MEDINFO 2007
HISA Ltd Australia
© 2007 The authors. All rights reserved.

Demonstration of a Light-weight Mobile Electronic Medical Record for the Homeless

David S. Buck[1, 2], Soni H. Gupta[2], James P. Turley[3], Kallol Mahata [2]

[1] *Department of Family and Community Medicine, Baylor College of Medicine, Houston, Texas, USA*
[2] *Healthcare for the Homeless-Houston, Texas, USA*
[3] *School of Health Information Sciences, University of Texas Health Science Center at Houston, Texas, USA*

Abstract

This paper represents a demonstration of custom designed HER for the street homeless.. Numerous barriers keep the street homeless from obtaining healthcare. Medical Street Outreach (MSO) programs are used to reach out to the homeless and offer healthcare services. Gathering relevant clinical information on the streets for the homeless is difficult. Carrying paper records in MSO is cumbersome and inefficient. Multiple complex healthcare record systems are available for collecting health data and for medical reference, for hospitals and outpatient. But, there are no systems designed for collecting health data on the streets. This article will discuss the model of a light weight Electronic Medical Record (EMR) built to address the process of healthcare on the streets. The EMR system has been designed for use on a Tablet Personal Computer (TPC) to collect, organize, and share clinical data between clinicians and provide quality healthcare to the homeless. This design can also be used in emergency situations.

Keywords:

demonstration. tablet PCs, healthcare for homeless, electronic medical record for homeless, medical street outreach

Introduction

Homelessness is a growing problem in the United States. A 2000 study by the Urban Institute estimated 444,000 to 842,000 homeless people. The number of homeless people counted in each state in 2005 totaled to 723,968 [1].71% of survey cities showed an average increase in request for emergency shelter by 6% in 2005 [2]. The homeless population in U.S. is composed of 43% single men, 33% families with children, 17% single women and 3% unaccompanied minors [3]. The majority of homeless population is men. However, studies have found that number of homeless women and families is growing.

In response to the federal government's 10-year plan to end homelessness, MSO programs have become a common feature of many community health service programs for the homeless[4-6]. In such programs, healthcare practitioners encounter homeless people in diverse settings—in meal programs, on the streets, under bridges, in encampments, and in shelters to improve their health, social functioning, or utilization of human services and resources[7].

Handheld technology on the streets

The method used in the Medical street outreach until recently has been to carry paper records. And carrying the paper records around to treat the homeless is very cumbersome. Scrambling through the records to find the patient's paper record is difficult and impractical. This disrupts the care workflow in MSO, resulting in reduced clinician-atient engagement and hence compromised care.

Health information is often poorly organized and not indexed in paper records. The paper records cannot be shared between multiple providers treating the same person. Inability to share records results in redundancy of records and insufficient patient information at the point of care. This inability to share patient information was the main impetus for the introduction of handheld computer technology into the healthcare delivery system for the urban street homeless in Houston.

Handheld technology like personal digital assistants (PDAs) are known for their mobility and flexibility in medical practice in the last few years [8-10]. Updated patient information available at the point of care shareable by all the clinicians enhances quality of care [11]. PDAs have their own limitations in memory, slow processing power, small screen size and a cumbersome input mechanism[8, 12].

Tablet Personal Computers (TPCs) is another handheld technology known for its use in the medical industry. It has a larger screen space, and a pen to write directly on the screen. Tablet PC offers mobility and fits well into the workflow for the MSO clinicians. The downside is that they are more expense and fragile than PDAs.

Two programs have tried to use PDAs for homeless healthcare. Boston's Health Care for the Homeless program used Palms devices to collect biomedical data. And Operation Safety Net (OSN) in Pittsburgh used IPAQ Pocket PCs. However, these were used in traditional clinical settings and not for medical outreach.

Methods

Healthcare for the Homeless – Houston (HHH) began using handheld technology to make medical street outreach more efficient for providers. In January 2001, HHH launched a personal digital assistant (PDA) system.

The use of Palm V Handheld Computers (PalmOne, Inc., Milpitas, CA) combined with customized software made it relatively easy to collect patient demographics and histories, as well as information on physical examination results, diagnoses, and medications. To prevent duplication of patient records, PDAs were synchronized into one main system. Informal interviews with the clinicians who pilot-tested the PDA platform revealed that they were satisfied with it as a method for collecting patient information. However, the limited memory available on the Palm became a major obstacle. Switching to the iPAQ H3765 Pocket PC (Hewlett Packard Company, Palo Alto, CA) improved the reliability of the system, but clinicians found the new hardware too slow.

Although PDAs proved ineffective, the positive feedback from clinicians in the pilot study [13] led to the development of a TPC platform in 2004. TPCs can record data with a digital pen, voice, keyboard, or mouse, while chart notes can be written or dictated. The display size of the Tablet PC is bigger and encompasses more data fields. The tablet PC used for street outreach by HHH is LS800 Mini TPC, from Motion Computing Inc., with a screen size of 21.34 cms and weighing only .997 Kgs. The EMR program is on a .NET framework and a MS Access Database.

EMR design

The Electronic Medical Record has been designed to enhance encounter workflow and data collection in street outreach for the homeless. Building the EMR involved data analysis from the pilot study on PDA[13] and involvement of the clinicians in an iterative heuristic process. Participation of the programmer in street outreach proved helpful in the logical design of the system.

The login on the TPC involves using fingerprints and username, password combination to comply by the HIPAA rules. Due to the mobile nature of the clinicians and the difficulty in bringing the programmers, implementation team and clinicians together, an audiovisual training module was developed. This training module proved effective in initial hands-on training with the system. The Go-live phase of the implementation involved participation of the implementation team in on-site training of the clinicians.

The EMR program has the capability of recording new encounters, new unlinked encounters, finding patient records and linking an unlinked encounter to a patient record. Patient record can be created using his name and demographics or even by any special appearance characteristics noted by the clinician. All fields have free text writing and typing options that makes taking clinical notes easier and quicker for the clinicians. There are drop-down menus for quicker selection for many of fields, for example: ethnicity. When entering a diagnosis the clinician can choose from the 20 most common diagnoses encountered in homeless on the streets or choose to view a list of more diagnoses. The system also has the capability of choosing a diagnosis by the ICD9 codes or by the abbreviations of the diagnoses. A summary page summarizes the patient encounter, goals and diagnosis. The summary page gets automatically populated at time of encounter data entry. Whenever one searches a patient file, it is the summary page that opens up, to give a comprehensive view in a jiffy. Patient file can be searched using his name, gold card number, or appearance characteristics.

The system has been designed to give the clinicians the mobility and flexibility to enter data on the fly. Before and after each street outreach visit the clinician goes to the clinic and synchronizes the data onto a common database. This way, each Tablet PC has the data from the other TPCs. Thus if a clinician has encountered a patient the other clinician encountered last week, he has all the patient data at the point of care. And there is not duplication of patient record. The enhanced information flow between clinicians helps provide improved quality of continued care.

Results

Despite the initial difficulties faced with the PDA and iPAQ use, there were beneficial lessons learned and a new system was designed with those feedbacks. With the Tablet PC, clinical information is accessible at all sites, by all physicians at the point of care. Data is replicated on the TPC hard drives from a repository on SQL Server. It has reduced the redundant documentation time and increased the encounter time for efficient patient care. Patient engagement has increased and clinicians are able to focus on building relationships with the homeless. The clinicians are able to devote time to addressing basic needs of the homeless, in addition to the medical needs.

The patients' attitudes toward and acceptance of technology has been surprising. Patient seemed nonplussed and flattered by the use of high-tech methods with them, instead of feeling anxious or intimidated by it.

From the lessons learned in the PDA development, we knew that user centered design was a critical first part of the TPC design [14]. The result has been an interface that requires little or no training and has been well accepted by the clinicians.

Future

The clinicians have been impressed by the flexibility with TPC use in street outreach medical care.

The research and programming team have been working on a Goal-Negotiated care (GNC) model of EMR [15]. The goal is to focus on patient goals and address patient needs directly, shifting the paradigm from a problem-based focus to a solution-oriented one. Goal negotiated care will help reduce feelings of powerlessness and increase self-efficacy. The GNC model allows clinicians to easily navigate through a care encounter between the goals and the encounter. In traditional care model, clinician moves linearly from history to diagnosis and treatment and the clinician drives the encounter, whereas in GNC, patient drives the encounter. Patient goal is the starting point and the clinician then moves forward or backward through the who, what, how, why, when and where components. An overview of the GNC logic model is presented in Appendix A. A set of goals commonly encountered in homeless patients aids in the process of selecting and generating the clinician and patient tasks. The entire process is more interactive for both clinician and patient, empowering and building the patient's self-efficacy by addressing his/ her specific goals and tasks.

GNC is currently being implemented and will be part of the demonstration.

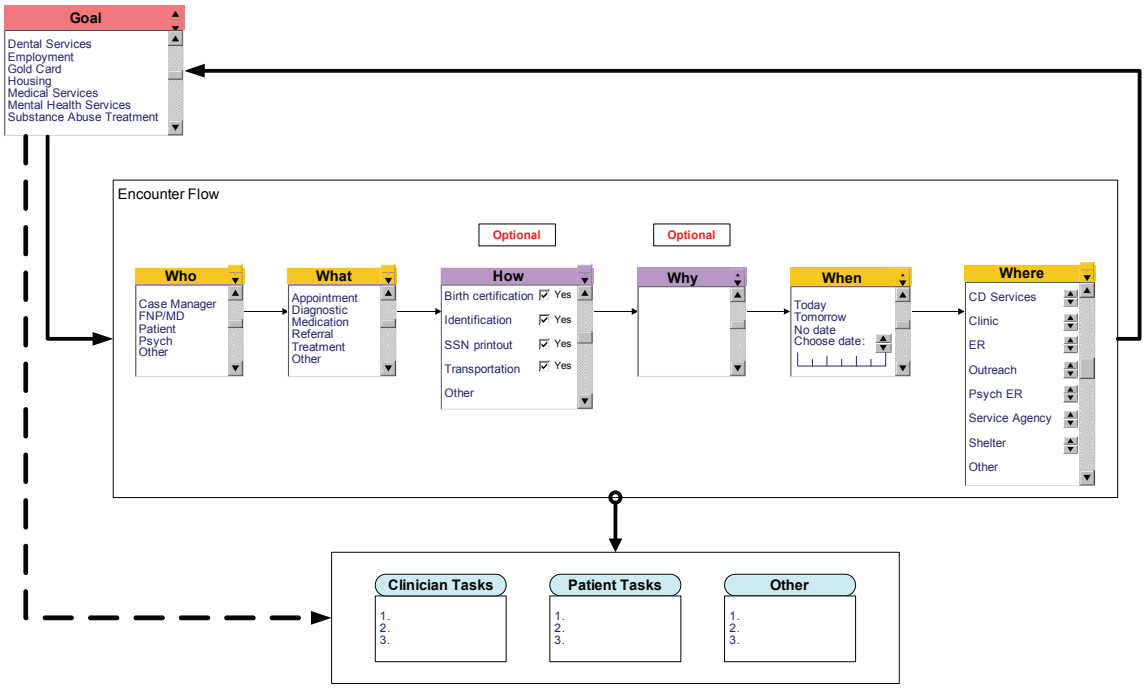
Acknowledgments

Funding for this project was provided by Healthcare for the Homeless – Houston.

References

1. Kasindorf, M., *Nation taking a new look at homelessness, solutions.* USA Today, 2005.
2. *Hunger and Homelessness Survey. A Status Report on Hunger and Homelessness in America's Cities, A 24-City Survey.* The United States Conference of Mayors - Sidexho, Inc., December 2005.
3. Susan Louisa Montauk, M., *The Homless in America: Adapting Your Practice.* American Family Physician, 2006. **74**(7).
4. Erikson S, Page J., *To dance with grace: outreach and engagement to persons on the street.* Fosburg LB, Dennis Dl, eds. practical lessons: The 1998 National Symposium on Homelessness Research. Washington, DC: US Dept of Housing & Urban Development, 1999. **6**(1): p. 6-24.
5. McQuistion HL, D'Ercole A., Kopelson E, *Urban street outreach: using clinical principles to steer the system.* New Dir Ment health serv, 1996. **52**: p. 17-27.
6. Lam JA, Rosenheck R., *Street outreach for homeless persons with serious mental illness: is it effective?* Med Care, 1999. **37**(9): p. 894-907.
7. Morse GA, Clasyn RJ, Miller J, Rosenberg P, West L, Gilliland J., *outreach to homeless mentally ill people: conceptual and clinical considerations.* Community ment health H., 1996. **32**(3): p. 261-274.
8. Chen ES, Mendonca E., McKnight LK, Stetson PD, Lei J and Cimino JJ, *PalmCIS: A wireless handheld application for satisfying clinician information needs.* J Am Med Inform Assoc, 2004. **11**(1): p. 19-24.
9. Yen-Chiao Lu, Y.X., Andrew Sears, Julie A. Jacko *A review and a framework of handheld computer adoptionin healthcare.* International Journal of Medical Informatics, 2005. **74**: p. 409-422.
10. Ruland, C.M., *Handheld technology to improve patient care: evaluating a support system for preference-based care planning at the bedside.* J. Am. Med. Inform. Assoc, 2002. **9**: p. 192-201.
11. Pipas CF, Carney P., Eliassen MS, Mengshol SC, Fall LH, Olson Al, Schifferdecker KE, Russell MT, Peltier DA and Nierenberg DW, *Development of a handheld computer documentation system to enhance an integrated primary care clerkship.* Acad med 2002. **77**(7): p. 600-9.
12. Embi PJ, *Information at hand:usinghandheld computers in medicine.* Clece Clin J Med, 2001. **68**(10): p. 840-853.
13. Buck David S, Rochon Donna.and.Turley James P., *Taking it to the streets: Recording medical outreach data on personal digital assistants.* Comput Inform Nurs, 2005. **23**(5): p. 1-6.
14. J Zhang, Vimla Patel., K A Johnson, Malin J, J W Smith, *Designing Human-centered Distributed Information systems.* IEEE Intel Syst 2002. **17** (5): p. 42-7.
15. Donna Rochon, David S.Buck., Kallol Mahata, James P. Turley, *The Evolution of Goal-Negotiated Care.* HIC 2006 Bridging the Digital Divide: Clinician, consumer and computer`, 2006.

Address for correspondence

David S. Buck M.D, M.P.H.
Department of Family and Community Medicine
Baylor College of Medicine
3701 Kirby Drive, Suite 600
Houston, TX 77098-3915
Email: dbuck@bcm.tmc.edu
Telephone: 713-798-7718; Fax: 713-798-7940

Appendix A
GNC Logic Model