THE FREE CLINIC RESEARCH COLLECTIVE

Implementation and Evaluation of an Electronic Medical Record for Medical Student-Led Homeless Outreach

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Abstract

University of Rochester Street Medicine is a medical student-run organization that seeks to improve the health and well-being of Rochester's homeless population by providing healthcare services to individuals where they reside. This article will demonstrate the use of an electronic medical record for medical student-led homeless outreach and review the demographics and medical needs of this underserved population. Over the course of 189 Street Medicine rounds from June 2016 to September 2018, an average of 12.1 (±8.7) homeless individuals were encountered. Out of 632 patient encounters, most common chief complaints included blood pressure checks (22.6% of visits), musculoskeletal pain (12.7% of visits), and foot or skin problems (8.1% of visits). Referral to primary care physician occurred at 24% of all visits, referral to other medical services occurred at 19%, and referral to emergency care occurred at 2.7%. Follow up visits occurred 330 times out of the 492 visits that required follow up, for a success rate of 67%.

Background

Homelessness is a pervasive problem throughout the United States, with 553,742 people experiencing homelessness nationally on a single night in January 2017 and yearly estimates of homelessness between 2.5 to 3.5 million.[1,2] Homelessness is a significant problem in Rochester, New York and Monroe County, with Point-in-Time data on a single night in January 2017 finding 817 total homeless individuals, with 6,440 individuals and 2,984 families placed in temporary housing in 2017.[3,4]

Homelessness and medical problems are highly interrelated, as people without homes are disproportionately exposed to the elements, to violence, and to communicable diseases. Homeless individuals are more likely than their housed counterparts to have mental illness and substance use disorders, as well as dermatologic conditions, musculoskeletal conditions, and infection diseases including Hepatitis C, HIV, and tuberculosis.[5] Homeless individuals also have decreased access to health care for a variety of reasons, including lack of transportation and telephone access, costs, inflexible scheduling, and difficulty enrolling in assistance programs. A

national study of medical needs in the homeless population found that 73% of individuals have unmet needs, including medical and surgical care, prescription medications, mental health or counseling, eyeglasses, and dental care.[2] Homeless individuals have overall mortality 4.5-fold higher than the general population, with death in 45 to 64 year olds 2- and 3-fold higher from cancer and heart disease respectively, owing to poor preventative and overall health.[6]

University of Rochester Street Medicine is a medical student-run organization that seeks to improve the health and well-being of Rochester's homeless population by providing healthcare services to individuals where they reside. Since its creation in 2011, on a bi-weekly basis, a group of three to five medical students participates in street rounds, commonly accompanied by physicians, nurses, nursing students, and formerly homeless individuals. Groups seek out homeless individuals at homeless encampments, at local shelters, and in various parts of the city in order to engage them in conversation, address any medical concerns they may have, and connect them with medical and social services. The goal of UR Street Medicine is to meet the needs of individualized patients and of the homeless community as a whole, while helping to foster a stronger relationship between the healthcare system and this underserved population.

UR Street Medicine involves a quarter of the University of Rochester School of Medicine student body and encounters an average of 12 individuals nightly. Because of the high volume of patient encounters and many students participating in rounds, students surveyed on their experiences with UR Street Medicine voiced a concern for inadequate follow up and continuity of care. To address these concerns, UR Street Medicine created an online electronic medical record for electronic capture and management of patient data in order to better understand the individuals we service, the services we provide, and unmet needs of this underserved population. Electronic medical records used for delivery of healthcare to the homeless have been successfully implemented by large organizations such as the Boston Health Care for the Homeless Program, Healthcare for the Homeless-Houston, and the New York Children's Health Project's mobile medical clinic.[7]

This article will demonstrate the use of an electronic medical record for medical student-led homeless outreach and review the demographics and medical needs of this population.

Methods

UR Street Medicine data was collected from June 2016 to September 2018 using REDCap (Research Electronic Data Capture), a free, secure, HIPAA-compliant, web-based application hosted at University of Rochester Medical Center. REDCap (Research Electronic Data Capture). REDCap provides 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.[8]

REDCap is organized to generate an individual record for each patient we encounter (Figure 1). Because of high volume of encounters, we only create individual records for patients who desire follow up or have significant medical or social concerns that are shared with medical students. Each patient has a demographics form, which includes identifying information, past medical history, social history, and documentation on medical and social needs. For each initial and subsequent encounter, an encounter form is created, which is in a progress note format and includes chief complaint, history of present illness, physical exam and vitals, important social updates, documentation of counseling or resources discussed, referrals, and plans for follow up. Subsequent encounters will be created in association with the individual patient's record, facilitating longitudinal documentation of encounters. Any medical student present on rounds may fill out these individual forms. If a patient requires follow up, the issues for follow up are documented with preferred date of follow up. On subsequent street rounds, the patients requiring follow up on that specific date will be retrieved and displayed using the reports function of REDCap.

In addition to individual patient encounters, after every street round, the student leader creates a summary of the rounds using a second arm of the REDCap database. Information recorded includes locations visited, number of individuals encountered, supplies distributed, and patients to be seen in future rounds.

We performed a retrospective analysis of de-identified records including patient demographics and needs, chief complaints, and outcomes of patient interactions. This project was undertaken as a Quality Improvement initiative and, as such, did not require approval by the University of Rochester Research Subjects Review Board (RSRB).

Data Collection Instrument	Demographics	Encounter 1	Encounter 2	Encounter 3	Encounter 4	Encounter 5	Encounter 6	Encounter 7
Demographics Form								
Encounter Form								

Figure 1. Data collection instrument showing an example for an individual patient with links to their corresponding demographics form and individual encounter form.

Results

From June 2016 to September 2018, 189 Street Medicine rounds with 141 unique medical students involved have taken place. Licensed physicians were present on 20% of rounds and were available by telephone and/or video conferencing during 38% of rounds.

Table 1

		SD or Percent
Number of Patients with Personal Records	338	
Average Age (years)	49	12.6
Male (#)	236	70%
White (#)	154	46%
Black or African American (#)	127	38%
Hispanic or Latino (#)	31	9.2%

Table 1. Demographics of patient population.

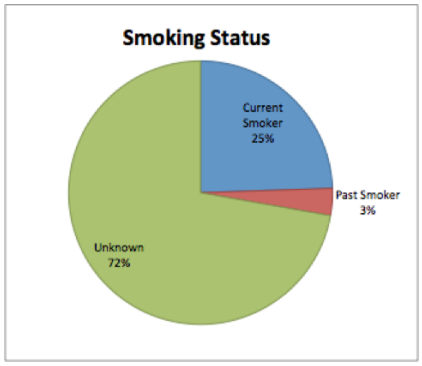

Figure 2. Smoking status of patients from demographics data.

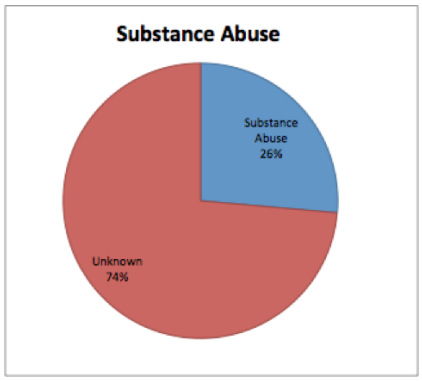

Figure 3. Substance abuse status of patients from demographics data.

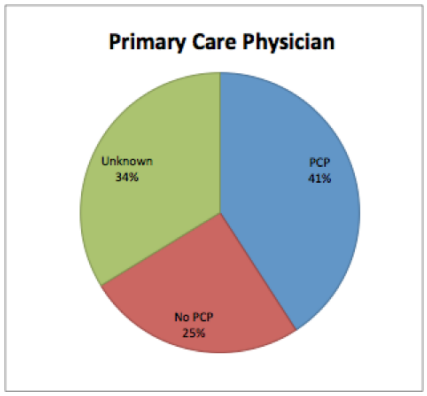

Figure 4. Known primary care physician for each patient from demographics data.

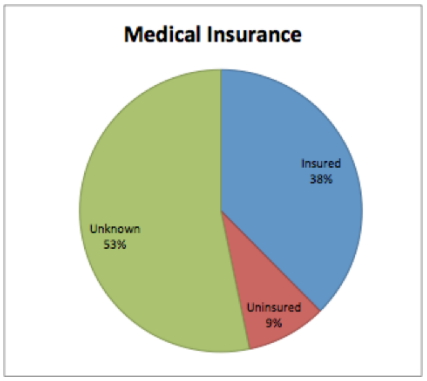

Figure 5. Medical insurance status of patients from demographics data.

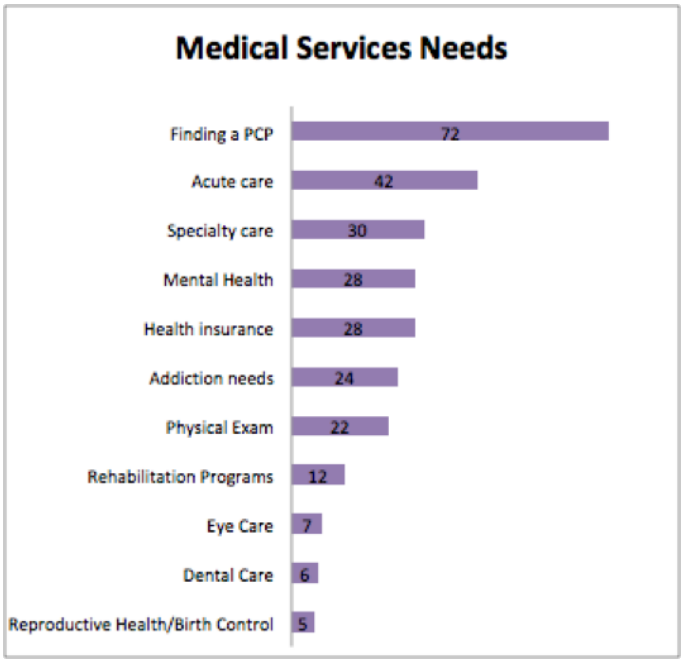

Figure 6. Needs for various medical services from demographics data.

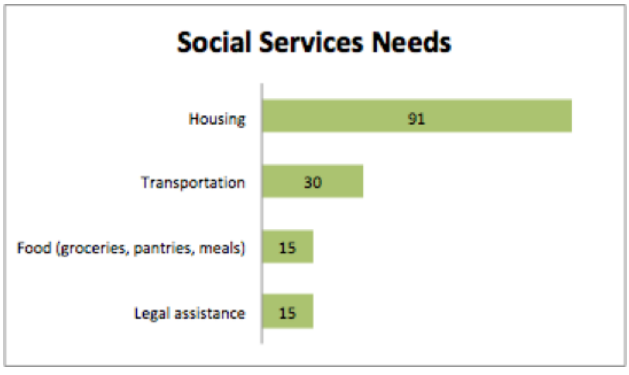

Figure 7. Needs for various social services from demographics data.

Over the course of the 189 rounds, a total of 2,293 individuals have been encountered on street rounds, with medical and/or social issues discussed with 1,267 individuals, for an average of 12.1 (±8.7) total individuals encountered and 6.7 (±5.4) individuals with whom medical and/or social issues were discussed. These numbers includes patients who were seen on multiple street rounds.

A total of 338 individuals have individual demographics forms with data showing an average age of 49 (±12.6) and 73% male. Of those with race recorded, 51% were white, 41% were African-American, and 20% were Hispanic/Latino (Table 1). Twenty-five percent were known current smokers, and 26% were known substance abusers (Figures 2 and 3). Thirty percent were without a primary care physician, and 12% were without insurance (Figures 4 and 5). Missing data is common in demographics data, ranging from 34% missing (PCP) and 53% (insurance), to 72% and 74% for smoking and substance abuse respectively. Forty-five percent of patients have documented needs for medical and social services, most commonly finding a primary care physician (21%), acute care needs (12%), mental health (8%), and addiction needs (7%) (Figure 6). Needs for social services include housing, transportation, food and legal assistance (Figure 7).

There are a total of 632 documented encounters for the 338 patients with individual medical records. Out of the patients seen, 106 individuals had at least 1 follow-up visit, with an average of 2.9 (±3.5) follow-up visits per patient. Documented chief complaints include blood pressure checks (22.6% of visits), musculoskeletal pain (12.7% of visits), foot or skin problems (8.1% of visits), diabetes (7.9% of visits), substance abuse (6.2% of visits), mental health (5.2% of visits), infectious disease including respiratory infection, sinus infection, and eye infection (5.1% of visits), and neurologic complaints (4.1% of visits). General medical support and discussion of sub-acute or chronic complaints occurs at 26.4% of visits, and non-medical

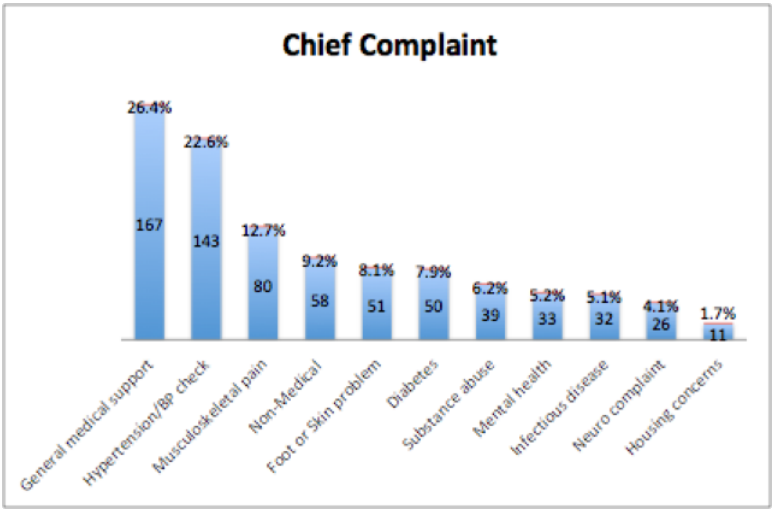

Figure 8. Total number of common chief complaints and percent occurrence.

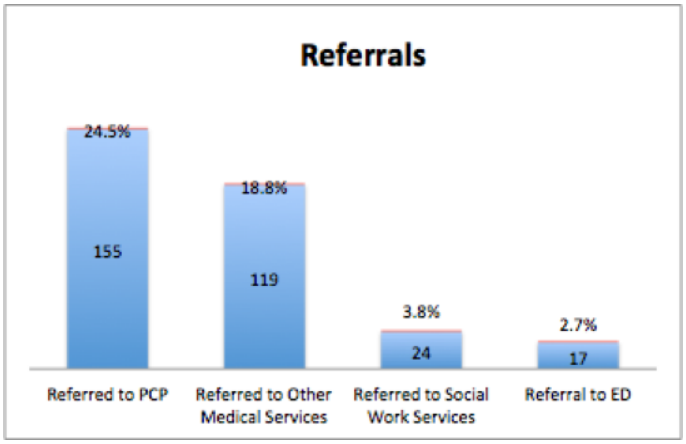

Figure 9. Total number of referrals and percent occurrence.

interactions occurs in 9.2% of visits (Figure 8). Blood pressure was recorded at 40% of visits (mean blood pressure 137 [± 21]/83 [± 15]), and blood glucose was taken at 12% of visits (mean 214 [± 104]).

Items available on outreach rounds include hygiene items, foot care supplies, socks, gloves, hats, hand warmers, and bus passes. Flu vaccines were administered 83 times. Select over-the-counter medications (e.g., ibuprofen, Tylenol, omeprazole, and hydrocortisone cream) are also available with physician supervision. Frequently requested items included inhaler spacers, glucometer supplies, trash bags, socks, and bottled water. Medical students involved with UR Street Medicine also created medical and housing resource cards for distribution. Medical cards showed information on local free clinics and sliding-scale clinics and were distributed 84 times. Housing cards showing local shelter options were distributed 31 times.

Out of 632 patient encounters, counseling was performed and documented in 91%. Referral to primary care physician occurred in 24%, referral to other medical services occurred in 19%, referral to social work occurred in 3.7%, and referral to emergency care occurred in 2.7% (Figure 9).

A need for a follow-up encounter was documented in 78% of visits, with issues for follow-up including general check-in (64% of follow-ups), medical needs (56%), and social needs (20%). Follow-up visits occurred 330 times out of 492, for a success rate of 67%.

Discussion

A UR Street Medicine survey of medical student experiences with the volunteer organization found participant concern over inconsistent follow up, in part due to lack of sufficient documentation of patient medical issues, resources offered, and follow-up plans. In order to meet the needs of the organization, an electronic medical record using REDCap was created with great success.

This project has allowed better understanding of Rochester's homeless population's medical and social needs. Forty-five percent of patients are recorded as having one medical need, compared to 73% in the national study by Baggett et al.[2] Documented needs include having a primary care physician, acute medical care, and specialty care. However, it is important to consider that this data is not self-reported, a limitation of this dataset and a possible reason for the fewer number of medical needs documented for this population.

Common medical problems among Rochester's homeless population include hypertension and diabetes, which lead to disproportionately increased morbidity in the homeless population. Additionally, many patients suffer from diseases that occur more commonly in the homeless population, including skin and foot issues, as well as concerns with the musculoskeletal system.[5] Throughout the Street Medicine program, students have reached out to hundreds of individuals to provide counseling and information on medical resources and offer hygiene supplies, warm clothing, and socks. We also note that 24% of the population smoke cigarettes and 24% use other substances. Many visits are dedicated to smoking cessation and general health counseling, occurring during 91% of encounters and representing Street Medicine's focus on preventive health. Referral to primary care physicians (24%) and other medical services (19%) often occurs, with rare referral to emergency medical service (2.7%).

Given that access to healthcare services among the homeless is often insufficient, medical student outreach to this population may improve access to primary care physicians and increase access to preventive services. With the implementation of REDCap, students are able to follow up with patients previously seen to create longitudinal patient relationships, with some student-patient relationships spanning the two years of REDCap use. This relationship can be very valuable in a population that is less likely to form long-term relationships with healthcare providers and can improve trust between homeless individuals and healthcare professionals.

Despite the success of the program in facilitating follow-up and documenting needs of the homeless population, there are multiple issues that have arisen in the implementation of this system. Firstly, there is a learning curve for REDCap use, which has made first-time use challenging for some users. Because of this, organization leaders created documents and instructional videos detailing the use of REDCap. Secondly, using this system requires extra time on rounds, up to one hour of documentation after the conclusion of rounds. However, REDCap is a fluid system, and data fields have been altered to decrease redundancy and increase efficiency. Thirdly, there is missing data in many of the data collection fields due to the casual interactions with individuals and the lack of standardized encounters. Missing data decreases the ability to complete a full analysis of the demographics and the needs of this population. Another issue is the lack of complete identification of patients, including the absence of documented last name or date of birth. This may result in duplicate patient records and uncertainty that the correct patient is located. Though these are required fields on the data forms, students often are unable to acquire this important information. Reasons for this include the casual nature of the interactions with the patients and a high level of caution among homeless individuals that often results in

concern about providing more personal identifiers to outsiders. Further, this data is all reported by the student volunteers, rather than self-reported, which may result in inaccuracies and biases regarding documented needs. Prior evaluations of the data set have shown some possible instances of bias, which is partly due to the interviewer reported nature of the data as well as the inability to document data during rounds (trial of REDCap's mobile platform encountered many problems). Street Medicine volunteers should be encouraged to directly ask patients what their needs are for improved documentation and could benefit from taking documentation sheets on rounds to improve accurate data collection.

Finally, there are many challenges in outreach for any transient patient population, including difficulty of follow up for those who are living on the streets. However, because of frequency of Street Rounds, relative stability of the homeless population we serve, and communication between Street Medicine student providers, we are able to successfully make follow up visits with 67% of our patients, which is likely an improvement from outcomes prior to use of the electronic medical record.

UR Street Medicine will continue to improve the electronic medical record system, critical in enabling collection of high quality data to capture the needs of this population and decrease the burden of acute and chronic disease while facilitating continuity within the medical system. Future work will include measures to increase data field completion. Because of many incomplete data regarding primary care physicians and insurance status, future work will need to be done to better evaluate the homeless population's access to these services. Similarly, it is important to engage the population in a conversation about their needs, as there are likely many unmet needs not captured by REDCap data collection. Additionally, Street Medicine will continue to focus its efforts on the most common chief complaints, including hypertension, foot and skin issues, and musculoskeletal issues, which are commonly discussed during UR Street Medicine encounters.

Conclusion

University of Rochester Street Medicine demonstrates the use of REDCap as an electronic medical record for medical-student led homeless outreach. Implementation of an electronic medical record system has improved homeless outreach provided by this medical student-led outreach organization, allowing over 600 encounters with 300 individuals to be documented with a wide range of social and medical concerns. Analysis of patient data shows a high prevalence of cigarette smoking and substance use, with common chief complaints including blood pressure checks, musculoskeletal pain, and foot or skin problems. Our medical outreach organization has the ultimate goal of decreasing the burden of chronic health conditions on the homeless population by providing medical support and health education for individuals. This goal is increasingly possible with the use of electronic medical records due to improved continuity of care and patient follow up.

We hope this discussion of the implementation and evaluation of REDCap will guide other outreach organizations to adopt similar electronic medical records, proven here to be effective in delivering long-term medical support to homeless individuals.

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