosen to develop toolsets that provide an ideal framework through which the strengths of medical home may be realized. This is accomplished by allowing the data supporting a patient to be seen under three aspects: at the clinical level for professionals, at a general health vital statistics level by a patient; and, at health profile level by both provider and recipient. This last aspect can greatly contribute toward aspects of preventive health.

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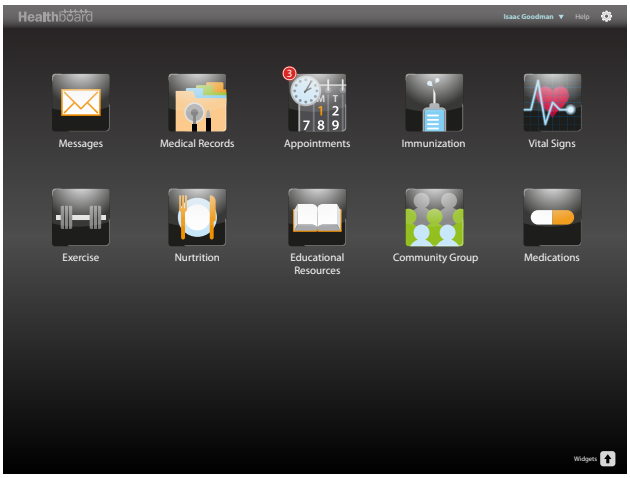
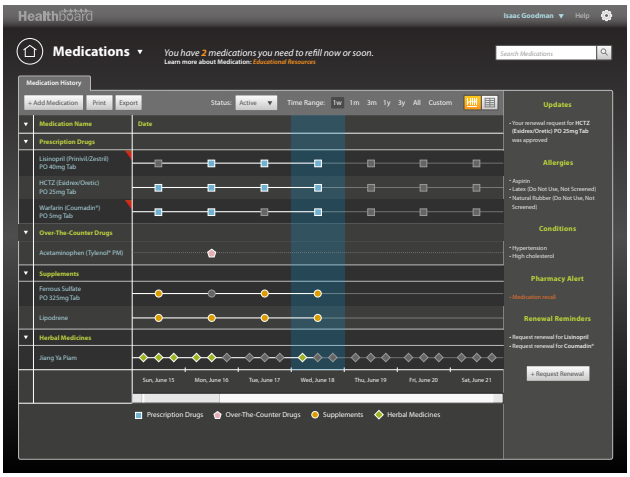
THE HEALTHBOARD TOOL

HealthBoard is a component designed to be used in conjunction with the Armed Forces Health Longitudinal Technology Application (AHLTA), the military's Electronic Medical Records (EMR) system. PIIM's prior experience in designing intuitive, deep interfaces supporting massive data sets, made us an ideal candidate for bringing the necessary expertise in GUI design and information analysis to the project. It was determined that a healthcare tool that could integrate into the large goal-sets of the greater AHLTA tool, and support the specific ideals for HealthBoard initiative be divided intro three sections supporting the three areas of data entry and retrieval.

One of the three aspects included a Patient Portal, designed for use by patients to interact with their healthcare providers, as an area to enter data and become part of their own health plan, and, as a means to gain access to parts of their medical records. In addition to the Patient Portal PIIM designed the interface variants for a Provider Portal and an Administrator Portal. The Provider Portal would allow the Patient Centered Medical Home (PCMH) team to interact with their patients, participate in team-based care, and provide functionalities in addition to working in conjuction with the larger AHLTA system. The Administrator Portal was designed for use by PCMH administrators to gain overall insight into their teams, providers, and patients. Additionally, this portal would assist in helping to assess and monitor facility-specific metrics and objectives.

In order to support these efforts PIIM was engaged patient-centered medical home related ideas, including: aspects of existing medical practice; reactive protocols; and comparisons between "traditional" practice and the patient-centered medical home related practice. Where existing medical practice has RNs and LPNs taking the vitals HealthBoard was to allow patients take their own vitals (blood pressure, blood sugar, peak flow, heart rate). However the tool had to go further, permitting data input from more subjective areas, such as full diet diary monitoring. Of particular interest are those areas of high incidence that the patient can be invested in to assist in prevention and illness mitigation on a continual basis: diabetes, hypertension, obesity, and COPD (Chronic Obstructive Pulmonary Disease).





From simple button views to temporal-based medication usage over time, many aspects of user-experience and medical familiarization had to be covered. PIIM not only creates the last mile of visualization for these sophisticated tools but contributes heavily to workflow logic and resultant information architecture.

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FLEXIBILITY OF DESIGN CONCEPT

Each of the accessible portals within HealthBoard (Patient, Provider, and Administrator) operate as separate systems with shared and common functionalities. In addition to the flexibility provided through the data flows that support each environment from a formal desktop application to an online tool, through to an iPad/tablet and iPhone/ Blackberry handheld devices. The browser of each portal was designed within a "complexity-level" style so to be adaptive, in future, to appropriate and desired publishing environments.

Every consideration for PIIM involves the last-mile aesthetics and user-experience: the point at which the human meets data that supports their decisions and lifestyles. PIIM has identified a "dashboard and widget" design concept that can be utilized in any of the environments identified above and can also support use/re-use across the platforms as necessary. The concept allows the GUI and UXD to be more flexible and user-configurable while also providing a common set of elements that can be used by any number of end-users and user groups/roles. Within each portal are modules that assist in performing a necessary function. Further, these functions are available in a variety of default or selectable styles. The styles can be represented through buttons, widgets, or detail views. The final mile of flexibility allows for data to be seen in a text-based, glyph-based, or chart-based formats.

PIIM utilizes a proprietary design process that we refer to as: Visualization Driven Rapid Prototyping With this method visuals are created of intended scenarios based upon requirements and deliverables objectives. As opposed to achieving functionality and and providing demonstrations through incremental stages, as is a common approach, PIIM builds storyboards and tight visual demonstrations at the very beginning of an endeavor. This allows all stakeholders to see, immediately, what the technology would ultimately generate. The feedback improves the design cycles, updates the requirements if necessary, and permits another visualization stage. The process is faster, engaging, productive, and directive toward shared goals. HealthBoard is being designed under such protocols.

The interface had to have a short "ramp-up" in terms of usability and a long "ramp-down" in terms of usefulness and utility. usability and ease of data entry was critical—the objective was to assist in generating real positive health outcomes. These outcomes were realized as a use of tracking data; PIIM had to turn a chore into a beneficial, and rewarding habit.

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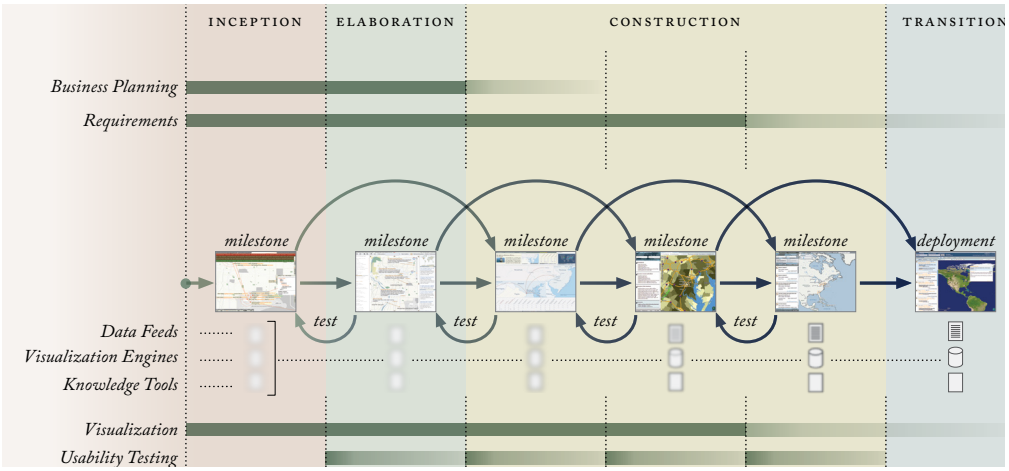

PIIM utilizes a proprietary method for its programs and research areas—the Visualization Driven Rapid Prototyping (VDRP) method. This innovatively integrates graphic user interface, user experience design, technology, and systems development.

PIIM CAPABILITY

The Parsons Institute for Information Mapping, builds knowledge tools that permit actionable insight from the use of interactive visual displays. We work at two levels: practical engagement on soon-to-be released projects; and, modeling future tool scenarios and theoretical efforts toward "next-next deployment." *(Example to the right)* Co-founded by Former Senator Robert Kerrey (D-NE) and Professor William Bevington, the Parsons Institute for Information Mapping (PIIM) is a one-of-a-kind university research and real-world development facility within The New School. Our primary mission is to support decision makers in their quest to rapidly understand, analyze, and react to large amounts of complex data. Christopher Goranson is the current director of PIIM, Jihoon Kang is the project lead on the HealthBoard tool.

PIIM's objective is to improve the comprehension and usability of complex and extensive data through innovative and intuitive applications. Our goal is to address society's urgent need to convert extensive or mathematically incomplete sets of data into visual patterns that render useful, actionable information—through the ideal marriage of design and technology. We either leverage our full engineering capability to realize our client's goals, or, we build the front-ends and information architecture to support our clients engineering expertise.

ACKNOWLEDGEMENT

This work is/was supported by the Telemedicine and Advanced Technology Research Center (TATRC) at the U.S. Army Medical Research and Materiel Command (USAMRMC) through award W81XWH1120183.

Case study: Delta web is a prototype for an application that uses two taxonomies (one taxonomy categorizes by type of visual, the other by type of information). The tool will permit rapid navigation through earth imagery, symbols, quantities, and visual relationships.

SELECTED CLIENTS AND PARTNERS

- *Centers for Disease Control and Prevention (CDC)*
- *Columbia University*
- *Dow Jones & Company, Inc.*
- *ESRI (Environmental Systems Research Institute)*
- *National Commission on Quality Long-term Care*
- *National Geospatial-Intelligence Agency*
- *Raytheon Company*
- *Siemens Corporate Research*
- *Telemedicine and Advanced Technology Research Center (TATRC), Department of Defense (DoD)*
- *United Nations Development Programme*
- *Veterans Health Administration*