

CASE MANAGEMENT, MOBILE HEALTH CARE AND PERMANENT HOUSING:
INCORPORATING PRE AND POST HOSPITAL CARE TO PREVENT FREQUENT
EMERGENCY DEPARTMENT VISITS.

By

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Abstract:

The use of emergency departments (ED) has increased over the years as more individuals have begun to use the ED services in place of primary care offices and urgent cares. With an increase in ED utilization, there is a higher cost to the hospital as well as an increased chance of overcrowding. This can also have a negative effect on patient care. Individuals who utilize an ED four or more times in a year are considered frequent users. To combat the amount of frequent ED users, programs have been implemented within hospitals across the United States; specifically, case management, mobile health care and permanent housing programs.

Information was collected through a literature search utilizing relevant databases and keywords to find and analyze papers on case management, mobile health care and permanent housing programs and their effectiveness at preventing frequent ED use and the costs associated with it. Overall, there was a positive correlation with the programs and decreasing the amount of times an individual frequented the ED.

Introduction:

Over the years, Emergency Department (ED) use has increased as more individuals are beginning to utilize ED services for non-emergency incidents. EDs first emerged in the aftermath of World War II, when there was a strong need for hospital-based medicine¹. At the time, individuals needed immediate emergency care that they could not receive any place else. Thus, the EDs were created. Over time, the need for emergency medicine grew. In order to accommodate the growing need for emergency medicine within the United States, the American Medical Association (AMA) created a committee on emergency medicine in 1967 and in 1968 the American College of Emergency Physicians (ACEP) was founded². These committees paved the way for the emergency medicine practices we see in EDs today.

In today's society, EDs serve as a place individuals can go to, at any time of the day, when they are in need of immediate care. However, over the years there has been a rise in the number of hospital visits as more people have begun to utilize the ED in place of primary care offices and urgent cares. In data collected from the CDC in 2017, about 19.7% of 18 to 75-year-olds visited the ED two or more times in a twelve-month span of time³. Within the individuals who visited the ED more than two times in a year, about 13.7% to 27.1% of those visits could have been treated at an alternative site, such as an urgent care or a primary care physician's office⁴. Over the span of ten years, ending in 2005, there was about a 20% increase in the number of ED visits in a year, in the United States, from 96.5 million to 115.3 million⁵. Individuals have begun to utilize the ED at any time they need medical assistance, even when they are not in an emergency. These individuals have been characterized as frequent users because they frequent the ED at least four times a year or super-utilizers if they frequent the ED between 2-18 times a year⁶. The increase in the number of visits has also increased the costs

associated with health care. The more that individuals frequent the ED and go through readmissions, the more costs to the hospital. It is estimated that about \$4.4 billion could be saved annually if individuals who frequent the ED visit an alternative site in place of an unnecessary ED visit ⁴. Additionally, the increase in the number of individuals who frequent the ED can cause overcrowding in hospital EDs and this can affect the care that is provided to patients in need.

Frequent users of the ED are often individuals who are of low-socioeconomic status, are uninsured, are homeless, have no primary care physician or access to medical care or are individuals with reduced access to health needs. However, there is a large group of individuals who have health insurance and a primary care physician, but still frequent the ED ⁵. Individuals in a low-socioeconomic status do not always have access to health insurance or medical resources and many suffer from poor health due to the health disparities they face on a daily basis. These individuals are also more likely to suffer from poor health due to the lack of education on the health system as a whole ⁷. Those who are considered to be in a low-socioeconomic status visit the ED on a more frequent basis because they do not have access to a primary care physician and so it is easier for them to just go to the ED. Additionally, many of these individuals cannot always afford co-payments and because visiting a primary care physician typically has a co-payment attached to the visit, they tend to skip over the primary care physician. However, no matter a person's financial or insurance standing, a hospital has a financial and legal obligation to treat patients who come in and so many people will head straight to the ER to get treatment ⁵.

With the growing use of the ED for health care, many health care workers and researchers have piloted new programs to try and find a way to reduce the unnecessary ED visits. Three of the most common and researched methods are the use of case management, mobile

health care and permanent housing. Case management is a holistic approach to medical care that takes into account the patients' medical and social needs ⁶. The ideal behind case management is to connect the patient to resources within their community to address any and all of their medical needs. This approach also takes on the task of educating individuals about the health care system and how to better take care of themselves so that they can avoid visits to the ED ⁶. The second method is mobile health care. This approach was first utilized in rural areas to address the health needs they faced; however, it has grown, and has been utilized in multiple states ⁸. Mobile health care is a program that helps to deliver in home visits, provides health education, wellness check-ups, routine health screenings and can also be utilized to assess the safety of one's home ⁹. The program can be expanded outside of these aspects as well. Lastly, the permanent housing approach aims to provide homeless individuals with housing, and often medical guidance, to get into a permanent housing situation, while reducing their number of visits to the ED. Many of the permanent housing programs begin with relocating homeless individuals, who frequent the ED, into a more supportive living setting and, once they complete the program, into a permanent housing situation ¹⁰. All three of these approaches were looked at in depth to assess their accessibility and success rate to determine if they are plausible solutions to decreasing ED use.

Objectives:

The objectives of this literature review are to:

- a) Summarize and compile the information on case management, mobile health care and permanent housing and their effects on ED use.
- b) Discuss the efficiency and success of case management, mobile health care and permanent housing on frequent users of ED use.

- c) Determine if case management, mobile health care and permanent housing are plausible solutions to decreasing the use of EDs.

Methods:*Literature Review Methods:*

Database searches were completed through PubMed, UofA Libraries, and NCBI. Within these databases, articles were found utilizing the search terms, frequent ED use, case management for ED frequent users, mobile integrated healthcare program, housing first and ED use among the homeless population.

Literature Review Criteria: Case Management

Articles were included in the review if they included an outline of the intervention that was followed for each patient participating in the study and included a study that lasted for thirty days or longer. Articles were also included if the study identified and included individuals who were considered to be frequent ED users and if the study occurred within the United States.

Articles were excluded if they did not mention frequent ED use, if the pilot study was shorter than thirty days or if the study did not include results to the study.

Literature Review Criteria: Mobile Health Care

Articles were included in the review if they outlined the specific services provided and available to each patient, if the services were provided for two months or longer, if the study included a team of more than one health care worker and if individuals were identified pre or post ED visit.

Articles were excluded from the review if the program was shorter than two months, if there were no results presented and if there were fewer than 20 participants in the study

Literature Review Criteria: Permanent Housing

Articles were included in the review if the study provided housing and medical assistance for the homeless, if the study targeted homeless individuals who were frequent ED users and if the study lasted for six months or longer.

Articles were excluded from the review if the study was shorter than six months, if there were fewer than 20 participants in the control and test group, and if housing were not provided to these individuals.

Results:

Literature Review: Case Management

In the literature review, 7 studies were identified that looked specifically at the use of case management to reduce the frequent use of the EDs. Of the 7 reviewed studies, 2 of the studies specifically identified frequent users who were considered to be in a lower socioeconomic status^{11,12}. One of the studies specifically targeted uninsured frequent users and the remaining 4 studies did not have specifications outside of being frequent ED users^{13, 14, 15, 16}. Four out of the 7 studies only identified frequent users who were 18 years or older^{13, 14, 17, 15}. Two of the studies did not have age restrictions^{16, 12}. Two of the studies were conducted in suburban areas^{15, 16}, 2 studies were conducted in urban areas^{12, 14}, 2 studies were completed in rural areas^{11, 13} and 1 study did not specify¹⁷. Three of the studies followed the patient's ED use 6 months prior to the program and 6 months after the program ended^{11, 12, 14}. Three studies

followed the patient's ED use 12 months prior to the program and 12 months after they completed the program^{13, 16, 17}. One study followed the participants for 6 years or more¹⁵. Six studies followed more than one hundred patients^{11, 12, 13, 15, 16, 17} and one study followed less than one hundred patients¹⁴. Three out of the 7 studies outlined primary care plans for the frequent users^{14, 15, 16}. Two studies assigned a specific case manager to each participant^{13, 17} and one study completed a personalized care plan outside of the hospital setting¹². Lastly, two of the 7 studies had a control group outside of the patients^{11, 13} and 5 of the studies did not have a control group outside of the patient's history^{12, 14, 15, 16}.

Case Management:

After reviewing all 7 of the studies, each study had a decrease in the number of ED uses per each patient and 5 of the 7 experienced a decrease in ED costs. The first study experienced a decrease from 0.58 ED visits per person per month to 0.23 ED visits per person per month (Fig. 1)¹¹. The ED and inpatient charges per person per month decreased from \$1167, pre-enrollment, to \$230, post-enrollment. The second study had a reduction of ED visits per year from 6 per person down to 3 per person, post-enrollment¹³ and an ED cost decrease from \$2545 to \$1874¹³. The third study experienced more than a 75% decrease in ED visits, from 16.5 visits per patient to 3.4 per patient post-enrollment¹⁴. The fourth study had an ED cost of \$21,022 per year and post enrollment had an ED cost of \$14,910¹⁷ with a decrease in ED use, medical inpatient and outpatient visits as well as ambulance services (Fig. 2)¹⁷. In the fifth study, patients were followed for 6 to 8 years after enrollment and on average patients averaged, per person per year, 7.1 visits in year one, 2.0 visits in year 6 and 1.9 visits by year 8¹⁵. The sixth study had a decrease in ED use from 1,685 (combination of all patients) to 855 after enrollment into the

program ¹⁶. There was also a change in ED costs from a total of \$14,280,923 pre-enrollment to a total of \$8,446,648 post enrollment ¹⁶. Lastly, the seventh study had a 48% decrease in ED visits from 3,999 visits within the cohort to 2,096 post enrollments. There was also a total reduction of \$1,446,280 in ED visits throughout the entire study ¹².

Figure 1. Hospital use (emergency department [ED] and inpatient [IP]).

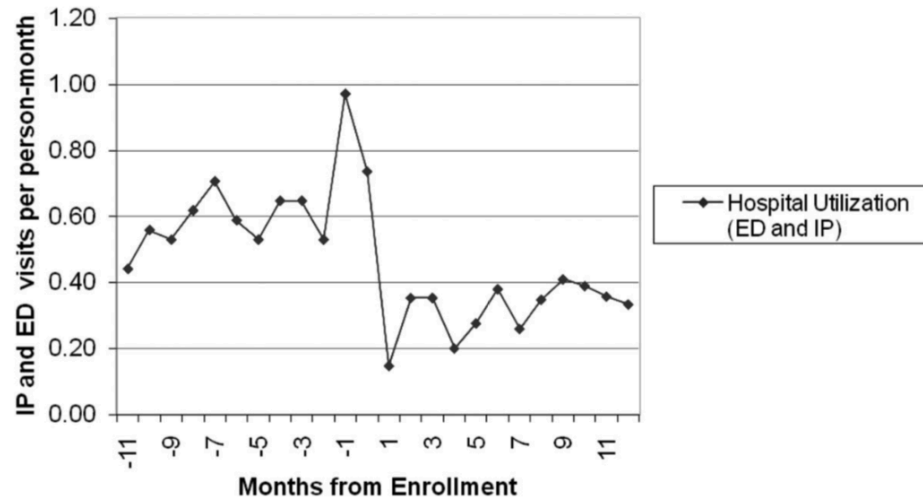


Figure 1: The emergency department (ED) and Inpatient visits (IP) of participants per month one-month pre and post program (Crane, 2012).

Type of Cost	Medians			P (Median Change = 0)	95% Confidence Interval for Median Change
	Pre	Post	Pre-Post Change		
Total (all hospital services)	\$21,022	\$14,910	\$-2,406	=.06	\$-6,361 to \$-430
ED	\$ 4,124	\$ 2,195	\$-1,938	<.01	\$-2,459 to \$-1,013
Medical inpatient	\$ 8,330	\$ 2,786	\$-1,082	<.01	\$-8,330 to \$0
Medical outpatient	\$ 476	\$ 612	\$ 94	=.38	\$-101 to \$273
Psychiatric inpatient	\$ 0	\$ 0	\$ 0	=.99	\$0 to \$0
Psychiatric emergency	\$ 0	\$ 0	\$ 0	=.99	\$0 to \$0
Physicians' professional fees	\$ 1,330	\$ 1,149	\$ -270	=.03	\$-464 to \$-113
Ambulance	\$ 2,269	\$ 1,135	\$ 0	=.93	\$-1,135 to 0

Figure 2: Hospital service costs 12 months pre- program and 12 months post case management enrollment (n=53) (Okin, 2000).

Literature Review: Mobile Health Care

A review of the literature yielded 1 study that specifically targeted frequent users of the ED. The majority of the studies done utilizing mobile health care did not focus on frequent ED users, but rather individuals with chronic diseases. Most of these studies yielded a decrease in ED use as well; however, they were excluded from the study because they did not specifically target frequent ED users.

The study spanned 60 to 90 days with a total of 64 participants (9). Participants were identified if they had 4 or more ED transports within a year and ED visits were compared 12 months prior to the program and up to 9 months after. The mobile integrated healthcare study took place in an urban setting. The study focused on individuals who were 18 years or older, who had the mental capacity to understand medical advice and who were able to seek health resources outside of the ED ⁹.

Mobile Health Care

Within the study, 64 individuals participated for 30 – 90 days. Two participants were active in the program for less than 30 days, 10 participants were active for 30-60 days, 28 participants were active for 61-90 days and 24 participants were active for more than 90 days ⁹. Of the participants, 38% had improved mobility, 70% had improved self-care, 40% experienced improvements with anxiety and depression and 60% did not experience a change ⁹. At the conclusion of the study, 9.38% of the participants indicated their health had declined due to the program, 17.19% indicated their health did not experience a change and 73.44% indicated their health improved from pre to post program. Overall, there was a 61% decrease in ED transports and 66% less ED admissions ⁹.

Literature Review: Permanent Housing

Within the literature review, 3 studies were identified by their work with homeless individuals with frequent ED use. Of the 3 studies, 2 did not have an age specification^{10, 18}, whereas one study required each participant to be 18 years or older¹⁹. All 3 of the studies had a control group of individuals who were eligible for the study but who were not enrolled as participants. Two out of the 3 studies were completed in urban areas^{10, 18} and the remaining study was completed in a rural area¹⁹. One study included more than 100 participants within the study and 2 of the studies had fewer than 100 participants^{10, 18, 19}. In terms of timing, one study followed each participant and recorded their ED use 6 months prior to the program and 6 months following the completion of the program^{18, 19}. Two of the studies offered monetary compensation to participants who were involved actively^{18, 19}. All 3 studies provided housing to each participant. Lastly, one study experienced the death of a participant and the death was related to the study as the participant overdosed while celebrating his housing placement¹⁰.

Permanent Housing

With all 3 of the studies, each had results that highlighted a decrease in ED visits and one study also had a decrease in ED costs. In the study by McCormack et. al (2013), there was a decrease in ED visits from 18.5 per person to 12 per person as well as a decrease in inpatient admissions: 12.5 per person to 5.5 per person (Fig. 3). In the second study completed by Larimer (2009) both a decrease in ED visits and ED costs were outlined. The study had a decrease in ED costs from a total of \$8175922, incurred by all who participated, to \$1492, after 6 months in the program and \$958, after 12 months. Lastly, the third study utilized a housing first model and had

a decrease in the ED use (29%) and hospitalizations (24%)¹⁹. All three were compared to a control group and all yielded a difference in ED visits that was statistically significant.

Health Care Utilization	Intervention Arm (n = 20), Median (IQR)	Prospective Controls (n = 20)		Retrospective Controls (n = 20)	
		Median (IQR) or Mean (95% CI)	P	Median (IQR) or Mean (95% CI)	P
ED visits					
6 mo before median	18.5 (10.0-26.5)	11.0 (8.0-17.0)		16.5 (7.0-25.0)	
6 mo after median	12.0 (4.5-18.5)	16.0 (9.5-21.0)		19.0 (14.5-35.0)	
Difference in differences		-12.1 (-22.1, -2.0)	.02	-12.8 (-26.1, 0.6)	.06
Inpatient days					
6 mo before median	12.5 (3.0-24.0)	6.5 (3.0-13.0)		7.5 (1.5-12.5)	
6 mo after median	5.5 (0.5-14.5)	6.0 (0.0-13.5)		22 (4.5-30.5)	
Difference in differences		-8.5 (-22.8, 5.8)	.24	-19.0 (-34.3, -3.6)	.02

Note. CI = confidence interval; ED = emergency department; IQR = interquartile range.

Figure 3: Health Care utilization 6 months before and 6 months after permanent housing intervention, as seen with participant and controls (McCormack, 2013)

Discussion

Case Management

The implementation of case management programs has shown a decrease in both the amount of times a frequent ED user utilizes the ED as well as the costs on the ED within a span of time. There were three main approaches to case management. The first was a care plan that was created and implemented within the hospital^{14, 15, 16}. The care group consisted of physicians, registered nurses, social workers, emergency physicians, chemical dependency providers, behavioral health registered nurses, case managers as well as representatives from local insurance providers¹⁶. These individuals would convene and discuss the best course of action for frequent ED users. The care plan would then be placed in the medical records of the patient and any time they come in the ED; a physician would utilize the plan to treat the patient. This plan included but was not limited to referrals to a care manager or specialists, as well as not giving out refills for medications. These plans could and did get updated over time to accommodate changes with the patients. The second kind of case management studied was care provided

outside of a hospital setting. These programs would assign a case manager to an frequent ED user and they would work with the patient in finding services they needed, assessing the safety within their home, accompany them to doctor's visits and helping them set up any medical needs they may be in need of ^{11, 13, 17}. These plans often worked on not only helping the patient but also providing education to them as well. The last kind of case management was more personalized care ¹². These programs occurred outside of a hospital setting and they worked to assess, plan, implement and evaluate along-side the patient. Patients would undergo goals setting, education and referrals with the case manager. The patient would then be connected to supportive networks that they may have needed. Lastly, the case management would connect the patient with contacts of different agencies and assist them with orientation of those needed agencies. Even though the execution of the case management program differed, they all yielded similar results in that there was a significant decrease in the number of times a frequent user visited the ED.

Mobile Health Care

The Mobile Health Care approach did experience a decrease in ED visits as well as ED transports. The integrated mobile health care pilot study that was reviewed implemented a 60-90-day intervention. The intervention included twice a week in home visits, health education, routine health screenings, phlebotomy and electrocardiograms (if needed) ⁹. The program also provided wellness exams, follow up care as well as transportation to appointments when needed. Each participant also received a 10-digit access number that could be utilized 24/7 by the patient to request a mobile integrate health visit and if they needed to call 911, dispatch would also notify the mobile integrated health team that "on demand" services were needed ⁹. The overall

goal of the program was to educate participants on health care and how to recognize problems within their own health as well.

The program was a success; however, there was a lack of other literature to be found that focused specifically on those who utilized the ED frequently. More information on this specific target group is needed in the future to determine if mobile health care provides lasting reductions to ED use.

Permanent Housing

Many of the programs that focused around permanent housing or housing first models targeted homeless individuals who had chronic diseases, mental illnesses and/or alcoholism. The three studies reviewed had a mix of all of these characteristics as well. All three of the studies provided housing to each participant and 2 of them provided housing after a hospital discharge. Within these programs, a homeless patient would be identified by hospital administrators and a social worker and the outreach team would be paged ^{10,19}. If the patient met all of the requirements to participate in the program, they would be offered a place to stay after being discharged. They would then be assigned a case worker who would work with the individual by coordinating multidisciplinary care as well as planning bi-weekly meetings with them ¹⁰. The studies differed in that one offered temporary housing and the others offered a more permanent housing situation ¹⁹. In two of the studies, participants were able to participate in interviews about their health and housing situation and in return were offered monetary compensation. In the study completed by Larimer (2009), individuals were not recommended into the program based on hospital discharge. Instead, this program drew participants from a list that was ranked in order of homeless individuals who had the highest total costs from frequent ED use in 2004.

Once identified, the program was based on a first found first assigned basis for housing. Individuals who were found were offered housing and access to on-site case managers who would work with each participant on substance abuse, life goals and with health care services. Most individuals would then move on into a more permanent housing situation.

Funding

Few of the studies outlined the funding they received and or utilized to complete their pilot study. Crane et. al (2012) outlined that funding for their study was received through grants from the North Carolina Healthnet program as well as from the Margaret R. Pardee Hospital Charitable foundation. These grants are geared for programs that aim towards the low-income and uninsured populations. Additionally, with the Deficit Reduction Act of 2005, \$4 million was provided for grant funding for states to build and establish alternative nonemergency networks ¹³. Lastly, the pilot program for the mobile healthcare program was funded by a grant that was awarded to the study by Medstar Mobile integrated health ⁹. Some programs occurred within the hospital and did not require additional funding others did not outline the funding they utilized. There were also some limitations that were mentioned within some of the studies that were caused by the lack of funding.

Limitations

There are limitations to this study as some literature had to be excluded on the basis that it did not follow all of the required criteria. Additionally, many of the studies outline specific limitations they experienced within their research. The largest limitation was funding. Two of the studies outlined that they were limited on the number of participants they could have due to the

lack of funding. This also limited the results they found. A limitation/challenge that was discussed in many of the studies and literature, about mobile health care, was that the costs of the programs were higher and there was a lack of training for paramedics. In order for the programs to be a success, EMS would require more training, which would require more funding. The largest limitation with all three of these approaches is that each study focused on a very small cohort of individuals, but the groups are not representative of all the frequent ED users. Some of the studies also outlined that their cohort did not represent the geographical area they were in ^{9,15}. Most of the studies are test pilots, but there are limitations if the pilot were to be tested on a larger group of individuals.

Overall:

Throughout all of the studies and literature reviews completed, there is a clear distinction that case management provides one of the largest decreases in ED costs and usage. This approach also had the most abundant and accessible information available for our target group, frequent ED users. A majority of the studies do have a combination of one or more of these approaches. Some incorporate permanent housing and case management, as they can both be beneficial to the participants. This also indicates that combining two or more of these approaches could yield greater results on the tested cohort. Additionally, there needs to be more information provided on mobile integrated health systems that focuses specifically on frequent ED use. There is not enough available information to make a claim for or against the approach. Altogether, the usage of EDs can be decreased to ensure each patient is receiving the health care that they need without the worry of overcrowding or subpar care when these approaches are utilized.

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