

User Profiles and Personas in Consumer Health Technologies

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Abstract

Consumer health technologies (CHT) are considered important catalysts for what some are calling the “dawn of a new era – the age of the empowered health consumer” [1]. To develop effective systems, we must reach the level of personal connection to capture the essence of user groups and their issues. User profiles and personas can be used to help the development team to mentally visualize and communicate how intended users of CHT’s will interact with the proposed design in a meaningful way. We use an action research approach to call attention to important health related characteristics for CHT user profiles and personas, provide persona and profile artifacts for chronic diabetics, and illustrate the process and benefit of these tools in requirements generation, design, and implementation planning.

1. Introduction

We are in an age where consumers are increasingly using electronic media to manage many aspects of their lives, including their health. Consumer health technologies (CHT) are considered important catalysts for what some are calling the “dawn of a new era – the age of the empowered health consumer” [1]. The growth of the sub domain of consumer health informatics is primarily due to advances in technology and changes in the medical care environment, specifically the shift toward increasing patient empowerment and engagement in setting their health care agenda. The implications of innovations are great for prevention and awareness, as well as equipping the chronically ill with the tools and resources for effective self-management. For these tools to fulfill their intended purposes, they must not only be functional, but usable. Usability refers to “the effectiveness, efficiency, and satisfaction with which specified users can achieve specified goals in particular environment” [2]. In 1998, Roberts, Berry, Isensee, and Mullaly indicated [3] that usability of a solution depends 10% on the visual aspect of the product (the “look”), 30% on how a user interacts with the product (the “feel”), and

an enormous 60% on meeting and exceeding the user’s mental model. The user’s mental model construct is still considered a strong, useful tenet in Human-Computer Interaction (HCI) literature, though construct specifics may not be precise [4]. The user’s mental model is generally comprised of their expectations, prior experience, and anticipated behavior. Therefore, understanding who the intended CHT users are—not just their demographics, but also how they think, feel, and behave—is critical to the success of the consumer health informatics and, ultimately, to the return on investment.

Traditional Information System (IS) development adopts a systematic approach for conducting analysis, design, and testing, without necessarily using a specific user model. A characteristic of the traditional IS design methodology is that it typically limits user participation to a consultative role, where the bulk of the design decisions are made by the IS designers and/or developers [5, 6]. In fact, systems designers /developers can potentially “ground” themselves (“a human natural behavior of finding a known reference point in a foreign information space,” as described by the psychologists), and run the risk of designing an interface for themselves, rather than the user groups. Research and practice of end-user computing in IS development have emphasized the importance of end-user participation and involvement (e.g., [7]), but have not given much attention to formalized mental models of users.

User-Centered Design (UCD) is a modern HCI design philosophy and a multi-stage problem solving process, in which the needs, desires, and limitations of the end users of an interface are inquired and analyzed, and assumptions of the user behavior are transferred into the prototypes and tested. UCD techniques such as user profile and user persona are structured ways of typifying a group of users in text and pictorial formats (i.e., conceptually modeling the end users). Researchers claim profiles and personas can be very beneficial in: preventing designers from grounding themselves; conceptualizing users’ mental models; and helping the development team to mentally visualize and communicate how intended users will interact with the proposed design in a

meaningful way [8, 9]. Profiles and personas can be used as part of an entire UCD methodology or to enhance current processes by introducing user-centered thinking into whatever design and development process is being used [10]. The use of user profiles and personas has not received a lot of attention in health care informatics research and, in particular, research involving CHT. The purpose of this work is to begin to fill this void in three ways. We use an action research approach [11] to: (1) call attention to how to further enhance and complement traditional user profile and persona techniques for CHT design by integrating cognitive structures and present behavior that drive health care thinking, future behavior, and demand; (2) develop user profiles and personas for a specific population with a demanding health care need, self-management of chronic diabetes, with the hope that the resulting profile and persona may be used as foundational material for those considering the design, development, and evaluation of CHT aimed at helping a similar population; (3) show how the profile and persona are being used to influence requirements, design, and implementation decisions for a technology aimed at facilitating diabetes self-management.

2. Background

CHT have met with mixed success regarding usability and consumer satisfaction. Fogg recounts the study of 72 consumer health applications in the early millennium that were not effective in motivating people to move towards more positive health care behaviors [12]. Disappointing results were attributed to limited, if any, persuasive design considerations and kairos limitations (i.e., technology intervention at the “right” opportune time). Understanding users’ conceptual models is integral to many aspects of developing a persuasive design to motivate change and/or compliance and recognize opportune moments for technology intervention. CHT are more than just convenient tools; they actually tap into health care values and behaviors. Understanding users is a precursor to appropriate requirements, system usefulness, information quality, and interface quality; all are paramount to success.

UCD is especially useful in addressing the aforementioned concerns [13, 14]. Basic tenets of the UCD process include: (1) placing the user at the center of the design, (2) focusing early on users and their tasks, (3) measuring usability empirically, and (4) designing iteratively, whereby a product is designed, evaluated, and modified with real users

repeatedly in quick iterations. User profile and persona are conceptual models of targeted user group(s) that can serve to promote the shared understanding that underpins UCD throughout development and implementation.

2.1 Models in IS

Models are not new to the IS systems analysis and design process. Some traditional and widely used forms of modeling, such as the various Uniform Modeling Language (UML) diagrams, are utilized extensively in the development of information systems. Studies have found these models helpful in enabling developers and system stakeholders to visualize data processing and interaction between the system and outside entities (e.g., [15, 16]). These models semantically represent the structure and behavior of the system, but they do not embody the user’s mental model. A mental model is an individualized conception of how the world works and the way it is structured. In contrast, a conceptual model is a synergized representation: designers /developers tap into users’ mental models (i.e., systems analysis) to create a user conceptual model; then, they use the user conceptual model to create an application or provide a solution; finally, the conceptual model is surfaced to users via the interface (i.e., system design) [17].

Requirement gathering has been particularly problematic in traditional systems analysis and design methodologies, as it does not seem to reach the level of personal connection needed to capture the essence of user groups. Past studies indicate that a lack of shared understanding of and communications with end user groups are among the major problems of the requirements gathering process (e.g., [18, 19]). Shared understanding refers to the communication among multiple individuals on the same topic in a manner such that all individuals leave the communication session with the same understanding of the topic under discussion. Freeman emphasized the importance of a shared understanding among users and systems analysts (who may come from distinct backgrounds, experiences, perceptions, and styles) [20]. Previous studies have argued that conceptualizations of users’ mental models could be used effectively and successfully to create a shared understanding among multiple individuals over a single topic or domain and thus a better system (e.g., [20]). As aggregated conceptual models, user profiles and personas should facilitate shared understanding in project communications by creating a “mutually understood context.”

A user profile is a dynamic repository used to categorize, characterize, and prioritize a system’s

target user groups, sub user groups, and uses (applications) of the system. User profiles are often represented as a table of descriptors, e.g., "male, average age 45-50, intermediate-level computer user, etc." User profiles help the crafters of the systems focus on the users by serving many functions, for example, the basis for identifying user tasks and capabilities, which impact requirements and conceptual models. A persona is a fictional and supertypical characterization of a user created to represent a user group. It is a profile that comes to life, e.g., "Marty is a school teacher who uses his home computer to shop. His two kids fight over internet use..." The development team creates this supertypical user as a symbiosis of the real users they have observed and interviewed for each significant user group. Personas often include a name, photo, likes and dislikes, habits, background and expectations, and other information needed to provide dimension. Most importantly, personas explicitly highlight key goals for the user. The primary advantage of the multi-dimensional persona is to help the development team identify with the user, communicate effectively with the users, and constantly remind them to design for the users' needs. In a study of how to design effective tools to aid software developers, personas were found to be a helpful technique, with many resulting benefits, in closing the gap between a software engineering tool's functionalities and the intended users' tasks and experiences [9].

User profiles and personas are more than end products of the requirements elicitation effort; they can and should directly impact functional models and design/prototyping. Requirements and functional models portray the "*what*" and profiles and personas inspire the "*how*." Hence, with requirements, user profiles and personas become the hub of the analysis and design process.

2.2 Design Context–Diabetic Elderly in China

A CHT design to help elderly diabetics in China self manage was selected as our instantiation context to construct user profiles and personas, which were used in the design, development, and implementation process. The total number of people with diabetes in the world is projected to grow from 171 million in 2000 to 366 million in 2030 [21]. Diabetes is increasing significantly throughout the world, and the problem is especially severe in China. The world's most populous country is expected to soon become the nation with the largest number of individuals affected with diabetes [22]. This situation is particularly acute for the growing aged Chinese

population for whom diabetes is a costly, chronic condition and a major cause of disability. Diabetic prevalence tends to increases with age [23]. Currently, there are 130 million Chinese over the age of 60. By 2030, the number of elderly is estimated to be 336 million [24].

Recent studies attribute the burden of diabetes complications to poor patient practices of self-management and limited knowledge of the clinical complexities of diabetes. Patients' active involvement in their medical care protocol is considered one of the most challenging tasks for people with chronic illness [25]. Thus, CHT that can effectively assist with self-management activities have the potential for major impact at an individual and even countrywide level.

3. Methods for Qualitative and Quantitative Analysis

We use an on-going project involving the design and development of a smart phone application to facilitate self-management to call attention to key areas where the profiles and personas can be used. Our multidisciplinary research team is composed of four core team members (two Americans and two foreign-born American residents). In addition to one native Chinese, two American researchers have previously spent extended periods of time conducting field study in China (one providing medical care to Chinese elderly diabetics). The other member grew up in Italy and has close to no previous exposure to Chinese culture, in general, and Chinese elderly, in particular. Only one member of the team self manages a chronic disease.

The smart phone tool, *Chinese Aged Diabetic Assistant* (CADA), will be used to provide a self-monitoring tool for things such as the diet and exercise habits of elderly diabetics. The second goal of CADA is to increase the knowledge regarding diabetes and healthy living among the population under investigation. UCD methodology, and in particular user profiles and personas, are guiding the design and development of culturally and age appropriate tools for the target population through interactive prototype iterations.

A typical user profile contains system-relevant characteristics for each user group, such as: (1) users' prior knowledge and experience (e.g., web site search proficiency), (2) physical characteristics (e.g., mobile or stationery computer user), (3) cognitive characteristics (e.g., preferred learning style), (4) social and physical environment (e.g., working in

isolation, distraction level), and (5) job, task, and requirements (e.g., key tasks for system) [26].

User personas draw from these characteristics to create a more fully developed characterization of the targeted user group(s). Though the aforementioned characteristics may work for a number of types of technologies, they do not necessarily provide a sufficient representation to characterize the health care consumers. Traditional user profiles and personas do not attend to or recognize the psychological/psycho-social forces within people and their impact on health care choices and outcomes. Thus, they fail to recognize research indicating that cognitive and behavioral patterns of perception and action can affect both short-term and long-term success with interventions directed toward managing a disease or adopting wellness [27]. In response, we expand traditional profiles and personas to include characteristics based on past research that provide insight into current health care behaviors and cognitive patterns of perception including [27]:

- Level of health care information seeking (active learning)
- Propensity to avoid health care (care seeking/outcome expectancy)
- Trust in medical professionals (outcome expectancy)
- Physical activity level
- Level of involvement in health care decision making (locus of control)
- Care support infrastructure (spouse, family, doctor, friends)
- Perceived challenges to self-management
- Self-management capabilities (overcome barriers, suitable methods, achieve goals, obtaining support, coping)
- Current level of compliance
- Self-efficacy to provide self care
- Involvement in family health (motivation/risk perception)
- Level of being health proactive (self regulation/self efficacy)
- Health price concern (resource allocation)
- Health quality concern (outcome expectancy)

There are multiple potential sources of qualitative and quantitative data that can be used to support generating user profiles and personas. Initial literature review did not provide the depth of knowledge we felt was needed to serve the development of the CADA application (in particular, user profiles, personas, and requirements). Thus, qualitative research activities (i.e., in-depth interviews, focus groups, and direct observation) and

quantitative activity (i.e., survey) were conducted in China between June 2008 and April 2009.

We conducted nine focus groups with diabetes elderly (55 – 80 yrs old) patients in various geographic locations. We also interviewed 21 physicians and 9 nurses from various health facilities. Over 20 hours of field observations of clinical interactions between patients and providers, as well as between patients and designated diabetes educators, were also part of the broader study.

It became evident during data collection that patients differed in their health beliefs and personal role in health care. The adoption and impending diffusion of this system is potentially challenged by some belief structures alluded to in qualitative data collection (e.g., “I am too old, it does not matter...”) and supported by others (e.g., “This would be helpful!”).

We also conducted a patient survey with the help of Department of Geriatrics at Peking University First Hospital and Sichuan University Huaxi Hospital. Some of the measures used to complement our qualitative analysis related to psycho-social health care beliefs and attitudes, diabetes self-management assessment (e.g., capabilities, lifestyle), current diabetes self-care efforts, physical ability, technology assessment, and demographics. All scales used were previously validated.

4. Profile and Persona Results

Recordings of the focus groups and interviews were transcribed and then translated from Mandarin Chinese into English by a group of bilingual researchers with medical training, who were familiar with this study. The transcripts were reviewed and coded independently by two culturally aware lead researchers, who then collaborated to reach consensus on profile and persona attributes. A total of 323 patient survey responses were obtained from urban and rural areas near Beijing and Chengdu.

It is important to recognize that user profile and persona work is not restricted to primary users of technology. In fact, analysis may help to reveal users not previously identified, resulting in previously unknown system requirements. The data gathering process for the present study revealed there were actually multiple secondary user groups of CADA. We provide a listing of these user groups below, briefly highlight their CADA role (as depicted in their respective profiles or personas), and provide examples of resulting influences on system requirements, design, and implementation.

User Groups	Characteristics	CADA Influence on:
Physicians	Currently lack diabetes patient trend data; Most do not have extensive specialized training on diabetes care; Enthusiastic to have tool to help.	Functionality: Share patient education data. Provide way to link patient logs. Implementation: can serve as a conduit for CADA adoption and diffusion.
Patient Educators	Interested in sharing their knowledge of diabetes and experiences in diabetes self-management with other patients yet are limited by current resources; migrate to various health facilities.	Design: would welcome CADA as a portable, mobile educational tool and also suggested television output to serve this purpose.
Supportive caregivers and friends	Want to participate in the care of their loved one may use the phone with the patients.	Functionality: Consider "buddy" options.
Hospital Administrators	Oversee the diabetes education and outreach programs; Have limited current tools and resources	Implementation: Integrate CADA into existing educational and support group classes

We restrict in-depth discussion in the rest of this manuscript to the primary user groups, diabetic patients, in the interest of manuscript length.

The focus groups, interviews, and survey illuminated common traits as well as contextual differences in perceptions, beliefs, and possibilities among the elderly diabetics. Common traits, detailed in the resulting profiles and personas included:

- Empty nesters
- Good at self-initiating follow-up doctor visits
- Understand the need to adjust lifestyle (i.e., diet, exercise) to manage diabetes
- Environment of system use: hospital, home, and community centers
- Diabetes management is a hassle (28 on a scale of 40 with 40 being "no problem")
- Co-morbidities
- Potential for system use - peak after diagnosis and when diabetes educational outreach not readily available
- Wish for better health care quality of community hospitals; hope there are more health specific community resources to utilize

The common traits are being used as a unifying theme in CADA development.

In addition, we found several differences between urban and rural patients in cognitive and behavioral patterns of perception and action through both qualitative and quantitative data analysis. Given the potential implications on system functionality,

design, implementation, and adoption motivators, patient users were segmented into urban and rural sub user groups. Excerpts highlighting differences from the resulting urban and rural user profiles and personas subgroups are provided in Appendices A and B (full analyses can be obtained from the authors).

Most urban patients were diagnosed during a hospital visit and/or stay for other illnesses (like cardiovascular disease) or at annual physical exam. The urban population seems more likely to test blood glucose levels at home using a glucose meter. About half of the urban patients own mobile phones (about 1/3 use short messages and PCs; about 2/3 carry mobile phone for family to reach them and to make emergency calls). They see their doctors for diabetes care on a regular basis. Overall, urban elderly are excited about CADA (assuming it is well designed - easy to use and useful in helping their self-management). Urban users are willing to invest in purchasing CADA, even if it is somewhat expensive.

On the other hand, rural patients generally only see a doctor when serious complications appear and become troublesome. They tend to have more misconceptions about diabetes than urban patients. The rural patients seem more likely to assess their blood glucose level using personal feelings and symptoms than the urban patients. Ownership of a cell phone is somewhat lower than urban to non-existent. Overall, rural elderly consider themselves "old" and are more hesitant about learning new technology. They indicate more acceptance of CADA if it can connect to a television set.

From a health value and attitude perspective, the most predominant group of urban patients can be described as avid information seekers of information on health treatment, price, nutrition, and healthy diet. They are price sensitive regarding health care, but not price prohibitive. They tend to be decision makers for the family (self and spouse) regarding health care. The urban patients are usually proactive and pay attention to preventive care. In contrast, the most predominant group of rural patients can be described as reactive dependents, who count on close ones for health care decisions for themselves. They often live an inactive lifestyle and exhibit high trust in health care providers.

Analysis of Variance (ANOVA) was used to compare urban and rural patients' survey responses. No statistical significance (at $p>.05$) was found regarding how groups assessed their individual capabilities, perceived barriers to diabetes self-management, inference on lifestyle, and severity. However, urban elderly patients exhibited statistically significant higher capability in (1) overall

diabetes self-management, (2) overcoming barriers in self-management, (3) determining suitable methods, (4) achieving goals, (5) obtaining support, (6) coping, and (7) treatment adherence. Urban patients also had significant higher social support, who exhibited more positive behaviors in providing support.

5. User Profiles and Personas in Action

Insight into these two primary patient user groups is being used to design the CADA smart phone application prototype. All team members, including developers, were “introduced” to the patient user personas (Appendix B) and their related profiles (Appendix A). The personas and profiles offered the team an early familiarity and grasp of the target user groups by painting them a “word picture.” The personas and profiles were especially helpful in resolving group conflict. Specifically, debate about different design options was often arbitrated using a patient persona conceptual model. In such a debate, a team member would say, “What would Shufen think? Which option do you think that Shufen would like?” (see Shufen’s persona in Appendix B). This conscious effort reminded us to leave out personal preferences and channel our compassion to truly design for the users by “walking in their shoes.”

Profiles and personas also inspired CADA prototype functional requirements, design, and considerations for implementation (adoption and diffusion) in various ways. The following sections highlight some of these influences that either added to or extended initial thoughts about the system.

5.1 Influence on Functional Requirements

Given the common situation of co-morbidities (e.g., cardiovascular diseases, retinopathy) with both urban and rural populations, CADA functionality includes a daily “symptom report” that checks for symptoms indicative of potential co-morbidities. In addition, educational features will include co-morbidity education. Future versions of CADA should more expansively address management of common co-morbidities.

Logging, particularly for diet, scored high as a hassle for both urban and rural patients in survey responses (this was echoed in focus groups and interview comments). Dietary compliance was not at an ideal level for either subgroup. Some compliance issues actually seemed to be related to misconceptions about food choices (e.g., congee/porridge) and tracking food quantities. In response, CADA functionality includes dietary logging functionality that minimizes user input and also

provides feedback and education on good dietary practices. The use of smart phone mobile technology enhances the kairos factor of opportune timeliness by making an efficient logging system potentially available with every meal [12].

The educational component of CADA needs to be delivered in “doses” of up-to-date and accurate information that could be suited to situational preference based on time or avoiding “information overload” issues. In addition, educational content remedy misconceptions held by rural patients as well as support urban patients’ more active information-seeking habits. The importance of various aspects of treatment adherence will be emphasized in the education features. Active information seeking can be supported by a modular approach and updates. This approach accommodates targeting basic and critical knowledge for those who do not want to go further, as well as broader coverage through expansion options provided by additional modules.

5.2 Influence on Design

Patient input options include voice, input touch screen, and limited handwriting due to physical and language keyboard challenges for both rural and urban patients. Icons and characters are used instead of text wherever possible.

Our targeted users are mostly empty nesters; the personal support they received is often limited to their spouses, co-resided caregivers, and health care providers. Rural patients received significantly lower social support (particularly of the positive, encouraging nature) than urban patients from their personal network. CADA pays particular attention to delivering positive reinforcing feedback messages to encourage its users to pursue health behaviors.

Neither urban nor rural patients fully appreciate adherence and the role of logging/monitoring (See Appendix A – Current Practices in Managing). Thus, the system must be engaging to draw the patients into learning and regularly monitoring. Our targeted users, especially urban patients, desire assistance to make diabetes self-management more convenient and fun. As a result, we are using the entertainment value of games for routine entry and education to lure patients into these compliance tasks. Gaming draws on the persuasive technology design principle of liking and attractiveness [12]. A variety of games have been successfully implemented in diabetes education and self-management (e.g., [28]). Video games are found to empower elderly people in addressing their cognitive, social, and health care needs [29].

5.3 Influence on Implementation & Diffusion

Both urban and rural patients indicated high trust in health care providers and at the same time, they hope for more and individualized attention from the providers. Providers indicated support for a tool that can help them extend their stretched services. Thus, system distribution, diffusion, and training may be best addressed using medical providers as conduits.

Urban patients have greater capacity and skills to use smart phone technologies than rural patients. Thus, the level and extent of their training can be reduced. However, urban patients need to be "sold" on the quality of CADA as an information resource since they currently have access to many information sources, many of which have incomplete or inaccurate information that they have to screen through. Medical providers, particularly nurse educators, can use the smart phone as a mobile teaching tool (one-on-one or for a small group if television output is available).

Rural patients lack the resources that their urban counterpart has to be aware of and learn about diabetes. In some ways this may be advantage as more centralized and standardized training can be provided by a mobile provider in a group setting (especially if television output is available).

Elderly patients have limited income, although urban patients may have stable pension, however, increasing health care cost may consume a large portion of that. Although in China elder parents are often taken care of financially by their children, purchasing and maintenance costs are a primary concern of the users. They or their family and friends are willing to make one time expensive investment to purchase CADA, if the providers deem it worthwhile. However, unanimously they demand updated information with no or close-to-none extra cost.

6. Conclusions

The adoption of user profiles and personas may arguably enhance CHT design and development performance in three complementary ways: (1) empathy with users, (2) social richness by enhancing communication through text and visual cues in the profile and persona, and (3) social integration supporting free flowing conversation [30, 31]. We found all three to be true in the case of the CADA project. Enhanced richness in understanding diabetic patients and their context was achieved by expanding traditional profile and persona content to include psycho-social health care beliefs and attitudes and other health care behavioral considerations. The resulting user models can be used in future research

by others who are interested in designing CHT for populations that are similar or related to ours. In general, the techniques used in this study can serve as a guide for bringing conceptual user modeling into the design of user interfaces targeted for specific health care communities. Further study is needed to empirically assess the value as well as other benefits user profile and persona may have in analysis and design of CHT.

7. References

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Appendix A – User Profile Rows Highlighting Contrast Between groups

Characteristic	"Urban"	"Rural "
Existing Computer/Internet Skills and Experience	All over the board from low to high	Non-existence to low
Educational Level, Intellectual Abilities, Skills of the User	All over the board from some high school to high school and college graduates.	All over the board from some functionally illiterate to high school and college graduates
General Attitude Toward Technology	Favorable.	From unfavorable to conservative.

Characteristic	"Urban"	"Rural "
Ownership and Use of Mobile Technology	Urban own mobile phones (1/3 use short messages & PCs; 2/3 carry mobile phone for family to reach them and to make emergency calls).	Ownership of the cell phone is lower in rural areas.
Learning Style	Mentioned games. Prefers icons and Chinese symbolic characters to text.	Mentioned games. Do not want the language to be "doctor" language.
Attitude toward CADA	Overall, urban elderly are excited about CADA, if simple and straight forward to use and actually effective in helping their self-management; willing to invest even if it's a little bit more expensive.	More accepting to CADA if connects to a television set.
Means Used Concurrently to Find out about Diabetes	Alternative resources: <ul style="list-style-type: none"> - Face-to-face with providers - Health seminars - TV/Radio - Print publications (newspaper, magazines, books, brochures) - Internet - Personal network. 	Alternative resources: <ul style="list-style-type: none"> - Face-to-face with providers - TV/Radio - Personal network.
Knowledge of Application Domain (Knowledge of diabetes)	All over the board from low to high.	Non-existence to low. They tend to have more misconceptions about diabetes than urban patients.
Current practices in managing	- Urban population seems more likely to test blood glucose level using a glucose meter - Most take long walks each day - Some participate in outdoor group exercises -Treatment adherence, 16.15 on summative scale with a maximum of 20.	- Rural population seems more likely to assess blood glucose level using personal feelings and symptoms - Some take long walks each day, though others live inactive lifestyles. -Treatment adherence, 13.67 on summative scale with a maximum of 20.
Attitude toward Providers	Good at self-initiating follow-up doctor visits; go to clinic if have questions.	Most trust and listen to doctors completely; generally only see doctors when there are serious complications.
Health Beliefs (<i>determined by using profile cluster analysis of survey data related to health beliefs</i>)	The most predominant group of urban patients can be described as avid information seeker for information on health treatment, price, nutrition, and healthy diet. They are price sensitive regarding health care, but not price prohibitive. They tend to be decision makers for the family (self and spouse) regarding health care. The urban patients are usually proactive and pay attention to preventive care.	The most predominant group of rural patients can be described as reactive dependent who count on close ones for health care decision for themselves. Exhibit high trust in health care providers. Rural patients are more reactive and generally only see doctors when there are serious complications.
Caregivers/ Support Network (spouse, other family members, friends, doctor)	Good family support (e.g., spouses especially wives help monitor diet and exercise); most come to clinics with spouses, children, or other caregivers. Evaluation of support system 3.87 (mean of reflective items) on a 5-point scale. Also indicated high positive reinforcement, 4.06 (mean of reflective items) on 5-point scale.	Lesser level of support network. Evaluation of support system 3.14 (mean of reflective items) on a 5-point scale. Also indicated less positive reinforcement, 3.53 (mean of reflective items) on 5-point scale.
Diabetes Detection and Diagnosis	Most diagnosed during hospital visit/stay for other illnesses like cardiovascular diseases or at annual physical exam.	Not diagnosed until they notice typical symptoms or had complications, for example, major eye problem.

Appendix B – Sample Personas

Rural Patient

personal profile

Ms. Qi is a 68-yr old grandma lives in a farming village in Sichuan Province in southwest China. Her three grown children all moved away to work in big cities. Ms. Qi and her husband have been raising their granddaughter since she was a little baby. Ms. Qi was diagnosed with diabetes three years ago. She had been feeling tired for a long time and had drastically lost a lot of weight before she sought care. The lab work confirmed diabetes; her blood and urine glucose levels were pretty high. In fact, the doctor told her that perhaps she might have had diabetes for several years by then.

After trying various health products, Ms. Qi's blood glucose level was still out of control. During a third hospital stay in two years, she was put on insulin. Although it took her a while to learn how to inject insulin on her own and it's troublesome to take two shots a day, Ms. Qi trusts that her doctors will prescribe the best medicine for her.

To manage her diabetes, Ms. Qi also tries to eat less. Like many older Chinese, Ms. Qi loves eating the comfort food congee for dinner. She reasons that compared to a bowl of steamed rice, a bowl of congee contains less rice. Ms. Qi cooks bitter squash dishes often and drinks a bowl of bitter squash juice everyday, since she heard from a couple of other diabetics in the village that bitter squash is good for diabetes patients.

The village clinic owns a glucose meter. However, Ms. Qi only had her glucose measured there a couple of times, because her fingers became so painful from all the piercing. Ms. Qi feels that she can tell when her glucose level is high or low by how she feels, so testing blood glucose at the clinic is kind of unnecessary and costly. Ms. Qi's daughter left them a cell phone after getting a new model. Ms. Qi was initially intimidated by the phone, but her granddaughter is helping her to become more comfortable with using the phone. Whenever she gets some free time, Ms. Qi likes watching soap operas on TV.

Shufen Qi 齐淑芬

"I want to see my granddaughter grow up and get married."



background

- Lives with her husband of 40 years and a 7-yr granddaughter
- Husband feels diabetes is just a part of getting old
- Very limited education, finished primary school, never used computer

attributes

- Unaware of the importance of monitoring of blood glucose level on a regular basis
- Trusts diabetes information she encounters blindly
- Dependent on close ones for health care decision for self
- Has a lot of misconceptions about diabetes
- Fearful of and minimal interest in technology

user needs

- Correct and trustworthy information about diabetes self-care basics
- Assistance in managing diet
- Corrections on current misconceptions
- Improve awareness of the potential seriousness of diabetes complications

Urban Patient

personal profile

Mrs. Shuxin Gao, a 63-yr retired account, lives with her husband in a comfortable 3-bedroom apartment in Beijing. With a family history of diabetes, Mrs. Gao was first diagnosed with gestational diabetes in 1974. Starting her mid 50's, Mrs. Gao tried to control her blood glucose through diet, but this did not work and she switched to oral medications. In 1998, Mrs. Gao's retina suddenly started bleeding, eventually she lost her left eye because diabetes induced glaucoma. She is now on insulin.

A few years back, many primary hospitals in Beijing started offering health seminars. Mrs. Gao likes attending the diabetes seminars. Although the seminars often present too much information each time for her to digest and remember, she enjoys making friends with other diabetes patients. Unfortunately, Mrs. Gao is not able to attend those seminars as often as she would like because commuting to the seminars takes a lot of time. Through the seminars, she has mastered the basic knowledge of diabetes and her blood glucose level are pretty much under control.

Mrs. Gao tests her blood glucose level often, at least once every three days. She learned from the seminars that she should record her glucose test results to see how she is doing over a period of time. Mrs. Gao only occasionally uses the log booklet that the glucose meter company provided, as it is such a hassle writing things down each time. Mrs. Gao knows that diet is important, but struggles with managing her diet during frequent family meals with her children and grandchildren and especially when they go out to eat. Mrs. Gao often forgets what or how much she ate hours later when she tries to write down what she ate in her log. Mrs. Gao enjoys group ribbon dancing in a nearby park every morning.

Ms. Gao carries her cell phone around so her husband who suffers hypertension can reach her easily. She likes to exchange short messages with her son who lives in Shanghai and only comes home for major holidays.

Shuxi Gao 高树新

"I want to help other diabetics."



background

- Lives with her husband of 38 years, both have stable pension
- High school graduate with an accounting certificate
- Enjoys cooking, knitting, and learning how to play poker games on computer with her husband

attributes

- Outgoing and warm hearted
- Has a clear goal in diabetes management and likes to plan ahead
- Feels empowered by diabetes knowledge she has accumulated over the years and wants to share with others
- Avid information seeker (e.g., nutrition, healthy diet)
- Decision maker for the family regarding health care

user needs

- Easy and portable way to log and track daily diet, glucose levels, and exercise.
- Better access to enjoyable diabetes education approved by her doctors.
- More time and individualized attention from her providers
- Assistance to make diabetes self-management more convenient and fun at an affordable cost