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Mobilized Healthcare: The Future of Accessible Medicine

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By

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Abstract

This literature review discusses the impact that MIH teams can have in our health system. It is well known that there are communities that benefit from MIH teams such as rural or underserved areas; however, this paper discusses a variety of other demographics that may benefit from implementation of MIH teams. It will also evaluate how MIH teams alter patient Emergency Department (ED) visits, hospital admissions, facility spending, and patient outcomes. MIH is a form of preventative medicine that may be better optimized by healthcare facilities going forward, and this article helps to weigh the pros versus cons of MIH team implementation in local communities. Databases utilized for the initial article search were Google Scholar, Cochrane, Elselvier, and PubMed. Keywords for the initial search included mobilized integrated healthcare, patient outcomes, rural communities, urban communities, hospital spending, and hospital admissions. The search yielded 2,522 articles prior to the exclusion criteria being implemented which was publication dates being prior to 2017, studies that were not primary research, not in the English language, and had limited quantitative data or small sample sizes. Ultimately 10 articles were included in the final review. Current literature demonstrates how MIH teams can help reduce overall hospital and ED admissions as well as decrease hospital spending and show patient outcome improvement overall. These findings further support the concept that communities should initiate MIH teams more abundantly.

Key Words: Mobile Integrated Healthcare teams, Patient Outcomes, Rural Communities, Urban Communities, Hospital Spending, Hospital Admissions

Introduction

Mobilized Integrated Healthcare (MIH) is an innovative approach to healthcare delivery that leverages mobile technologies and integrates them into a cohesive and interconnected healthcare system. This model aims to enhance the overall quality of patient care by seamlessly combining various elements of healthcare services through mobile clinics, digital platforms, and comprehensive care coordination. The overarching goal of MIH is to make healthcare more accessible, efficient, and patient-centered. By incorporating mobile technologies into the healthcare system and fostering collaboration among various stakeholders, MIH seeks to improve patient outcomes, optimize healthcare spending, and provide more tailored and responsive care to individuals across diverse demographic groups.

MIH teams have the potential to benefit a wide range of individuals, but certain populations may experience particularly significant advantages. For example, MIH teams can optimize care for chronic disease patients by aiding in management of medications and providing timely interventions, thus preventing complications. Rural communities are yet another population that may benefit from MIH teams, as patients in these regions often have limited access to healthcare. They can be more readily cared for via telehealth, mobile clinics, and remote monitoring.

The feasibility of implementing MIH depends on various factors, including the healthcare system's specific goals, scope, and infrastructure. The upfront costs of implementing MIH can include investments in technology infrastructure, development or acquisition of mobile applications, integration with existing healthcare systems, and staff training. While these costs can be substantial, they may be offset by potential long-term savings and improved efficiency. Assessing the feasibility of MIH should consider the potential return on investment, such as cost savings, improvements in patient outcomes, reduced hospital readmissions, and increased efficiency in healthcare delivery. Demonstrating the positive impact of MIH can enhance its long-term viability. Healthcare organizations need to conduct thorough cost-benefit analyses, consider the unique characteristics of their patient populations, and assess their capacity to adopt and sustain MIH over time. Advances in technology and evolving healthcare models may also contribute to increased feasibility as the field matures.

Statement of the Problem

Adequate healthcare accessibility is not evenly distributed amongst urban and rural communities. Currently, there are many communities that suffer from poor access to healthcare treatment and routine health management. Additionally, hospitals routinely admit many patients that suffer from preventable healthcare conditions which can increase overall hospital spending. This brings to question whether compared to traditional emergency medical services (EMS), are mobile healthcare teams a safe and effective tool to reduce emergency department (ED) visits and hospital admissions?

Methods

A comprehensive literature review was conducted across electronic databases, including Google Scholar, Cochrane, Elsevier, and PubMed. The search utilized both keywords and MESH terms such as MIH, hospital admissions, emergency department admissions, rural communities, and patient outcomes to identify literature related to MIH and Community Paramedicine (CP). The literature search included studies discussing topics such as emergency department readmissions, hospital inpatient readmissions, patient health outcomes, and hospital readmission costs. The search was limited to articles published from 2010 onwards. Articles were then examined to identify relevant sources.

The initial searches yielded a total of 2,522 studies related to MIH and 456 studies related to community paramedicine. Studies prior to 2017 were excluded, which was five years prior to the initiation of this research analysis. Additionally, studies that were not primary research, not in the English language, and had limited quantitative data or small sample sizes were excluded. Ultimately, 10 studies met the criteria for inclusion, examining the impact of MIH on emergency department readmissions, hospital inpatient readmissions, patient outcomes, or hospital readmission costs.

Literature Review

ED Visits Amongst Patients with Access to Mobile and Integrated Medical Teams

Mobile integrated health and hospital utilization for congestive heart failure in a rural setting

This retrospective propensity score matched case-control study evaluated participants of an MIH program that was associated with a rural Pennsylvania health system. It analyzed emergency department utilization and inpatient admissions surrounding participants with congestive heart failure between April 2014 and June 2020. This study analyzed whether MIH programs reduced emergency department and inpatient utilization amongst participants diagnosed with congestive heart failure.

This retrospective case-control investigation sought individuals who participated in a MIH program associated with a rural Pennsylvania healthcare system, spanning from April 2014 to June 2020. According to Bourdages et al. (2023), for each patient, congestive heart failure (CHF) was a key diagnosis, and the participants were disqualified if they had any non-CHF hospital admissions between their CHF admission and their first MIH encounter. The control group consisted of participants involved in CHF-related emergency department and inpatient visits that took place within the same time frame but had never participated in an MIH program. The study excluded individuals under the age of 18, encounters lacking admission date and time information, and encounters that occurred at hospitals where there were no MIH participants. This study had a 1 to 3 ratio following 1237 cases alongside 3711 matched controls. Average age amongst the interventional group was 71.6 years (SD=13.1) while the average amongst the control group was 71.3 years (SD=13.9). The intervention group included 691 men and 546 women, and the control group contained 2074 men and 1637 women. Due to propensity score matching, the two groups had similar percentages regarding the varying ethnicities and past medical history of stroke, hypertension, coronary artery disease, and diabetes.

For this study, the MIH unit was comprised of two paramedics and a physician. The MIH unit's intervention tactics include home visits where patient education, medication reconciliation, care coordination, and diuretic administration was utilized to prevent the need for hospitalization in cases of heart failure. Quantitative data assessed the participants' ED admissions and inpatient admissions 30, 90, and 180 days both prior to and following admittance into the study. To compare utilization between the treatment and control groups during these periods, Generalized Estimating Equation (GEE) models were employed. These were used to assess utilization of ED and inpatient services both prior to and during utilization within each group, and to compare changes in utilization between the case and control groups.

MIH case participants and controls displayed comparable utilization of ED services within the 30-day period before the initiation of the study ($p = 0.76$). However, in the post-period, there was a significant ($\Delta = -3.2\%$) decrease in 30-day ED utilization among cases [95% CI: -5.4%, -1.1%], while there was no significant change ($\Delta = 0.4\%$) among control group participants [95% CI: -1.0%, 1.8%]. Importantly, the overall reduction in 30-day ED utilization among cases versus controls was $\Delta = -3.6\%$ [95% CI: -6.1%, -1.1%]. Similarly, ED utilization within the 90-day period preceding the index encounters was similar with 20.9% use in case and 20.4% use in control groups ($p = 0.71$). However, in the post-period, ED utilization significantly decreased ($\Delta = -3.2\%$) among cases [95% CI: -6.1%, -0.4%], while controls showed no significant change ($\Delta = 0.02\%0$ [95% CI: -1.4%, 1.9%]. Overall, at day 90 of the intervention, ED utilization between case and controls was significant ($\Delta = -3.5\%$) [95% CI: -6.7%, -0.2%]. When examining ED-only utilization within the 180-day period both before ($p=0.64$) and after (p=0.32) initiation of the study encounters, MIH case participants and controls displayed no significant differences.

MIH case participants and controls demonstrated comparable patterns of inpatient utilization within the 30 days [95% CI: 0.75, 1.06], (p = 0.20), 90 days [95% CI: 0.88, 1.15], (p=0.95), and 180 days [95% CI: 0.81, 1.05], (p=0.23) leading up to their index encounters. When assessing changes in inpatient utilization within the 30-day period following the index encounter, there was no significant difference between cases and controls (p = 0.34). Similarly, at the 90 and 180-day intervals, the changes in inpatient utilization among cases did not diverge significantly from those observed in the control group (p = 0.56 and p = 0.43).

MIH case participants and controls exhibited similar levels of CHF-related ED-only utilization within the 30 day [95% CI: 0.79, 1.19], (p = 0.77), 90 day [95% CI: 0.88,1.20], (p=0.71), and 180 days [95% CI: 0.84, 1.11], (p=0.65) preceding their index encounters. Although the control group demonstrated a noteworthy increase in utilization from the pre-index to post-index period (Δ = -1.0%; p=0.03), the difference in pre/post utilization change between cases and controls was not statistically significant [95% CI: -2.6%, 0.6%]. At the 90-day interval leading up to their initiation of the of the study, 5.9% of cases experienced CHF-related ED-only encounters, compared to 6.5% of controls (p = 0.39). During the 90-day post-period, ED utilization increased to 8.0% for cases and 8.9% for controls. However, the change in ED utilization among cases did not significantly differ from that among controls [95% CI: -2.5%, 2.0%]. Within the 180-day timeframe, both cases [95% CI: 1.30, 2.10], (p<0.0001) and controls [95% CI: 1.16 , 1.52] (p<0.0001) saw substantial increases in CHF-related ED-only encounters in the post-period. Nevertheless, the change in pre/post utilization between cases and controls was not statistically different (Δ=2.2%); [95% CI: -0.5%, 4.9%].

Before their index encounters, MIH case participants and controls had comparable levels of CHF-related inpatient utilization within the 30-day period ($p = 0.25$). Notably, the control group experienced a significant increase in utilization from the pre-index to post-index period (Δ=2.9%; p=0.0001), yet the difference in pre/post utilization change between cases and controls was not statistically significant ($p = 0.30$). Within the 90-day period leading up to their index encounters, MIH case participants had higher CHF-related inpatient utilization compared to controls [95% CI: 1.2%, 6.5%], ($p = 0.005$). During the post period, inpatient utilization remained similar for cases ($p = 0.05$) but experienced a significant increase for controls ($p < 0.0001$). Both MIH case participants and controls demonstrated similar CHF-related inpatient utilization within the 180-day period preceding their index encounters ($p = 0.05$). In both groups, there were significant increases in utilization from the pre-index to post-index period. However, the change in pre/post utilization between cases and controls was not statistically different ($p = 0.27$).

Examination of the MIH program reveals its effectiveness in providing community-centered care that reduces emergency department visits for all causes. Though it appears via the results of this study that the use of MIH units may most notably decrease overall use of ED visits, not just those affiliated with heart failure.

Using community tele-paramedicine to reduce unnecessary emergency department visits and 30-day readmissions among high-risk patients with heart failure

Patients with heart failure (HF) often experience frequent 30-day readmissions and visits to the emergency department (ED) per Daniels et al. (2019). Ideally, early contact with a physician within seven days of discharge can improve outcomes, but this has been challenging to implement due to obstacles like appointment availability, low patient attendance, and transportation difficulties. The goal of this study was to evaluate the viability of an inventive initiative called Community Tele-Paramedicine (CTP) for HF patients who are at a high risk of early readmission, particularly at a major urban tertiary care center. This study helps determine if a CTP program is a feasible way to decrease hospital readmissions for heart failure patients after discharge.

In a collaborative initiative involving the ED, cardiology, and hospital-based EMS, acute care evaluations were provided as needed for recently discharged HF patients who had been identified as high-risk by a cardiologist within the healthcare system. This study had 25 participants enrolled. Of note, the average age of participants and ethnicities were not included in the final publication of this study. No additional demographics of participants in this study were involved in final publication.

Due to this study being a single cohort evaluated prior to and following an intervention, this is not a blinded study. Quantitative data was analyzed regarding the number of patient ED visits and hospital readmissions while in a control period and then an intervention period. Paramedics and emergency medicine physicians conducted home visits. These home assessments included a physical examination, ECG, and medication review. Paramedics were authorized to administer oral or intravenous medications, and emergency physicians could consult with HF cardiologists as required. This analysis focuses on the healthcare utilization patterns of this high-risk patient group during both the intervention and control periods. The CTP program was implemented for two 6-month intervals, specifically between November 2017 and May 2018 and between December 2018 and May 2019. Data regarding ED visits and hospital admissions was extracted from the electronic health record, additionally encompassing the six months prior to the introduction of CTP. Per Daniels et al. (2019), rates of inpatient admissions, 30-day readmissions, and ED visits were calculated both overall and per 30 days of enrollment.

During the two 6-month pilot studies, 25 participants were enrolled and monitored for a total of 1015 patient-days, averaging about 40 days per patient. A total of 78 home visits were conducted as part of the Care Transition Program (CTP), with an average of 3.1 visits per patient, ranging from 1 to 16 visits. Among participants who received CTP visits within seven days of discharge, only one admission occurred within 30 days of discharge, accounting for an 8.3% 30-day readmission rate. In comparison, the 30-day readmission rate for the same group of heart failure patients during the control interval was 33% without CTP, or 32 of 98 discharges. Overall, there were 0.32 admissions per 30 patient-days [95% CI: ±0.09] compared to 0.12 admissions per 30 patient-days [95% CI: ±0.21] while participants were in the CTP. The total number of emergency department (ED) visits for participants averaged about 5.3 visits per patient, equivalent to 0.44 [95% CI: ±0.13] visits per 30 patient-days. For participants in the CTP program, the average number of ED visits was 0.2 or 0.15 [95% CI: ±0.2] visits per 30 patient-days within the CTP program.

Participants who gained the most from the Care Transition Program (CTP) were those who visited shortly after leaving the hospital and additionally needed multiple CTP visits to prevent readmission. Although not reaching statistical significance, initial findings suggest that CTP has the potential to lower emergency department (ED) visits and reduce 30-day readmissions.

A pilot MIH program for frequent utilizers of emergency department services

This small retrospective study followed participants who frequently used the ED and assessed their quality of life (QoL), ED transport, ED admissions, and hospital admissions pre-and post- program enrollment. This study looked to determine if MIH programs could improve QoL while reducing emergency department and hospital utilization.

Participants were required to have (1) been transported to the ED ≥ 4 times within a 1-year period during 2013–2015 seeking treatment for a non-emergent or emergent/primary care treatable condition, (2) the mental capacity to follow medical advice, (3) the willingness to engage in navigational assistance, and (4) the ability to proactively seek health resources outside the ED. Participants were excluded if they were: (1) pregnant, (2) receiving chemotherapy or radiation for active malignancies, (3) younger than 18-years old, (4) homeless without shelter, (5) lacking mental capacity to understand disease management, (6) unwilling to allow MIH team members to enter their home, (7) unwilling to be linked to a medical home physician or clinic, (8) actively abusing substances with no intent to abstain, and (9) deemed ineligible by the EMS agency medical director. Sixty-four participants were included in this study, of which 30 were men and 34 were women with the average age of 49.7 years (SD=13.5). Amongst the participants of this study, 42% were black, 34% white, and 24% of other ethnicity. The study cohort was urban city residents in an underserved metropolitan area community.

Information was gathered from 42 participants 12 months prior to implementing MIH teams, and then those enrolled were observed for nine months during MIH team implementation. During the enrollment period, the program delivered twice weekly at-home visits. At these visits, health education, screenings, vitals, injections, EKGs, phlebotomy, and medication management was provided among other things. The same members are included in both the pre and post implementation group. Qualitative information on the participants' perception of their own well-being was measured as well as number of ED transports, ED admissions, and hospital admissions. Results were measured by conducting interviews as well reviewing electronic medical records of those participating in the study.

According to Nejtek et al. (2017), out of the 48 participants, six individuals (38%) experienced enhanced mobility, 14 individuals (70%) saw improvements in their self-care abilities, 26 individuals (57%) reported performing their usual activities better than before participating in the program. Additionally, 20 individuals (42%) of the 48 participants who had moderate to extreme pain or discomfort prior to the MIH program reported experiencing no pain or discomfort upon program completion. Among the 48 participants who reported moderate to extreme anxiety or depression before the program, 17 individuals (40%) showed improvement, while 26 individuals (60%) experienced no change in their condition.

In terms of self-ratings using the Visual Analog Scale (VAS), 9.38% (six participants) believed their overall health had declined, 17.19% (11 participants) indicated that their health remained the same, and a substantial 73.44% (47 participants) reported improvements in their health, with a significant increase of 31.5% from pre- to post-program assessments (medians increased from 50 to 70; confidence interval 10 to 20; $\Delta = -5.26$, $p < 0.001$, $r = 0.66$). After program completion, there was a significant reduction in post-program ED transports compared to the pre-program period ($\Delta = -5.29$, $p < 0.000$). Likewise, there was a notable decrease in both ED admissions ($\Delta = -6.28$, $p < 0.001$) and inpatient hospital admissions ($\Delta = -2.94$, $p = 0.003$) when comparing the pre-program and post-program data. When looking at the means before and after the program, participants experienced a substantial decrease, with 61% fewer ED transports (5.34 ± 6.0 vs. 2.08 ± 3.3), 66% fewer ED admissions (9.66 ± 10.2 vs. 3.30 ± 4.6), and 56% fewer inpatient hospital admissions (3.11 ± 5.5 vs. 1.38 ± 2.5) at the completion of the program.

The results from this small retrospective program evaluation suggest that MIH participation was associated with improved QoL as noted in overall surveys conducted, fewer ED transports, fewer ED admissions, and reduced inpatient admissions. As with any study gathering qualitative data from surveys, it is difficult to determine if there is a self-report bias when participants answered QoL questions.

Hospital Admissions amongst Patients with Access to Mobile Medical Teams

Use of post-discharge emergency medical services to reduce hospital readmissions: Does it work and is it economically feasible

The study performed by Geskey et al. (2020) examined a novel healthcare delivery model that uses emergency medical services (EMS) to provide care transitions and ongoing chronic care at participants' homes. Through a retrospective case-controlled analysis, the study aimed to determine if EMS home visits to recently discharged participants from the same service area could reduce 30-day unscheduled ED visits and hospital readmissions. Additionally, the research assessed the financial impact on both the community-based EMS provider and the hospital from which participants were discharged. This study analyzed whether EMS home visits help reduce 30-day readmission rates in post discharge participants.

Between January 2018 and April 30, 2019, individuals residing in area code 43026 were identified by the case management team. The study employed the LACE (Length of stay, Acuity of admission, Comorbidities, ED visits) index, a validated tool, to assess the risk of death or unplanned readmission within 30 days of hospital discharge. Participants with a LACE index score of nine or higher, which is calculated within the electronic medical record, had their demographic information electronically relayed to EMS by the case manager. Subsequently, if the patient consented, a home visit was scheduled within 36 hours after discharge. This study followed 53 individuals in the intervention group alongside 53 matched controls. Each group contained participants with an average age of 62 years and included 21 men and 32 women per group. Both groups contained 42 Caucasian individuals, six African American individuals, and five individuals of other ethnicities not specified. Additional demographics that were evaluated included average LACE score which was 13 as well as type of insurance. Amongst both groups 37 individuals in both groups had government insurance, 10 had private-pay insurance, and 6 were uninsured.

The study gathered the following data for each patient who received the intervention: their age, gender, insurance status, diagnosis, LACE index score, and whether they had received additional case management intervention along with the EMS home visit. In parallel, for every patient who underwent the home intervention, there was a matched control patient. At the completion of this study, several outcomes were measured including the number of post-discharge ED visits and hospital readmissions as well as the cost of services and hospital reimbursement. Two chi-square analyses were conducted. The first one compared the percentage of participants with one or more ED visits between the home intervention group and the control group. The second analysis compared the percentages of participants with one or more readmissions between the home intervention group and the control group. The financial data were obtained from hospital billing sources. They encompassed variables such as total charges, estimated reimbursement, variable costs, contribution margin, fixed costs, total costs, estimated profit, and the length of stay for admitted participants. Variable costs covered expenses related to healthcare worker supplies, patient care supplies, diagnostic and therapeutic supplies, and medication. Contribution margin represented what remained after deducting the variable cost of delivering the product or service. Fixed costs included expenditures like salaried labor, building maintenance, and equipment. EMS expenses were calculated based on the salary and benefits of the personnel involved in the home visit, which were then converted into an hourly rate. This rate was multiplied by the duration of time spent on the intervention. Following this calculation, the mileage reimbursement, compliant with federal standards, that EMS received was subtracted to determine the total cost of the intervention.

In the intervention group, there was a tendency toward a decrease in both ED visits (p=0.3381) and readmissions (p=0.3532), but these changes did not reach statistical significance. The overall cost incurred by EMS for delivering the home intervention amounted to $1,937. Among the 53 participants in the non-intervention group, 15 (28.3%) were either Medicaid recipients or dual-eligible for both Medicare and Medicaid. Of these 15 participants, five (33%) experienced either a 30-day post-discharge ED visit or readmission, contributing to $7331 of the total $9915 hospital loss (73.9%). In contrast, among the 53 participants in the intervention group, 12 (22.6%) were either Medicaid recipients or dual-eligible for both Medicare and Medicaid. Among these 12 participants, 3 (25%) had either a 30-day post-discharge ED visit or readmission.

Though this study did not show a statistically significant decrease in overall hospital readmissions, on a larger scale this study may indicate that there is decreased readmission and ED visits amongst post discharge patients who have regular follow-up via EMS. Additionally, this study did demonstrate mild financial benefit to hospital systems if they pursued post-discharge follow-up.

Mobile integrated health to reduce post-discharge acute care visits: A pilot study

This was a retrospective cohort analysis of a quality improvement regarding the use of specially trained paramedics in a MIH team to bridge the gaps in local healthcare delivery. This study sought to determine if MIH teams were efficacious at reducing acute care hospitalizations.

Per Siddle et al. (2018), participants for the study were required to be diagnosed with one of the following diseases, Chronic Obstructive Pulmonary Disease, Pneumonia, Myocardial Infarction, or Heart Failure. Non-English-speaking participants were excluded if they did not readily have an English translator present after the initial visit. Of the 203 participants included in the study, 51% were male and 49% female. More specifically, 51% were Black, 46% were white, and 3% were of another ethnicity. The average age of participants was 58.6 years old with a standard deviation of 10.5 years.

They observed participants for 90 days prior to and following the implementation of MIH teams. The same members are included in both the pre and post implementation groups. At the completion of the study, Primary care visits, ED visits, Observational stay visits, Hospitalizations, Number of days hospitalized, and number of days in ICU were measured pre and post MIH team implementation. Information for these results was gathered from interviews as well as through accessing electronic medical records.

After analyzation of the 203 participants in the study, it was noted that inpatient critical care (ICU) hospitalizations were decreased by 82.7% with a p value of 0.001 after implementation of a MIH team. Additionally, medical floor hospitalizations likewise decreased by 81.4% following intervention ($p = 0.001$). Pre-MIH implementation, three ICU stays and 140 medical floor stays were recorded. These visits decreased to zero and 26 following the implementation of MIH. ED visits and observation unit stays increased by 5.6% and 11.6% respectively, but not significantly for ED visits ($p = 0.98$) and observation unit stays ($p = 0.30$).

The total number of ED visits went from 18 to 19 after the intervention was in place. Furthermore, observation stays increased from 95 to 106.

This study demonstrated a reduction in critical care and medical floor hospitalizations. Therefore, it supports the potential benefits and value of implementing MIH care-delivery model on a larger scale in communities.

Hospital Spending in Areas where there is Implementation of Mobile Medical Teams

Implementing mobile health–enabled integrated care for complex chronic patients: Intervention effectiveness and cost-effectiveness study

This study conducted a trial in a rural region of Catalonia, Spain, to evaluate the effectiveness and cost-effectiveness of implementing an integrated care model for elderly patients with chronic obstructive pulmonary disease or heart failure, along with their caregivers. The integrated care model, called CONNECARE, was supported by an eHealth platform, which included a patient self-management app, integrated sensors, and a web-based platform connecting healthcare professionals from different settings. The study aimed to assess the impact of this mobile health (mHealth)-enabled integrated care model on health status, unplanned healthcare visits and admissions over a 6-month period, and its cost-effectiveness. Integrated care was expected to improve healthcare efficiency by streamlining care delivery and focusing on patient-centered preventive approaches. The authors of this study wanted to determine if the implementation of a mobile health (mHealth)-enabled integrated care model was an effective way to manage patients with complex chronic diseases.

Patients were recruited upon hospital admission through the emergency room (ER). Identification of eligible patients relied on electronic medical record (EMR) data, and a case manager reached out to them before their discharge. Once patients were recruited for the intervention group, an active search began to find a comparable control group with similar characteristics. Regardless of whether they were part of the study group or the control group, all patients and their caregivers received a personal explanation about the study through face-to-face interactions. A total of 112 patients underwent eligibility screening. After excluding those who did not meet the inclusion criteria, 52 patients were enrolled in the mHealth-enabled integrated care group, while 35 patients were enrolled in the control group. The final analysis included 48 patients from the integrated care group and 28 patients from the control group who successfully completed the follow-up. The average age amongst the interventional group was 82 (SD=7 years) while the average age amongst the control group was 82 (SD=8 years). The intervention group included 24 men and 24 women, and the control group contained 17 men and 11 women. Data was not provided to determine the differences or similarities in the ethnic background of the participants. Additional health characteristics that were considered between the two groups include the participants' Barthel scores, LACE scores, HAD anxiety score, HAD depression score, and GDS score. In these respective categories the intervention group scored 90 (67.5 to 100), 14 (12 to 17), 4.3 (±2.7), 5.7 (±2.3), and 44 (92%). Comparatively, the control group scored 90 (72.5 to 95), 15 (13 to 17), 4.9 (±3.5), 5.6 (±2.9), and 27 (96%).

The study collected various patient characteristics such as age, gender, primary chronic conditions, comorbidity assessment, quality of life, daily living activities, mental health status, dwelling characteristics, medications, tobacco, and alcohol consumption. The main study objectives included assessing the intervention's effectiveness by measuring changes in participants' physical and mental health domains using the SF-12 questionnaire (a quality-of-life questionnaire), tracking healthcare resource usage and associated costs over six months, and determining cost-effectiveness by analyzing improvements in quality of life relative to costs using the incremental cost-effectiveness ratio (ICER). Additionally, the study examined whether hospital admissions or healthcare visits were related or unrelated to participants' chronic diseases. The similarities and differences in demographics between the intervention and control groups can be seen below for accurate visualization of comparisons in data between the control and intervention groups.

Table 1

Baseline characteristics of patients in the usual care and integrated care (IC) arms.

Characteristic	Usual care (n=28)	IC (n=48)	*P* value[a]
Sex (male), n (%)	17 (61)	24 (50)	.37
Age (years), mean (SD)	82 (8)	82 (7)	.88
Charlson score, mean (SD)	7.4 (2.1)	6.7 (2.0)	.15
LACE[b] score, median (IQR)	15 (13-17)	14 (12-17)	.38
Barthel score, median (IQR)	90 (72.5-95)	90 (67.5-100)	.40
HAD[c] anxiety score, mean (SD)	4.9 (3.5)	4.3 (2.7)	.44
HAD depression score, mean (SD)	5.6 (2.9)	5.7 (2.3)	.95
Pfeiffer intact intellectual functioning, n (%)	21 (75)	37 (77)	.67
GDS[d], no cognitive decline, n (%)	27 (96)	44 (92)	.25

[a]χ^2 test, *t* test, or Kruskal-Wallis equality-of-populations rank test, as appropriate.

[b]LACE: Length, Acuity, Comorbidities, and Emergency score.

[c]HAD: Hospital Anxiety and Depression scale.

[d]GDS: Global Deterioration Scale.

Three major outcomes were measured through the progress of this study. First, changes in the health status of participants were analyzed via participants filling out a SF-12 domain. Second, the total number of health services during the follow-up period was likewise studied. Finally, the average cost per patient and cost-effectiveness of all unplanned visits were also analyzed throughout the study. Patient characteristics were gathered at recruitment using electronic devices with the SACM system, which included information such as age, gender, primary chronic conditions, the Charlson comorbidity index, quality of life assessed through the SF-12 survey, Barthel index for daily living activities, Hospital Anxiety and Depression scale results, assessment of dwelling conditions, primary medications, the Pfeiffer mental status questionnaire, and details about tobacco and alcohol consumption. Per de Batlle et al. (2021), the primary study objectives included: (i) assessing the effectiveness of the intervention by measuring changes in the SF-12 health questionnaire's physical and mental domains from baseline to discharge; (ii) examining healthcare resource utilization over a 6-month period, along with estimated costs based on data from the Catalan Health Department, with all costs reported in US dollars; and (iii) evaluating cost-effectiveness, which involved analyzing improvements in quality of life relative to costs using the incremental cost-effectiveness ratio (ICER). Data on healthcare resource usage, including hospital admissions, emergency room visits, primary care visits, and specialist visits, were extracted from electronic medical records (EMRs). Additionally, each admission or visit was categorized as related or unrelated to the patient's chronic diseases, creating a binary variable for analysis.

The study conducted by de Batlle et al. (2021) examines how the QoL, as measured by SF-12 domains, changed from the beginning to the end of the study. In the integrated care group, participants experienced a noteworthy improvement in the SF-12 physical domain and the overall SF-12 scores. Although the QoL improvements were in favor of the integrated care participants, these differences did not reach statistical significance. The integrated care group saw a change in physical domain of +3.7 while the control group only changed +2.0 points via the surveys. This provided p-values of 0.004 and 0.16. Likewise, for a mental domain, the integrated group had an overall score change of +2.0 while the control group had a mental domain change of -1.2 points. These changes provided p-values of 0.21 and 0.59 respectively.

The study further indicates that participants receiving integrated care had a substantial 57% reduction in unplanned healthcare visits, which was statistically significant with a p-value of 0.001. This value was then adjusted via the negative binomial regression model for age, sex, and Charlson score to a p-value of 0.004. Additionally, these integrated care participants also saw a 50% decrease in hospital admissions linked to their primary chronic conditions with an adjusted p-value of 0.32, although this difference did not reach statistical significance. Finally, at the completion of the study, the integrated care program resulted in savings ranging from US $584 to $1,434 per patient, depending on different scenarios. Importantly, it was deemed cost-effective based on the Incremental Cost-Effectiveness Ratio (ICER). The program not only appeared to improve the quality of life (QoL) for participants but also reduced overall healthcare expenses.

The adoption of a patient-centered mHealth-enabled integrated care model, which empowers participants and connects healthcare professionals from various settings, resulted in reduced unplanned healthcare system interactions and lowered costs. It also proved to be a cost-effective approach, highlighting the effectiveness of using mHealth tools to implement integrated care across different healthcare organizations.

MIH intervention and impact analysis with a medicare advantage population. Population Health Management

The healthcare system in the United States has been facing growing challenges, including elevated costs and inconsistent quality of care, which have led to reforms focusing on value-based reimbursement models. A study by Roeper et al. (2018) examines the cost-effectiveness of introducing a team-based MIH approach within the Medicare Advantage population. Additionally, a sub-analysis within the study investigates 30-day readmission rates for both the intervention group and the control group. This study evaluated whether MIH programs reduce emergency department visits, hospital readmissions, and overall hospital spending in Medicare advantage population patients.

This retrospective observational study focuses on high-risk participants from a Florida-wide population. The program uses predictive models to identify high-risk individuals based on claims data and employs various outreach methods like mail, phone calls, and emails to engage consenting members. Enrolled members are placed in one of three evidence-based MIH intervention programs based on their needs: transition of care, high-risk chronic illness management, or palliative support for advanced chronic disease management. Physician assistants or nurse practitioners, supervised by physicians, develop standardized care plans for enrolled members, guiding team-based care coordination and intervention in collaboration with primary and specialist providers. This study followed 1,074 total cases alongside 1,241 matched controls. Average age amongst the interventional group was 73.56 years, while the average age amongst the control group was 74.63 (p=0.0700). The intervention group included 447 men and 627 women, and the control group contained 534 men and 707 women. Though control subjects were matched to intervention subjects in terms of ethnicity, this data was not included in the final published article. Additional demographics that were evaluated and matched included percentages of participants with a history of CHF, COPD, coronary artery disease, diabetes, dementia, chronic kidney disease, and stroke/TIA.

Participants in the MIH intervention program from November 2015 to February 2016 were placed in the intervention cohort. Since the control group was matched to the intervention group based on propensity score matching, including HCC risk scores, demographics, and potentially avoidable costs, the study team determined that there are no significant differences between the two groups in terms of gender, age, risk scores, or comorbidities. As a result, these two groups are suitable for comparison.

The study team began by taking the risk-adjusted Per Member Per Month (PMPM) cost for the intervention cohort during the 6-month period before the intervention, which was $359.59 and compared it with the post intervention costs which were $317.77 a month. A more detailed breakdown of costs pre and post intervention in comparison to the control group can be seen in Table 2 provided by Roeper et al. (2018). They projected this cost forward using the risk-adjusted trend from the control cohort, which was 4.1% per month. Next, they applied the risk score to this trend-adjusted PMPM for the intervention cohort and subtracted the actual PMPM for the group to determine savings. Per Roeper et al. (2018), this resulted in a net savings amount of more than $2.4 million over the 6-month program duration. Even though both groups were matched using propensity scores before the study, it is worth noting that the intervention cohort had higher readmissions per 1,000 members prior to the intervention. During the program, the trend for 30-day readmissions showed a 14% increase for the control cohort but a 2.7% decrease for the intervention cohort. This aligns with the earlier findings of reduced ED and inpatient medical costs and utilization, as fewer readmissions would naturally lead to lower ED and inpatient medical costs and utilization. Patient activation scores were collected initially and periodically during the intervention, and the data showed a 7.5% increase in activation scores in the high-risk intervention group. This increase aligns with the observed cost savings, as improved patient engagement and activation are known to reduce costs. Additionally, member satisfaction was high, with the majority of members expressing positive views about provider communication and a willingness to recommend the program to others. Overall, the results indicate that enhancing patient activation can contribute to better outcomes and experiences in healthcare interventions.

TABLE 2. PER-MEMBER PER-MONTH COSTS, UTILIZATION, AND TRENDS: RISK ADJUSTED PER-MEMBER PER-MONTH AND UTILIZATION PER 1000

	pre	*post*	*diff*	*pre*	*post*	*diff*	
	Intervention (n = 992)			*Control* (n = 995)			P *value*
PMPM (6 mo. mean)							
Total	$359.59	$317.77	$–41.82	$228.81	$291.98	$63.17	0.00002
Inpatient	$179.65	$162.83	$–16.82	$100.66	$152.45	$51.78	0.01538
ED	$28.80	$23.44	$–5.36	$14.50	$18.13	$3.63	0.00687
Utilization (6 mo. mean)							
Inpatient (per 1000)	28.14	22.23	–5.91	15.63	21.40	5.77	0.00001
ED (per 1000)	39.47	30.19	–9.28	19.64	24.26	4.62	0.00280

ED, emergency department; PMPM, per member per month.

Novel healthcare delivery approaches like MIH hold great potential as they could potentially reduce inpatient medical and emergency department (ED) utilization and associated costs, in addition to decreasing readmissions. This analysis provides further confirmation regarding the significance of targeting patients with specific activation needs and interventions, the expandability of interprofessional team-based care, and the efficiency of the MIH model in reducing unnecessary expenses and healthcare utilization within high-risk populations.

Patient Health Outcomes in Areas where there is Implementation of Mobile Medical Teams

Community Paramedicine Applied in a Rural Community

This pre/post-test with a comparison group study evaluated a community paramedicine (CP) program in rural South Carolina that followed and served local patients who frequently utilized the emergency department (ED). The purpose of the study was to determine if the CP program efficaciously improved patient outcomes while reducing ED visits. The endpoint of this study is to determine if a community paramedicine program in rural regions decreased ED visits while simultaneously improving patient outcomes.

Participants were eligible for the program if they visited the local emergency department more than twice in a month and had at least one chronic disease. They were recruited through referrals or self-referral, and upon obtaining consent, a care plan was created and executed by a community paramedic. Participants were reassessed as needed and graduated once their condition was managed effectively. This study followed a one to two ration of 68 total cases alongside 125 controls. Factors such as age, gender, ethnicity, history of HTN, COPD, diabetes, and HF were kept as similar as possible between the two groups.

To select this comparison group, a matching algorithm was used that considered factors such as gender, age (in 5-year increments), race, and insurance type. This study as unable to provide a statistically significant comparison group because the authors of this study could not find comparable participants who lacked insurance, used the AAMC ED, and were not already part of the program.

The study measured the satisfaction rates of CP program participants as well as ED visits, hospitalizations, and readmissions. Additionally, the study measured changes in blood pressure, blood glucose levels, and shortness of breath among participants compared to the control group. The impact of the program studied was assessed via data collection from the time frame of January 2011-August 2015. The sources used for data collection include AEMS Records regarding CP patient visits and 911 visits, ACEMS Financial Records, AAMC Medical Records, AAMC Financial Records, Better Outcome by Optimizing Safe Transitions (BOOST) Surveys, and Satisfaction Surveys.

In this study, significant improvements were observed among participants in a healthcare program compared to a control group. Per Bennet et al. (2017), the participant group experienced a 58.7% reduction in emergency department (ED) visits, while the comparison group saw a 4%

increase ($p < 0.0001$). Inpatient admissions decreased by 68.8% among participants but increased by 187.5% in the comparison group ($p = 0.045$). Length of stay decreased by 15.7% for participants, while it increased by 162.5% in the comparison group ($p=0.03$). For those in the program who required hospitalization, there was a 41.2% reduction in 30-day readmissions, and this reduction was even higher (75% decrease) among those with COPD. In comparison, the control group saw a 35.9% increase in readmissions. Notably, the 30-day readmissions rate was significantly affected by one participant, accounting for 16 visits; without this participant's data, there was an 83.1% decrease in 30-day readmissions, which is marginally higher than the control group ($p < 0.0001$). In terms of clinical measures, participants with diabetes saw an 85% reduction in fasting blood glucose levels, with an average decrease of 33.7 mmol ($p = 0.04$). Notably, 70% of participants with hypertension experienced a decrease in both systolic (7.2 mmHg) and diastolic (4.0 mmHg) blood pressure ($p < 0.0001$ for both systolic and diastolic). The CP program did not use standardized equipment to track COPD metrics, but per self-reporting, a significant 91.6% decrease was found in ED admissions for shortness of breath episodes among COPD participants ($p = 0.01$).

The CP program exhibited a substantial improvement in the well-being of its participants while simultaneously lowering their reliance on healthcare services. Participants in the CP program diminished their reliance on emergency department and inpatient services, necessitated less intensive care, achieved improved health outcomes, and lowered healthcare costs for the community.

MIH - community paramedicine: An integrated and novel approach to caring for heart failure patients

Heart failure (HF) readmissions come at a substantial cost and are linked to higher mortality and morbidity rates. This study by Reynolds et al. in 2018 was conducted to evaluate the effectiveness of the MIH - Community Paramedicine (MIH-CP) program in reducing readmissions related to HF. This study analyzed whether the use of mobile integrated health and community-paramedicine decreases the overall frequency of readmission heart failure patients.

Participants were selected based on information provided by Piedmont Healthcare. Participants had to have a diagnosis of Heart Failure and had to have been admitted to the hospital between the timeframe of May 1st, 2016 to December 31st, 2016. This study involved 132 enrolled participants. The average age amongst the interventional group was 67. Of those enrolled, 64% were Caucasian, 31% were African American, and 5% were of other ethnicity. Finally, 69 (52%) of the participants were men whereas 63, or 48%, of the participants were female.

Participants were purely grouped based on their history of Heart Failure. Of note, information was not provided on ethnicities of the control group as the control group was gathered from national data provided by the healthcare facility.

The main study objectives included assessing hospital readmissions and changes in quality of life (QoL) as primary endpoints. The study compared the readmission rate (RR) of participants who underwent a minimum of three visits in the program with those who were not part of the program. Additionally, patient QoL was assessed at the beginning and conclusion of the program using the EuroQol Eq-5D self-assessment tool.

According to Reynolds et al. (2018), on average, each patient had approximately four visits. The 30-day readmission rate for these participants was 9.7%, which stands in contrast to the national readmission rates reported by PHC and CMS during the same period, which were

19.1% and 21.6%, respectively per Reynolds et al. (2018). The median EuroQol scores at the initial and final encounters were 70/100 and 85/100, respectively.

The MIH-CP program demonstrated a reduction in heart failure (HF) readmissions. Participants who successfully completed the program experienced lower readmission rates (RR) and reported an improved quality of life (QoL) compared to participants who were discharged without access to this resource.

Impact of a MIH and Community Paramedicine Program on Improving Medication Adherence in Patients with Heart Failure and Chronic Obstructive Pulmonary Disease after Hospital Discharge: A Pilot Study

A pilot retrospective cohort observational study conducted by Sokan et al. (2022) was designed to evaluate the impact of the MIH-CP program on medication adherence among patients with congestive heart failure (CHF) and/or chronic obstructive pulmonary disease (COPD). This study helped to determine if utilization of MIH improves medication adherence in patients with CHF or COPD.

Participants enrolled in the program had to be 1) admitted patients at the University of Maryland Medical Center (UMMC) or the UMMC Midtown Campus; (2) 18 years of age or older; and (3) residing in West Baltimore ZIP codes 21201, 21216, 21217, 21223, 21229, or 21230. Additionally, participants had to have stable housing so the field team could conduct home visits. Participants were excluded from the study if they were or became pregnant or homeless. Of the initial 94 discharges (47 cases versus 47 controls), 11 subjects were excluded because of missing pharmacy data. This resulted in a sample of 83 subjects (43 cases versus 40 controls) for the final analysis. The average age of 64.8 (SD=13.1 years). Of those involved in the study, 26 were men and 57 were women. In this study, 84% of participants were black and

16% white. Thirty-five participants were diagnosed with CHF alone, 25 were diagnosed with COPD alone, and 23 participants were diagnosed with both chronic diseases.

Between the dates of February 6, 2020, and May 11, 2020, a total of 385 participants who had been diagnosed with either Congestive Heart Failure (CHF) or Chronic Obstructive Pulmonary Disease (COPD) and had been discharged from either UMMC or UMMC Midtown Campus, were deemed eligible to participate in the MIH-CP program. In selecting a control group, a 1-to-1 nearest neighbor propensity score matching (PSM) method was used, ensuring no replacement of selections. Through this matching process, the averages (or proportions, in the case of categorical variables) of the 11 predetermined factors (namely, age, presence of CHF [yes/no], presence of COPD [yes/no], gender, race, type of insurance, type of service, patient classification [inpatient or outpatient observation], zip code, discharge date, and existence of pharmacy claims [yes/no]) demonstrated no significant differences between the group that participated in the MIH-CP program and the controls.

Qualitative information on the participants' perception of their own well-being was measured via qualitative questionnaires as well as ED transports, ED admissions, and hospital admissions. Results were measured by conducting interviews as well as reviewing the electronic medical records of those participating in the study.

The study encompassed a total of 83 participants, with 43 individuals assigned to the intervention group and the remaining 40 serving as propensity-matched controls. After accounting for factors such as age, gender, and third-party payer, the findings revealed that, within the initial 30 days following discharge, participants participating in the MIH-CP program exhibited a greater level of medication adherence in comparison to the control group. This trend was particularly noticeable among participants diagnosed with CHF (8% difference in PDC, with a 95% confidence interval [CI] of -0.12 to 0.28%) and COPD (14% difference, with a 95% CI of -0.15 to 0.43%). However, these differences did not attain statistical significance. As time progressed beyond the 30-day mark post-discharge, the difference in medication adherence between enrolled and non-enrolled MIH-CP program participants became less pronounced.

This initial pilot study trended an inclination towards enhanced medication adherence within the group of participants engaged in the MIH-CP program. Subsequent investigations encompassing a more extensive patient population will be necessary to validate these initial observations.

Discussion

This literature review was completed to determine whether when compared to traditional emergency medical services (EMS), are mobile healthcare teams a safe and effective tool to reduce emergency department (ED) visits and hospital admissions. Upon thorough evaluation of the previously dissected research articles, there is one overarching commonality amongst a majority of the studies: the use of Mobile Integrated Healthcare teams can prove beneficial to overall patient health outcomes. Bourdages et al. (2023), Daniels et al. (2019), and Nejtek et al. (2017) appear to be in accordance with the concept that MIH teams help decrease the overall number of Emergency Department visits, though each study varies on their level of statistical evidence. Siddle et al. (2018) did show a statistically significant decrease in overall hospital readmission for participants of an MIH program whereas Geskey et al. (2020) did not have the statistical data to back this concept. Though lacking statistical significance, both de Battle et al. (2021) and Roeper et al. (2018) agree that the use of a local MIH program can decrease overall hospital spending related to readmissions and ED visits. Other areas of health that seemed to have made an improvement for participants partaking in an MIH program include overall self-perception of quality of life and medication adherence.

However, there were some limitations to the studies analyzed that may pose the question of applicability to the general populace. Each of the studies analyzed tended to follow a specific patient population based off of disease or diagnosis and evaluate the response to the program. In the real world of medicine, it is hard to enroll in healthcare coverage and only let it apply to certain participants. Future studies should take either broader study samples or more numerous population groups in their evaluation of interventions. With that being said, future studies should always try to encompass larger sample sizes. Another limitation of the studies analyzed include the fact that many of the studies evaluated were short term. It would be valuable information to assess long-term benefits of being involved in an MIH program. Additionally, it would be beneficial to future studies to all have their MIH teams practice in the same scope, perform similar assessments and tasks, and have a universal protocol to allow for minimal differences amongst studies.

MIH programs fall short in rural communities though these are the communities that could possibly best benefit from MIH involvement. Rural communities do not always have the resources at hand to be able to have a team of healthcare staff who can follow-up, respond to, or assist a large number of patients outside of a hospital or clinic setting. Another area where MIH programs may fall short are in situations of non-English speaking communities. Ultimately, it would be nice to have a medical translating service for all MIH visits so that patients have equal access to these services. Other limitations of the studies include the matter of not all the studies analyzed had a clinician present at the time of the visits. Some studies had a provider present, whether advanced practice provider (Nurse Practitioner/Physician Assistant) or physician, others had providers present via telehealth, whereas some studies were staffed by specifically trained EMS staff. The groups studied with EMS providers were unable to perform as many diagnostic tests or make as many new orders.

Future research regarding MIH teams should include health outcomes on patients requiring pre- and postnatal visits as this is a pivotal time of life when services could fall under preventative healthcare. Prenatal care requires multiple visits with a clinician, and this is not always feasible for many patients; thus, having mobile teams deployed for prenatal care may vastly improve the health of mothers and babies, decrease the occurrence of preeclampsia, preterm labor, or even prevent fetal demise. Another area of research that could prove beneficial with the use of MIH teams is patients discharged after major orthopedic or cardiac surgeries. These surgeries often require consistent rehab maintenance whether it is physical and occupational therapy or cardiac rehabilitation. Often patients who require these types of surgeries are either older populations or more unhealthy populations. These patients may not always be able to attend their follow-up visits whether due to lack of mobility or concern with resources or drivers. For that reason, a mobile team that can complete at home visits and rehab would benefit overall patient health and overall subsequent hospital visits due to muscle atrophy and falls or inadequate cardiac strengthening. One final area of MIH teams that needs to be better studied includes the area of healthcare system spending on preventable ED visits and hospital admissions. Our current healthcare system in the United States is heavily driven by financial gains or losses. If we could more accurately define the financial benefit of a community MIH team, the use of such teams may be better received and funded.

Based on the information gathered from the studies analyzed, MIH teams can play a major role in bridging the gap in healthcare services. The use of such teams would not only help improve access to healthcare in rural areas, but it may also help people to stay accountable for managing their overall health es demonstrated in Sokan et al. (2022). This service would also help prevent the use of certain services that can be expensive for both the patient and the healthcare system such as ambulance rides, ED visits, and even health concerns such as myocardial infarctions, strokes, or COPD exacerbations.

Conclusions

The utilization of Mobile Integrated Healthcare (MIH) has shown promising potential in improving patient outcomes, reducing hospital admissions, and decreasing overall healthcare expenditure for medical facilities. By leveraging mobilized medicine, MIH facilitates continuous monitoring of patients, enabling timely interventions, and personalized care plans. Patients with chronic conditions, in particular, benefit from remote monitoring, leading to better management of their health and a reduction in the severity of complications. MIH's emphasis on preventive care and early intervention contributes to improved patient outcomes by addressing health issues before they escalate, ultimately fostering a proactive and patient-centered approach to healthcare.

Moreover, MIH has demonstrated its effectiveness in decreasing hospital admissions and related costs. Through remote consultations, virtual follow-ups, and proactive management of chronic conditions, MIH helps prevent unnecessary hospitalizations and readmissions. The seamless integration of mobile care, digital health platforms, and comprehensive care coordination enhances the efficiency of healthcare delivery, optimizing resource utilization and reducing the burden on inpatient facilities. While there are upfront costs associated with implementing MIH, the potential for long-term savings, coupled with improved patient outcomes, suggests that the utilization of Mobile Integrated Healthcare can be a strategic investment for medical facilities seeking to enhance the quality and cost-effectiveness of healthcare services.

Clinical Applications

In clinical practice, the adoption of Mobile Integrated Healthcare (MIH) holds significant implications for healthcare professionals and patients alike. The emphasis on continuous monitoring, timely interventions, and personalized care plans aligns with the core principles of patient-centered care. For clinicians, MIH provides a valuable toolset for managing patients with chronic conditions, allowing for remote tracking of vital signs, medication adherence, and symptom progression. This real-time data empowers healthcare professionals to make informed decisions, intervene proactively, and adjust treatment plans as needed, ultimately improving the overall quality of patient care.

Furthermore, the reduction in hospital admissions and readmissions associated with MIH is particularly relevant in clinical settings. Clinicians can leverage MIH to provide virtual consultations, follow-ups, and postoperative care, minimizing the need for patients to physically visit healthcare facilities. This not only enhances accessibility for patients, especially those in rural or underserved areas, but also optimizes the allocation of resources within clinical practices. The streamlined communication and comprehensive care coordination offered by MIH facilitate collaborative efforts among healthcare providers, promoting a team-based approach to patient care.

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