

# Formative Development of a Web-based Diabetes Medication Adherence Dashboard

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*Diabetes affects millions of people. Care management outcomes are often suboptimal, with gaps in many aspects of management, in part because of minimal facetime with providers. Can technology help?*

In the U.S., over 24 million people are affected by diabetes. Understanding of ideal patient and provider diabetes management practices has significantly improved; however, optimal diabetes care behaviors are often not achieved in real-world clinical experiences as a result of personal, environmental, and sociotechnical barriers.

Two such barriers to patient self-management and regimen adherence are inefficient communication and lack of clinical “facetime.” Technology may be able to help address these deficiencies in care. Web-based patient dashboards, with management, information, and education resources may help, yet for diabetes care generally, and medication adherence specifically, these tools have remained unexplored. This presentation describes the development process, system components and resources; and discusses the formative evaluation, implications, and future work.

**Goal.** Increase effective patient management of diabetes

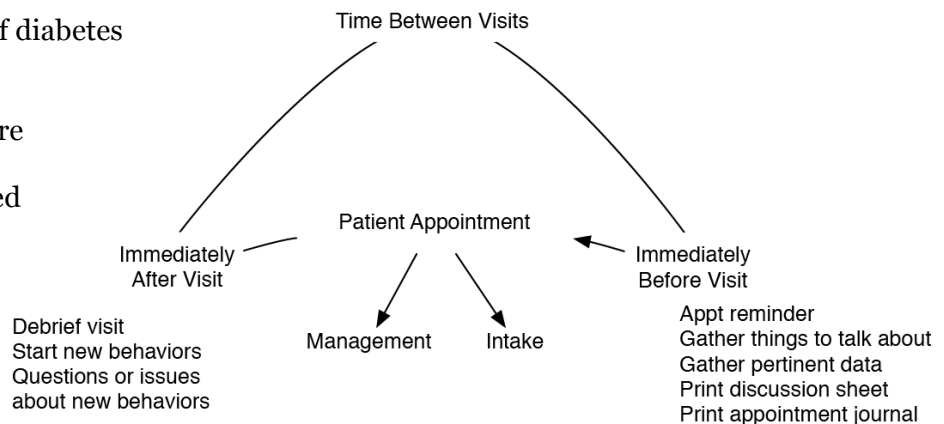
## Specific Outcome Objectives.

1. to help patients schedule, remember, prepare for, and document healthcare visits
2. to help patients implement doctor prescribed health care behaviors between visits

**Approach.** Diabetes is a complex problem, and management of diabetes even more so, involving, as it does, clinical, personal, and social decision-making and behavioral change. As such, solutions need to come from many different directions, supporting many different patient needs. The target of our research is to understand how web-based tools can make the patient-provider interaction, and the various stages of a patient appointment cycle, as effective as possible given the sociotechnical and structural limitations on actual “facetime.” Therefore we sought to develop and evaluate research-based, theory-grounded diabetes management tools, including a patient dashboard and related educational and performance support tools, to improve diabetes patient understanding, self-management, and provider communication throughout the diabetes patient appointment cycle.

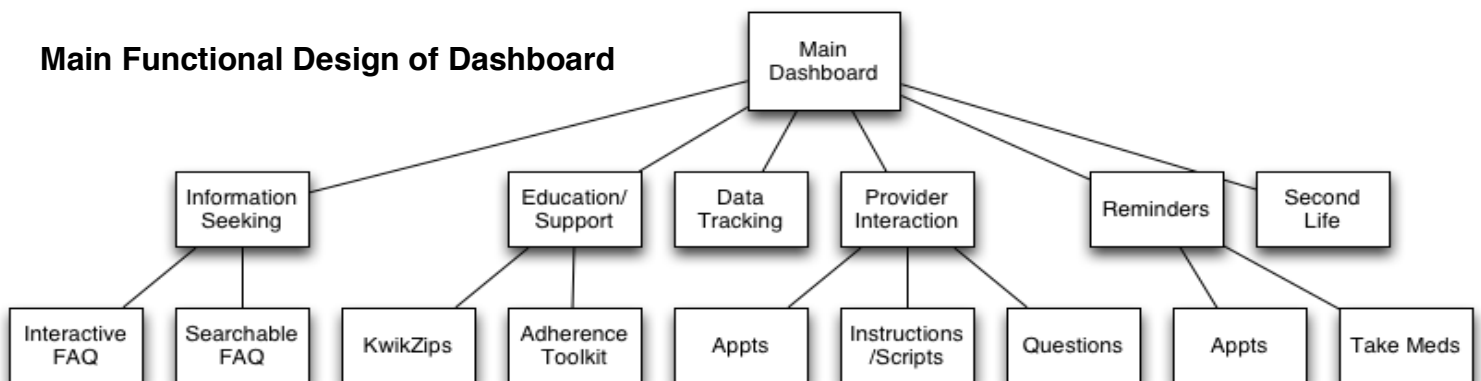
**Methods.** Dashboard and supporting resource development occurred through a well-established, iterative, user-centered process, with input and ongoing formative review by a panel of experienced subject-matter experts, high performing practitioners, and, through using single subject usability sessions, diabetes patients.

**Results.** We designed a pilot EMR-integratable dashboard, patient self-assessment/self-management tools, and self-tailorable, adaptive, learning resources ranging from an interactive FAQ, to animated segments, to video cases. As shown in the figure below, the pilot system was designed to multiple, diverse aspects of supporting patients.



## Supporting Diabetes Patients throughout the Appointment Cycle

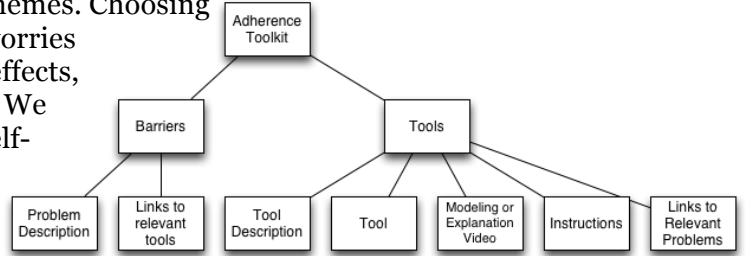
## Main Functional Design of Dashboard



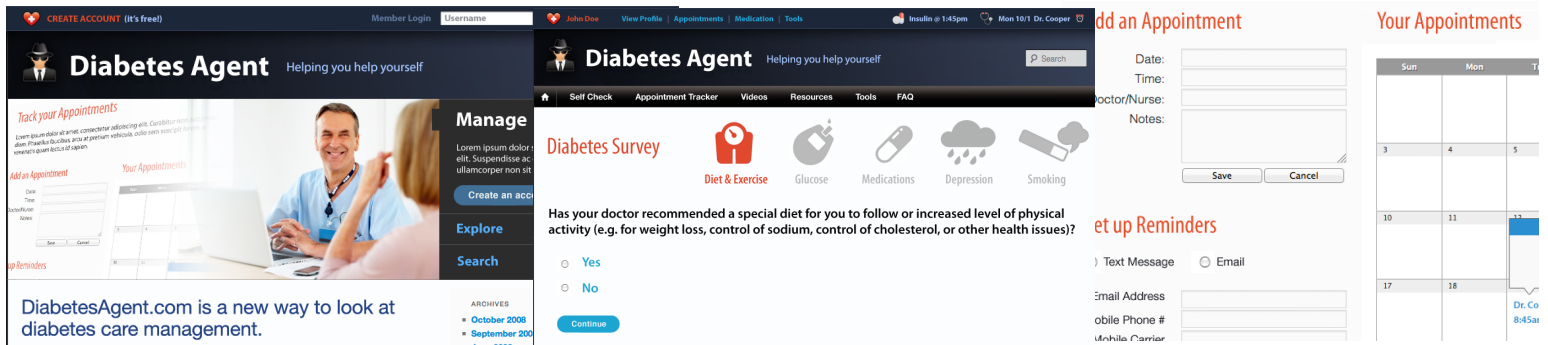
**Key Medication Adherence Barriers**  
 Patient forgets....  
 Patient chooses not to...  
 Patient does not have...

Because our emphasis was on medication adherence, although not to the complete exclusion of other key diabetes areas (i.e. diet and exercise), considerable effort was put into designing a medication adherence toolkit. Based on research by Marrero, we identified key patient barriers to medication adherence. These barriers clustered around several key themes. Choosing not to, for example, includes worries about side effects, actual side effects,

and perceptions that the medication(s) may not be necessary. We then developed resources to address each barrier, created a self-assessment survey to help patients identify areas that may be of concern, and developed the architecture to deliver the content via a CMS-based website.



We then built out limited prototypes of several of the sections, including the main dashboard, the survey, and toolkit.



We investigated use among a sample of patients diagnosed with Type 1 Diabetes (Type 2 patients were not included in this sample as their medication issues are generally different from those of Type 1 patients). Results of the usability field-testing indicate that such a system is usable and may be worthwhile. In particular, most participants strongly agreed they would use the system before and/or after their next clinical appointment and that they would use the medication adherence toolkit tools. Those who indicated a previous problem with adherence were particularly likely to ascribe value to the toolkit and to have accessed particular toolkit components either through self-exploration or through the guided self-assessment diabetes management survey tool.

**Discussion.** Diabetes management and medication adherence is a recalcitrant problem. This effort demonstrated that a diabetes dashboard could mitigate some barriers for some patients, potentially leading to better care outcomes. Several challenges arose during implementation, including issues related to integrating with an existing EMR (primarily policy issues versus technical ones), issues with provider willingness to be involved in program components, and more typical problems associated with designing support tools for complex interpersonal behaviors. Moreover, there are several quite significant limitations to the evaluation to date. Most importantly, it does not include any ecologically valid measures of diabetes management and/or medication adherence, relying instead on self-report.

### Conclusions and Next Steps.

Based on our initial research, there appears to be significant merit to systems that not only provide patients access to medical records, such as PMRs, but that alternatively, or ideally also, provide support to patients for the behaviors they are expected to engage in during and between the face-to-face patient-provider interaction. That is, how can technology be used to make those face-to-face encounters more effective, from activating a patient prior to a visit, to debriefing an appointment, to supporting patients (and patient-provider communication) between appointments? Our effort shows that such support is possible, albeit complex. Some of the most significant challenges perhaps rest on making the systems useful and usable in a way that does not generate near-term extinguishing of initial adoption. Useful, engaging, *on an ongoing basis* versus perceived immediate utility but no ongoing use. Next steps include refining the system based on formative evaluation, extending it to include non-piloted functionality, and evaluating the system in a longitudinal field trial with ecologically valid measures of diabetes management.

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