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# Homeless HealthShare: Connecting Health Professionals and the Homeless

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**Abstract**

We are developing a web-based system that helps improve the health of homeless individuals by aiding healthcare professionals in identifying, locating, and contacting homeless patients in order to initiate and continue effective healthcare. Poor health is both a significant cause and a symptom of homelessness, carrying high costs for the general public as well. Our system addresses health problems amongst the homeless by allowing healthcare professionals and other homeless service professionals from multiple organizations to better share, manage, and communicate information vital to effective healthcare.

**Keywords**

Health Management, Homeless Healthcare, Information Management

**ACM Classification Keywords**

H5.m. Information interfaces and presentation (e.g., HCI): Information Systems: User Interfaces: Graphical user interfaces (GUI).

**Introduction**

The multitude of health issues related to homelessness and health are significant and well documented in United States (U.S.). Research shows that homeless people have higher rates of health problems, typically

3-6 times that of the housed population [1]. For example, compared to the general population, homeless people are 200 times more likely to contract tuberculosis (TB), 29 times more likely to have hepatitis C, 16 times more likely to contract HIV/AIDS, and 4 times as likely to die [4]. Health problems also tend to be more severe and difficult to treat amongst the homeless [2, 8, 9]. An estimated one in four homeless individuals will be hospitalized at least once during the year and 75% of these hospitalizations are for preventable diseases [3]. Much of this treatment occurs in the emergency room, which is costly to the public in terms of tax dollars [3, 8]. One reason for this cost is the fact that the homeless tend to ignore their health until conditions worsen, requiring emergency treatment [8]. Moreover, emergency care is not very effective in the long-term, and approximately 40% of homeless people discharged from the hospital end up back in the emergency room, often with the same illness [3]. Conditions not treated properly can also become a public health issue, such as TB outbreaks [8]. Finally, poor health has been cited as a frequent cause of homelessness and a significant barrier to transitioning out of homelessness [1, 9]. Thus, poor health is both a cause and symptom of homelessness, carrying high health and financial costs for the homeless and the general public as well.

While the need for emergency care is often unavoidable, continuous primary care is critical for effective long-term healthcare. Unfortunately, the homeless tend to lead transient lifestyles, making continuous care difficult to sustain [8]. In particular, healthcare professionals have trouble identifying health problems and barriers to care with homeless patients, locating patients and communicating with patients.

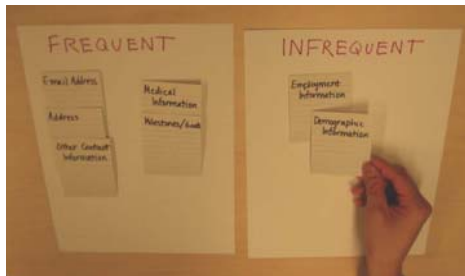
Often, this is a result of poor inter-organizational communication. Our system addresses all of these issues by sharing and aggregating information amongst professionals who already work with the homeless and obtain such information.

### **Homeless Care Professionals (HCPs)**

Although our system is ultimately intended to improve the health of the homeless, the target users of our system are various homeless care professionals (HCPs) who work directly with the homeless. HCPs fall into three main groups: (i) primary and emergency healthcare (e.g. health clinics, hospitals), (ii) health-oriented case management (e.g. substance abuse, mental health), and (iii) non health-oriented homeless services (e.g. housing). The reason we chose to target people who work with the homeless is that working directly with the homeless proved difficult and these groups were already trained to work with this population. Together, HCPs form an important network which can obtain and share health information.

Our research showed that a homeless individual typically frequently utilizes multiple health and non-health oriented services [10]. However, a major problem is that the homeless often do not consistently utilize health services such as primary care. Also, the patient information obtained by an organization is typically shared only within that organization.

Many HCPs use software to help manage client records. However, there are many different systems used and they do not allow sharing or aggregating information across organizations. Many healthcare providers keep electronic medical records (EMRs) for patients. Case managers sometimes use software to keep notes and



**Figure 1.** Example Card-Sorting Activity

information on clients. Large homeless shelters often use Homeless Management Information System software (HMIS). A problem with all of these systems is that there are many platforms, they do not all allow sharing of information, and they are expensive and not everyone uses them. Moreover, these systems are not designed to share and aggregate the most important and relevant types of health information. For example, EMRs do not help with appointment reminders, while HMIS deal mostly with demographic information, which does not help in identifying at-risk homeless individuals in need of special care.

### Research goals

Our research is concerned with improving the health of homeless individuals by facilitating effective use of existing health services, such as continuous primary care. Based on research, our focus shifted from targeting the homeless directly to targeting HCPs who work with the homeless directly.

### Design process

#### Methods

We began our user-centered design process by conducting contextual interviews with 10 HCPs at shelters and other social service agencies for the homeless. Our goal was to gain a better understanding of the homeless population by speaking to people who work with the homeless frequently and on an individual basis. We also conducted contextual interviews with four medical HCPs (doctors and nurses) who work with the homeless in clinics and the emergency room so we could learn about the homeless healthcare system. Additionally, we sent e-mail questionnaires to HCPs from various cities in U.S. in which we asked about the types of information they needed to facilitate proper

healthcare. This helped insure that our findings could be generalized to cities throughout the U.S.

Initially we planned to conduct full contextual inquiries with HCPs, but due to privacy issues this was not possible. Instead, we conducted semi-structured contextual interviews along with card sorting activities (Figure 1) in which participants wrote down and grouped information and items they use for their work (e.g. client phone number, patient release forms, health information). We asked participants to talk about the items as they sorted the cards into piles, such as information obtained frequently/infrequently and information shared frequently/infrequently. This gave us a better understanding of what and how information is collected and shared. In order to analyze the large amounts of qualitative data we obtained, we constructed an affinity diagram (Figure 2) where we grouped and labeled related data to form a hierarchical structure to help us generate design insights.

#### Concept formation

We initially considered developing a new communication system by modifying community voicemail systems or creating preformatted cell phones to provide homeless people with a stable phone number that doctors can use. However, our research revealed that this would not be worthwhile for several reasons. First, it would be difficult for us to work directly with the homeless because of their transient nature and the fact that they are typically already burdened with many problems. We consistently heard that the homeless are rarely proactive about their health and often have great difficulty with everyday tasks such as scheduling appointments. Consequently, it is necessary for HCPs to work directly with them. We also discovered that most



**Figure 2.** Affinity Diagramming

homeless people already do establish temporary addresses and phone numbers, such as at homeless shelters or with friends.

From our primary and secondary research we had learned that effective health care must be continuous. However, our affinity diagram revealed numerous breakdowns in continuity of care within each of the four stages we identified in the healthcare cycle (Attraction, Treatment, Adherence, and Follow-up).

Patient contact was one significant problem area we identified within each of the four stages. We learned that health-oriented HCPs have great difficulty contacting patients because phone numbers and addresses change frequently. We found that being able to reach patients is necessary for important tasks such as reminding about appointments, relaying test results, checking with medical compliance, scheduling follow-up treatment, etc. Despite the difficulty, the health-oriented HCPs we talked to all stressed the importance of maintaining contact with patients, and asking for updated contact information was a top-priority with nearly all HCPs we interviewed. For example, one organization told us that appointment reminders were important because 50% of their clients do not show up for appointments, while an outreach clinic described to us the difficulties finding certain patients with serious chronic health problems who were having difficulty complying with treatment.

Lack of client health information was another significant problem area affecting each stage in the cycle. For example, HCPs are often unaware of important health needs with a client such as insulin storage or special dietary needs and consequently are unable to help

provide them. Another problem is that because each organization keeps their own records, it is difficult to obtain a complete story about a client. As a result, at-risk patients who are chronically non-compliant with treatment or frequently utilize emergency services are not always identified and given special attention.

A theme that emerged throughout the problems we identified was poor inter-organizational communication. We learned that HCPs already share and request client information informally with other organizations through phone calls and in-person communication. However, these informal methods are problematic for several reasons. First, they are simply too inefficient for routine tasks such as finding a patient to reschedule an appointment and, therefore, HCPs are routinely unable to contact their patients. It is also too inefficient for aggregating information to create a more complete basic health profile on homeless clients. Finally, informal communication is often ineffective when patients need to be contacted in emergency situations such a patient leaving the hospital without medication or test results.

Despite the problems with communication between different organizations, HCPs do have clients sign release forms or have signs posting policies which allow them to share information with other HCPs. We learned that clients are usually very willing to sign release forms and that HCPs work with clients to help insure their privacy is protected.

Based on our insights, we decided to focus on a formal system for aggregating and sharing contact information and health information among HCPs working with different organizations. We also decided to leverage the

fact that HCPs (both medical and non-medical) already collect contact and basic health information from their clients, and are willing and able to work with them to resolve health issues.

### Proposed design

Our proposed design for HealthShare is a web-based application to be used by HCPs. Registered users will be able to log into the system to update their homeless client's contact information or to search for and view the information already entered into the system. They can also note basic health information, for example, concerns about non-compliance with medication. Users can also enter appointment information for their client.

Healthshare also provides a notification system. When an HCP logs into the HealthShare system and views a client's information, an appointment reminder may appear, indicating that he or she should remind the client of the upcoming appointment. HCPs will also receive weekly e-mail updates containing appointment reminders for their clients, updated contacts, and flags highlighting at-risk patients HCPs should focus on.

### Scenario

Laura, a case manager at a day shelter meets with Bob, a homeless client, who informs her that he is staying with friends. Since Bob's friend has a phone, Laura logs into HealthShare and adds the new phone number to Bob's contact information (Figure 3). During the meeting Laura learns Bob has stopped taking his medicine, which Laura notes in his Health Profile.

Dr. Porter, the doctor who prescribed Bob's medication, receives the weekly e-mail report from HealthShare. He sees that Bob has been flagged as "at risk" because

concerns have been entered by multiple organizations. Using the newest phone number, Dr. Porter contacts Bob to schedule an appointment and enters an appointment reminder into HealthShare (Figure 4).

A couple weeks later Dan, a social worker at another day shelter, meets with Bob to help him sign up for food stamps. He is now staying at a local shelter so Dan logs into HealthShare to update Bob's contact information. Dan sees a reminder for the upcoming appointment (Figure 5). She reminds Bob of his appointment and helps him arrange transportation to get there.

Bob goes to his appointment, but Dr. Porter is not convinced that Bob fully understands the importance of remaining on his medication. He schedules a follow-up appointment for the next month and enters a reminder into the HealthShare system.

### Evaluation

To test HealthShare, we recruited three HCPs to evaluate our system. Our testing was done using paper prototypes and Scenario Based Testing. We chose a low fidelity paper prototype because we wanted feedback on the overall concept and features rather than the details of the visual design.

We gave participants our prototypes and scenarios, and asked them to complete certain tasks. An example task is a client who has moved locations, has a new phone number, and needs this phone number added to their HealthShare profile. We asked them to think aloud as they performed each task. Afterwards, we conducted a follow-up interview about their overall impression of the system. In the follow-up interviews, participants

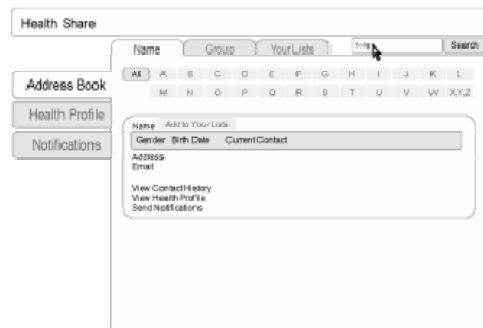


Figure 3. Address Book Main View

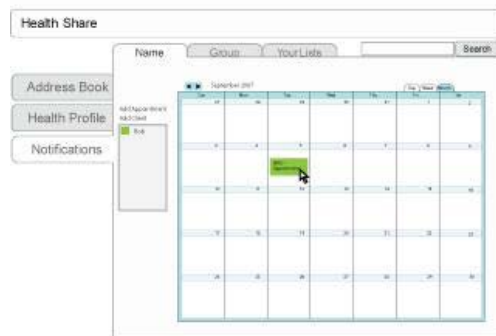


Figure 4. Notification Calendar View

expressed that the HealthShare system is easy to use and would help them better serve their clients. Because of its simplicity, it could be well integrated with current practices and complement existing software used. However, our study also revealed some issues, resulting in changes to the interface. These included:

- Some organizations do not want their name tied to information they enter into the system (e.g. HIV clinics). To address this issue, the interface now includes the option to choose whether or not an organization's name is displayed.
- HCPs may need to enter notes about a client. This capability was added to the health profiles section.
- HCPs often need to enter information about another organization. To address this, an auto-complete feature is included that fills in the information (e.g. address) for commonly used local organizations.

### Conclusion

Our system helps improve the quality of healthcare for the homeless by improving communication between the HCPs involved in the homeless healthcare system and the homeless themselves. The HealthShare system helps HCPs remain up-to-date with their clients' contact and health needs as well facilitate communication between HCPs and patients. Using an existing network of HCPs, HealthShare aims to efficiently and effectively encourage continuous healthcare, preventing costly and ineffective emergency care.

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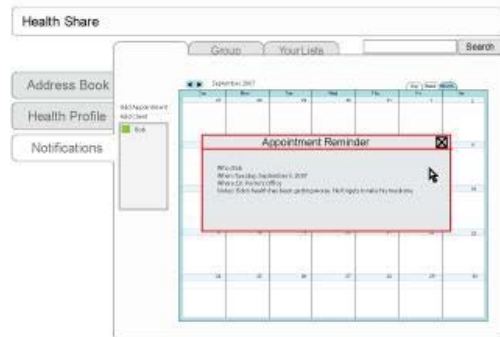


Figure 5. Appointment Reminder Screen