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## Management of frequent ED users by community paramedics improves patient experiences and reduces EMS utilization

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### Cover Page Footnote

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## Management of frequent ED users by community paramedics improves patient experiences and reduces EMS utilization

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### Abstract

This study examined a suburban emergency medical system (EMS)-led community paramedicine (CP) program in terms of adherence to protocol, patient-paramedic interactions, patient experience, and cost. Participants (n=57) are frequent emergency department (ED) users ( $\geq 4$  ED visits/year), with a mean age of  $59.8 \pm 17.6$  years and have multiple chronic conditions. Of these, 36 completed a modified Clinician and Group Consumer Assessment of Healthcare Providers and Systems (CG-CAHPS) survey at 3- and 6-months following program enrollment. The main outcome measures were adherence to intake goals; types, modes, and frequencies of CP interventions; CG-CAHPS patient experience scores; and cost savings. Cost savings compared EMS transports, ED visits, and hospital admissions during CP enrollment versus the previous year. Analysis also correlated participant demographics with the type and frequency of interventions. Adherence to enrollee intake protocols range from 5.3% for medication reconciliation to 78.9% for assessments of daily living (ADL) and home safety. The most popular interventions were follow-up and wellness checks occurring primarily in patients' homes, and 97% of participants would recommend the program to friends/relatives. Females and African-Americans had increased CP interventions ( $p < .0001$ ). Mean post-program 911 calls decreased significantly from pre-program levels, from 14.1 to 7.8 ( $p = .0012$ ), as did ED transports (10.1 to 5.6,  $p = .002$ ), and non-ED transports (4 to 2.2,  $p = .0380$ ). The estimated annual return on investment (ROI) is  $>51\%$ . This study objectively illustrates program success, showing that carefully designed and managed CP programs can deliver Triple Aim objectives.

### Keywords

Community paramedicine, MIH-CP, patient experience, interventions, EMS, cost benefit, CG-CAHPS, follow-up, patient-centered care

### Introduction

Frequent utilization of emergency departments (ED) for non-urgent reasons is a growing problem of high healthcare expenses in the US,<sup>1</sup> resulting in more than ten times the healthcare costs for non-frequent users.<sup>2</sup> Community paramedicine (CP) is an emerging healthcare intervention that has been garnering attention as a solution to curb non-emergent frequent ED use. Paramedicine represents a unique intersection of health care, public health, and public safety and allows paramedics and emergency medical technicians (EMTs) to operate in expanded roles by assisting with primary healthcare, preventive services and public health for underserved populations in the community. It has been deployed in a variety of settings,<sup>3</sup> including illness management,<sup>4</sup> senior housing,<sup>5,6</sup> flood disaster,<sup>7</sup> rural communities,<sup>8,9</sup> and recently in a ED-to-home transition intervention.<sup>10</sup> There is a push to study the effectiveness of these programs in achieving the IHI (Institute for Healthcare Improvement) Triple Aim.<sup>11,12</sup>

In general, there is a dearth of scholarly literature evaluating CP programs<sup>3,13,14</sup> related to program implementation, patient care and experience, and economic impact.<sup>15,16</sup> Based on extensive literature review by the authors, no study has reported the frequency and modality of CP interventions to patients in the program, nor described the process of enrollee intake and assessments. While studies on CP have explored providers' perspective of the program,<sup>17,18</sup> or used national health surveys, paramedic service database and/or highly structured interviews to assess program effectiveness,<sup>5,6,19,20</sup> there is a paucity of quantitative data about patients' perspectives and experiences.<sup>21</sup> Mobile Integrated Healthcare (MIH)-CP proposals and white papers written in emergency medicine cite the need for patient experience as one of the highly-desired outcome measures for establishing CP sustainability,<sup>11,22</sup> but the few studies on CP rarely reports this measure, and most report a single score on patient satisfaction.<sup>8</sup>

Research is required to understand whether CP enhances patients' experiences while maintaining or reducing costs.<sup>13</sup> Measuring patient experience of care has become a priority

for national payment and public reporting programs.<sup>23</sup> Specifically, CP sites have requested guidance in developing patient experience surveys with CP-relevant items.<sup>11</sup> In the US, the Consumer Assessment of Healthcare Providers and Systems (CAHPS) surveys are the standard to assess patient experience of care in traditional settings of inpatient hospital care, clinic visits, etc., but very few studies have adopted CAHPS instruments to measure effectiveness of innovations implemented in health care settings.<sup>24</sup> Few peer-reviewed studies have added EMS cost to the cost of hospital care to estimate the total cost of emergency care for frequent ED users.<sup>25</sup>

The aim of this study is to provide an understanding of patients' self-reported experiences of care with the CP program, and to test whether these experiences change over the time patients are enrolled in the CP program. There are no easily accessible peer-reviewed studies that sufficiently document the day-to-day types of activities or interventions in the CP program. To address this gap, this study reports the adherence to intake protocol, frequency and nature of the paramedic-patient interactions in the CP program, and participant characteristics. Finally, cost effectiveness analysis compares CP program costs and cost avoidance. These findings enhance the evidence base of the structure of an EMS-led CP program and achieve two of the Triple Aim objectives: patient-centeredness and cost versus benefits of CP programs.

## Methods

### *Study Setting & Design*

This is a quantitative study that is observational and prospective in design and occurred in a local government-funded emergency medical service (EMS) in the southeast United States (2017 population 446,228).<sup>26</sup> The ratio of residents to primary care providers (PCP) is high at 1500:1, in contrast to the 2016 national average of 1326:1.<sup>27</sup> This has left a gap in healthcare access, particularly for individuals with multiple chronic conditions (MCC) and few resources. The CP program focuses on these individuals to provide healthcare and decrease these individuals' need for emergency medical services. Services provided vary depending on the individual's needs and often include persistent patient follow-up (e.g., home visits and "hello" calls), home safety/ fall risk assessments, hospitalization visits/ post-discharge follow-up, medication administration, etc. The program is further described here<sup>28</sup> and is operated by the local public EMS agency, comprised of a cohort of paramedics who are specially trained in community health, a supervisor, a social worker and a physician medical director. Community paramedics receive an additional 20 hours of instruction in critical care and home-based primary care through didactic training and clinical rotations. Specific topics of training include program administration, roles and responsibilities,

and record-keeping; heart failure management; motivational interviewing; and activities of daily living. Two paramedics from the CP-certified cohort work on the CP program in one-month rotations. One of the two paramedics work each day from 7am-7pm on a rotating basis. Paramedics are encouraged to collaborate with the patient's PCP and social service workers to leverage all available community resources based on the individual's need.

There is a potential pool of approximately 2000 high-utilizers in the EMS coverage area who could benefit from this program, and patients are identified using one of three methods: referral by paramedics based on a patient's frequent use of 911 calls within a short time frame, referral by nurse navigators in the ED, or through a review of the 911 call log by the EMS agency. Patients are instructed to call a direct phone number, available from 7am-7pm, rather than 911. Patients who still call 911 are identified by EMS dispatchers, who in addition to sending an ambulance, notify the community paramedic on call. For assistance after hours, patients can call 911 to receive immediate care, and a note is made by dispatchers to the community paramedics to follow up the next day. The paramedic visits patients in a specially-marked EMS vehicle (not an ambulance), and all visits are conducted in the patient's home, at the patient's PCP office, or at the hospital/ED (if a patient was hospitalized). After each visit, the paramedic documents the visit using the EMS electronic reporting software. Patients are reassessed as needed over the course of the program and are "graduated (or dismissed if non-compliant)" when the CP provider team collectively decides that a patient is in stable health condition, able to self-manage his/her health care, and no longer needs the program's services.

### *Selection of Participants*

57 participants who had  $\geq 4$  ED visits during the previous 12 months were included in the study. This selection is consistent with previous literature, including the recent CMS (the Centers for Medicare & Medicaid Services) classification.<sup>29</sup> Other inclusion criteria were:  $\geq 18$  years of age, ability to give informed consent, ability to respond to written and oral questions in English, and willingness to participate/receive the CP interventions. Patients who were deemed inebriated, acutely confused, or lacked the cognitive capacity to give informed consent were excluded. As the paramedics evaluated these exclusion criteria, the researcher only visited with eligible patients. Thus, the number of excluded patients was not recorded.

Recruitment of study participants took place when one of the authors [OA], together with a paramedic, visited with patients at home. The paramedic first asked the patient if he/she was willing to participate in research, and if the response was positive, the paramedic would leave the room to allow a private conversation. The researcher

explained the experiment protocol verbally in addition to providing written documentation for informed consent, then answered any patient questions. The author emphasized that participation in no way affected care or status with the CP program. Participation was completely voluntary, and patients signed a consent form on the first encounter with the author. The consent specified that there was no compensation for participation in the study, nor were there any adverse consequences for withdrawing from the study. In addition, no personally identifiable information about the patients were collected nor recorded. The study protocols were approved by the Institutional Review Board of the Louisiana State University.

### ***CG-CAHPS-derived Survey Instrument***

A modified version of the Clinician and Groups Consumer Assessment of Healthcare Providers and Systems (CG-CAHPS) Adult Survey 3.0 was developed for this study because the design of the core items and the composite measures are best aligned to the structure of the CP model of care, the survey fits the target population of individuals 18 years and older, and the response burden to the patient is relatively small compared to other CAHPS. One of the recommended users/entities for this survey include “community-based collaboratives,”<sup>30</sup> which fits a description for this CP program. The Agency for Healthcare Research and Quality (AHRQ) explicitly allows the phrase “this provider” to be changed to fit the provider label specific to the entity being or organization being assessed.<sup>31</sup> For this study, the words “hospital” and “provider” were changed to “your home” and “community paramedic” or simply “paramedic,” respectively. This study utilized three composite measures: *Access*, *Provider communication*, and *Care coordination*, and two global items: *Program rating* and a supplemental item on whether participants would recommend the program (*Program recommendation*). One composite measure (*Helpful, Courteous, and Respectful Office Staff*) and one item from the care coordination composite (*Did this provider order a blood test, x-ray, or other test for you?*) were excluded as these are not relevant to the CP program. Removing one item should not negatively impact the Care Coordination composite score, since each item in the CAHPS’ composites is generally equally weighted. While the researchers understand that CAHPS surveys are designed to evaluate and compare health plans and healthcare providers, AHRQ advised that it is acceptable to compare across time, as it is customary to “do some trending for Health Plan populations” [OA, personal communication, 11/15/2017].

## **Data Collection Procedures**

### ***Patient Experience***

The CG-CAHPS-derived survey was administered once the participant was active in the program, first at 3-months (T<sub>1</sub>) and at 6-months (T<sub>2</sub>). One of the researchers [OA] visited the patient at home and read the questions verbatim to the participant. Each item’s score was averaged between all respondents, and the items scores corresponding to each scale was then averaged.

### ***CP Program Enrollee Intake***

Based on interviews with the program administrators regarding program goals for patient intake protocol and assessments, an audit examined intake paperwork and other patient documents against the protocol to determine how well paramedics followed the program’s prescribed goals for patient enrollment.

### ***EMS Records Regarding CP Patient Encounters and 911 Calls***

East Baton Rouge Parish EMS uses its existing electronic reporting software as the primary means to document CP and patient interactions. Specific measures obtained from this record included: date of encounter, patient identifier number, type of chronic condition(s), types of CP intervention provided (Table 1), if the encounter was scheduled or unscheduled, and if the encounter was successful or not (i.e., the purpose of initiating contact by either party was achieved). The data also included a record indicating if the patient called 911 or the CP phone, if the 911 call resulted in transport to an ED, the urgency of the need for ED transport (1=non-urgent, 2=urgent, 3=life threatening), and the frequency of same-day and next-day paramedic follow-ups.

## **Data Analysis**

### ***Outcome Measures***

The key outcomes of interest included (1) adherence to program enrollee protocols, (2) CG-CAHPS-derived patient experience score, (3) mean 911 calls, EMS transports, and non-transports, with associated costs, (4) descriptions of CP interventions: type and mode of delivery (Table 1), and (5) associations between frequency and type of intervention with participant demographic variables.

To determine if patient experience changes as patients are enrolled longer in the CP program, patient experience ratings at 6 months, T<sub>2</sub>, were compared to baseline ratings, T<sub>1</sub> (that is, 3 months following CP enrollment). Due to attrition yielding unequal sample sizes at T<sub>1</sub> and T<sub>2</sub>, the comparison was conducted using unequal sample *t*-test ( $\alpha = 0.05$ ). From pilot studies, the average length of time a patient stays in the CP program graduation/discharge is 6-9 months, although this varies according to specific needs.

**Table 1. Definition of Interventions**

	<b>Intervention Type</b>	<b>Definition</b>
1	Follow up	Initiated by CP due to a recent event/incident that s/he would like to check on (could lead to providing other interventions, e.g. patient education, vital check, medication assistance).
2	Well check	“Hello call” or home visit initiated by CP, not due to any recent or specific incident; often because there has not been any contact with patient in the last 5 days or more.
3	Patient reassurance	The only intervention initiated by patients; arising from patient having medical question/concerns or experiencing health problems.
4	911 response	CP responds to 911 call by patient or calls 911 on behalf of patient while providing care until ambulance arrives.
5	Patient advocacy	CP facilitates communication between patient and outside source or discusses possible care plans for patient with outside source (e.g. hospital, ED, PCP, fire department, police); also involves research.
6	Vitals check	CP visits to check patient’s vitals.
7	Appointment scheduling	Initiated by CP to remind or coach patient to schedule medical appointments.
8	Living assistance	CP assesses living condition of patient or helps to improve the living situation of patient.
9	Health coaching/Patient education	CP educates or advises patient about their health or navigating the health system.
10	Medication assistance	Initiated by CP because patient has difficulty assessing or reconciling medications.
11	Transportation scheduling	CP reminds or coaches patient about transportation options to medical appointments.

This study reports patient experience about the following composites: *Access, Provider Communication, Care Coordination*, and two global items: *Program Rating* and *Program Recommendation*.<sup>30</sup>

**Time Frame**

Data were collected from participants enrolled in the CP program from 2017 to 2018. Program impact on participants’ healthcare utilization was measured in 3 ways: (1) a retroactive 12-month chart review of EMS records was performed to identify EMS and ED utilization prior to program enrollment; (2) utilization during enrollment period; and (3) up-to 12-months chart reviews of EMS and ED utilization post-enrollment to compare changes. The CG-CAHPS-derived survey was administered between January and December 2018 to only the continuing patients from 2017, and patients that were enrolled in 2018 (if they had been in the program for ≥ 3-months). Paramedic encounters with patients (visits and calls) were tracked throughout the entire study period.

The number of 911 calls and the percentage of those calls that resulted in ED transports and the urgency of the transports were used to assess program impact on EMS utilization and the CP program’s effectiveness in educating patients to recognize and distinguish true medical emergencies. Records on paramedic-patient encounters were categorized as scheduled/unscheduled, phone/in-person, home/hospital/other, intervention type, and party who initiated the encounter (patient/paramedic-initiated)

to describe the level of paramedic involvement with patients, and the coordination of those encounters.

To determine the effectiveness of the program in reducing EMS utilization, paired student *t* tests were performed to assess differences in pre-enrollment and up to 12-months post-program 911 calls, ED visits, and non-ED transports. Categorical scoring is conducted for the CG-CAHPS responses for the three composite measures and two global ratings, and differences between 3- and 6-months ratings were determined using 2-sample *t*-tests. Associations between the type of intervention, frequency of interventions and urgency of ED transports, against demographic variables and type of chief complaint were assessed using Wilcoxon signed-rank tests. These associations were tested to assess whether patient’s gender, ethnicity, age group and chief complaint influences the type of intervention and how often the interventions were received. Nonparametric tests were used due to a small sample size yielding data that were not normally distributed. Significance level is set at 0.05 and analyses were performed using JMP Pro software (SAS, version 14.2.0, 2018).

**Cost Effectiveness**

Cost effectiveness was estimated using program costs and cost avoidance. Program costs were obtained from EMS records and included staff payroll, program receipts, and fringe benefits. Cost avoidance was estimated by examining utilization pre- and post-enrollment. Costs

included ambulance transports, ED visits, and inpatient hospital days. Ambulance transport costs were obtained from EMS cost reports using the average Medicare reimbursement rate.<sup>32</sup> Medicare reimbursement rate was used because it is generally considered to be closest to the cost of care.<sup>33</sup> ED visit and inpatient hospital costs were estimated using data from the Louisiana Hospital Inform database<sup>34</sup> and Healthcare Bluebook™<sup>35</sup> for Baton Rouge, Louisiana. Cost avoidance was then calculated as these average costs multiplied by reduction in ambulance transports, ED visits and inpatient days.

## Results

### Sample Characteristics

Between 2017 and 2018, the CP program enrolled 57 participants with varying levels of health needs and program exposure. All the participants enrolled in the current study and completed at least one set of surveys. The participants (n=57) were 66.6% female, 80.7% African-American, aged 59.8 years ( $SD = 17.6$ ), and most had high school level education or less (91.2%) (Table 2). 22 participants had heart-related diseases including hypertension, 12 had diabetes and/or chronic kidney-related conditions, 5 had drug/alcohol abuse, 5 suffered from mental health illnesses, 3 had COPD (chronic obstructive pulmonary disease) or asthma, 10 had other disease (3 chronic pain, 2 sickle cell, 2 morbid obesity, 1 HIV/AIDS, 1 seizure, 1 gastro-intestinal disorder), and 53 had a combination of these illnesses. Approximately half of the program participants remained longer than 180 days to help them achieve the goal of self-management to meet the required stabilization of their chronic conditions.

### CP Program Enrollee Intake

Results showed varied levels of adherence to intake protocols, with the lowest being medication reconciliation (only 5.3% of enrollees completed). The highest recorded accounts of conformance to program goals were administration of the Katz Index of Independence in Activities of Daily Living (ADL) instrument, and performance of home safety assessments (78.9% completion for both), followed by the Lawton's Instrumental Activities of Daily Living (IADL) (73.7% completion) (Table 3).

### CG-CAHPS Adult 3.0-Derived Patient Experience

Overall, patient experience was very positive, with at least 97% of participants reporting a "Definitely yes" in program recommendation to friend or relatives, and an initial (T1) top box score (9 or 10 out of 10) of 90% for global program rating. Initial top box score ("Always") for the Access, Provider communication and Care coordination domains were 98%, 88.2% and 70.5% respectively (Table 4, Appendix). At T2, participants reported a decrease by 25.8% in the Access composite score, but the difference appeared to shift to the middle

**Table 2. Participant Characteristics (n = 57)**

Age (mean, SD)	59.8 (17.6)
Gender (frequency)	
Men	19
Women	38
Race/Ethnicity (frequency)	
White/Caucasian	11
Black/African-American	46
Age at enrollment (frequency)	
18-24	0
25-34	7
35-44	5
45-54	7
55-64	16
65-74	13
75 or older	9
Employment status (frequency)	
Employed	3
Unemployed	54
Highest level of education (frequency)	
≤ 8 <sup>th</sup> grade	7
Some HS, but did not graduate	34
HS graduate or GED	11
Some college or 2-year degree	3
4-year college graduate	2
PCP at enrollment (frequency)	
Yes	30
No	9
Missing	18
Health insurance at enrollment (frequency)	
Medicaid	24
Medicare	17
Medicare dual eligible	10
Private	3
Other	3
Number of chronic conditions (frequency)	
≤2	17
3-5	32
6+	8
Chief medical complaints (frequency)	
Heart Disease	22
Mental Health Disorders, Drug/Alcohol Abuse	10
Diabetes	6
Chronic Kidney Disease	6
COPD/Asthma	3
Other	10
Eligibility Criteria (total (mean per patient))	
EMS (911) calls, prior 12-months	565 (14.1)
ED visits, prior 12-months	402 (10.05)
Non-ED transports, prior 12-months	160 (4)
Length of CP participation (frequency)	
< 60-days	14
60 – 180days	17
181 – 360-days	16
> 360-days	10

**Table 3. CP Enrollee Intake Summary**

	Goal	Actual n (%)
Medication Reconciliation	100% of patients enrolled have their medication reconciled	3 (5.3%)
Initial EKG	100% of patients enrolled receive baseline EKG measurement	17 (29.8%)
Health Questionnaire	100% of patients enrolled are physically assessed	39 (71.9%)
Nutrition Assessment	100% of patients enrolled	42 (73.7%)
Social Support Checklist	100% of patients are screened for social support	43 (75.4%)
Home Safety Assessment	100% of patients screened for fall risks	45 (78.9%)
Vaccination History	100% of patients are screened for up-to-date vaccine record	29 (50.9%)
Katz Index of Independence in Activities of Daily Living (ADL)	100% of appropriate patients (age 55+) receive ADL assessment: n=38	30 (78.9%)
Score: 0-2 (Patient very dependent)		5
3-4 (Moderately dependent)		3
5-6 (Independent)		22
Lawton's Instrumental Activities of Daily Living (IADL)	100% of appropriate patients (age 55+) receive ADL assessment: n=38	28 (73.7%)
Score: 0-2 (Severe functional impairment)		7
3-5 (Moderate impairment)		10
6-8 (High Functioning)		11

proportion score (“Usually”). However, the Provider communication and Care coordination composite scores appeared to improve at T2 by 5.8% and 11.5% respectively (Table 4, Appendix). However, none of these changes were statistically significant (Access,  $p = 0.6612$ ; Provider communication,  $p = 0.1541$ ; Care coordination,  $p = 0.6810$ ).

**Interventions and Patient Contacts**

Most interventions (95%) were unscheduled and occurred on demand relative to CP program and personnel resources. Also, interventions were largely initiated by paramedics (68.44%) rather than patients (31.56%, which includes patient reassurance and 911 calls). Depending on the nature of the intervention, these activities are mostly delivered in the patients’ home (47.17%), by phone (42.08%), and in the hospital following an ED transport (9.03%) (Figure 1 and Table 5, Appendix). As shown in Table 5, females and African-Americans received the most interventions: 51.6 interventions per female patient versus 47.1 interventions per patient overall, and 46.8 interventions per African-American patient versus 38.4 per Caucasian patient. These groups of patients also recorded the highest proportion of ED transports. These differences were confirmed with post-hoc  $\chi^2$  tests of independence: females:  $\chi^2 (2, n = 57) = 191.13, p < .0001$ ; African-Americans:  $\chi^2 (2, n = 57) = 72.25, p < .0001$ , showing that women and African-Americans were statistically more likely to receive more interventions than male or Caucasian participants.

To investigate the promptness of follow-up interventions, the researchers determined the proportion of same-day and next-day paramedic encounters with patients subsequent to patients’ 911 or reassurance calls. Paramedics follow up with patients after they call the CP phone for any health reason 51.1% on the same day, and 6.7% by the next day (Table 6, Appendix). However, if a patient calls 911, paramedics follow-up on the same day 22% of the time and 14.4% by the next day.

Further, this study investigated whether patients’ gender, race/ethnicity, age group and chief medical complaint were associated with the frequency and types of interventions received, as well as the EMS-recorded urgency of ED transports. As shown in Table 7 (Appendix), participants’ gender ( $p < .0001$ ), and age ( $p < .0001$ ) were significantly associated with the intervention type received, as with chief medical complaints ( $p < .0001$ ), specifically diabetes ( $p = 0.0002$ ) and kidney disease ( $p = 0.0003$ ).

Table 8 (Appendix) further examines patients’ chief complaints and frequency of intervention types through post-hoc analysis using  $\chi^2$  tests. Morbidly obese patients required significantly more patient reassurance interventions ( $p < .0001$ ). Similarly, patients whose chief complaint was seizures required additional reassurance than expected statistically ( $p < .0001$ ), and sickle cell patients had more frequent well-check visits ( $p < .0001$ ). For the frequency of interventions received, there were



significant differences observed within all the variables investigated (all  $p$ -values  $< 0.05$ ) (Table 7, Appendix). The urgency of transport to EDs when patients call 911 was not significantly associated with gender ( $p = 0.7182$ ), number of chronic conditions ( $p = 0.1235$ ), heart disease ( $p = 0.4591$ ), or lung disease ( $p$ -value  $= 0.2976$ ). All other characteristics were significant (Table 7, Appendix).

### ***911 calls, ED transports, and Urgency of ED Transports***

Using pre- and post-program means to compare EMS utilization, post-program 911 calls decreased significantly from pre-program levels, from 14.1 to 7.8 ( $t = 3.502$ ,  $p = .0012$ ), as did ED transports, from 10.1 to 5.6 ( $t = 3.32$ ,  $p = .002$ ), and non-ED transports, from 4 to 2.2 ( $t = 2.277$ ,  $p = .0380$ ). EMS (911) calls decreased by 45.1%, ED transports decreased by 44.53%, and the proportion of non-ED transports stemming from calls for non-emergent issues (i.e., health issues not requiring transport to an ED facility) decreased by 60.98%. Out of 57 patients, there were 4 participants who increased EMS utilization after completing the program. Urgency of ED transports as collected from EMS records did not change post-program as 86.9% of 911 calls resulting in an ED transport were non-urgent, compared to 89.8% pre-program.

### ***Cost-Benefit Analysis***

Based on \$9,035.47 in annualized start-up costs, \$2,678.16 for supplies and \$398,179.49 in personnel costs (2 FTE community paramedics, 1 FTE social worker, and 0.25FTE program administrator), the estimated program cost for the year of 2018 was \$409,893.12. The estimated cost of an average inpatient day was \$2,423.58, and an ED visit was \$648.<sup>34,35</sup> From the East Baton Rouge Parish EMS cost report, the average Medicare reimbursement rate<sup>32</sup> for ambulance transport was \$366.28. The authors were able to collect 2018 hospital admission data only for 25 of the participants during program participation. As a result of this limitation, the authors adopted a conservative reduction in inpatient admission of 50%, similar to Nejtcek, et al.<sup>36</sup> Given the annualized reduction in ED visits (224), inpatient days (245), and EMS transports (328), a positive marginal benefit to the local healthcare system was estimated to be at least \$439,481.5, which represents a ROI of more than 51%. Additional program expenses such as fixed overhead costs and equipment purchase and depreciation, may further influence this estimate. This cost benefit analysis is similar to Bennett and colleagues.<sup>8</sup> In addition, the savings may differ than estimated as the study could not access pre- and post-program inpatient data due to legal/ethical reasons given by the hospitals, nor could we ascertain that all hospital records for all the participants were available. Further, using average costs may underestimate the actual costs of care as each individual's health and intensity of care needed differs widely.

## **Discussion**

MIH-CP programs are growing in the US, yet there are almost no peer-viewed, published studies on MIH-CP outcomes.<sup>11</sup> This study describes the program enrollee intake and the nature and frequency of interventions within the CP context and adopts a national, well-validated instrument (CG-CAHPS) to measure patient experience of a CP program. The East Baton Rouge Parish EMS CP program demonstrates the strong belief of the paramedics in serving their community and doing what is right for their patients. The CP program involves intensive patient health management, which is delivered through on-demand, frequent and unscheduled paramedic-patient encounters. Participants were middle-aged, public insured, unemployed, had low educational attainment and MCCs. Most had a designated home hospital, and more than half had a PCP at enrollment (Table 2). Yet participants routinely used the local EMS and hospital ED for non-emergent or primary care treatable conditions prior to enrollment. The sample characteristics in this study are similar to Bennett et al<sup>8</sup> and mirrors the characteristics of frequent ED users as reported by Ondler, et al.<sup>2</sup> Following program intake, participants reported positive patient experience scores, with very high provider rating and enthusiastic scores in program recommendation (Table 4, Appendix). Pre/post program analyses also demonstrated reduced EMS utilization (911 calls and transports), and reduced ED visits, which, if sustained could produce meaningful improvements in their quality of life outcomes.

The positive care experiences observed through the modified CG-CAHPS survey may be attributed to psychosocial bonding<sup>36</sup> that participants received through the in-home care and the on-demand 12-hour availability that offered immediate healthcare access similar to traditional ambulance service. Participants also experienced assured follow-up encounters and wellness checks (more than 50% within the same day) with a trained health professional advocating for them as they navigate the current maze of the healthcare system (Table 6, Appendix). Similar to this finding, a CP pilot program evaluation supported by the Maine EMS<sup>37</sup> showed that the most popular intervention in the CP program is wellbeing check, which accounts for nearly half (48.3%) of all the interventions during the two year period of the evaluation. These results are similar to studies<sup>38,39</sup> which report that having a follow-up within either 7 days or 14 days after hospitalization for heart failure or MCC was associated with lower all-cause ED visits and readmissions. Through intensive management and involvement in the patients' lives, they are encouraged to be proactive in their health behaviors and call the CP phone when in need of healthcare or related concerns, an experience that is not typically experienced in the oft short and hurried outpatient appointments.

There is a lack of consistency in enrollee intake protocols (Table 3), which could be attributed to the monthly rotation of paramedics, evolving program administration, and sub-optimal communication practices between paramedics and program directors, which may have encouraged negligence and allowed paramedics to use their self-discretion in completing program enrollment protocols. The challenge caused by frequent paramedic rotation stems from lack of CP dedicated funding. This frequent rotation hampers effective communication between program administrators and the frontline community paramedics, which in turn results in subpar transition of care responsibilities. Inconsistency could impact patient data coordination, quality documentation of program effectiveness, and delivery of safe, quality care to the CP patients. This may also be a cause of the relatively long enrollment period (>180-days on average) compared to other studies reporting a typical program length of 90-days.<sup>8,36</sup>

To become financially sustainable, CP programs need to demonstrate value and also create reimbursement opportunities, however, the most powerful case for convincing payers or healthcare partners to invest in CP programs is to provide proof that the program delivers on the IHI Triple Aim framework.<sup>11</sup> This framework recommends that new health care innovations must simultaneously pursue three dimensions: (1) Improving the patient experience of care; (2) Improving the health of populations; and (3) Reducing the per capita cost of health care. Use of the CAHPS-based instrument offers a viable tool that CP programs can use to help build the business case for potential payers and healthcare partners.<sup>40</sup> This study adds to the evidence base that CP programs can produce positive patient experience of care, as participants remained positive about the program even as they stayed longer.

This study was able to demonstrate another case for convincing healthcare partners to invest in CP programs through the evidence of positive ROI (reducing per capita cost). Annual personnel costs appeared to be very high compared to a similar study<sup>8</sup> (\$398,179.49 vs. \$73,127.56). Nevertheless, the average healthcare costs were reasonable, using mean Medicare reimbursement fees<sup>32</sup> and Fair Price<sup>35</sup> amounts, and the analysis shows substantial cost savings due to the CP program. Due to the limitation experienced in accessing participants' ED and hospitalization records and costs, similar CP programs should form partnerships early with local healthcare entities in order to ensure improved and hurdle-free patient data exchange that is critical to program evaluation.<sup>41</sup>

The results of this study have clinical implications as well, especially in terms of directing healthcare resources. In addition to a higher overall share of Louisianans living in

poverty than the national average (23% vs. 15%), Louisiana has wide disparities in poverty rates by race/ethnicity and age. In Louisiana, Blacks are almost three times as likely as Whites to be poor.<sup>42</sup> The sample characteristics show a high female, African-American representation (66.6% female, 80.7% African-Americans), and non-parametric tests revealed that the type and frequency of interventions are significantly associated with participant's demographics, specifically being female and African-American. As Delia and colleagues<sup>43</sup> report, African-Americans and Hispanics, as well as those enrolled in Medicaid or Medicare Advantage were less likely to receive follow-up visits and thus present to the ED or hospital before having a follow-up visit. Females and African-American participants in the current study had statistically higher rates of interventions in the CP program, which could be counteracting the findings of Delia and colleagues by providing needed healthcare support before these patients are compelled to visit the ED or hospital. CP programs enrolling patients with similar demographics could plan to accommodate or provide more frequent follow-up interventions and paramedic-patient contacts to these groups. Ultimately these additional interventions could prevent unneeded ED or hospital visits.

In addition, patients with specific chronic conditions may benefit from different approaches to care that are tailored to their needs. Patients with morbid obesity or seizure disorders require more reassurance interventions, and patients with sickle cell disease require more wellness checks (Table 8, Appendix). CP programs can plan staffing and other resources in anticipation of these needs when they enroll patients with these conditions.

#### **Potential Limitations of Study**

Several limitations faced the evaluation of the CP program in this study. First, there is the possibility that eligible patients who could potentially benefit from this intervention refused to participate or comply with the program requirements. Thus, the program participants may not be comparable to the remaining frequent ED user population. Second, this study took place in a suburban US city, with a CP program serviced by a public EMS agency that rotates community paramedics every month. Patients in other demographic areas may experience different issues related to EMS and ED utilization, especially given the scarcity of healthcare resources in the geographic region the current CP program serves.<sup>44</sup> Also, while most (77.6%) CP programs utilize inter-professional collaboration to deliver care to frequent ED users,<sup>45</sup> the current program largely involved only EMS paramedics, with some oversight provided by an EMS-employed medical director and a social worker. This is a feature which if available, may yield improved outcomes and experience for patients.

The cost analysis was limited by several factors. Results did not include ED visits and in-patient hospitalizations outside of the parish jurisdiction of the EMS agency in this study, therefore, participants' utilization at other hospitals during the intervention period was unknown. Also, the authors were unable to access actual utilization costs from individual participant records, due to patient privacy laws and other administrative hurdles. Instead, the investigators used average costs from third party healthcare pricing databases which makes the costs less precise.

Finally, several amendments to the CG-CAHPS survey and administration may have affected the validity of the data. The investigators removed the *Office Staff* composite and *Ordering tests* item in the CG-CAHPS survey to reflect the CP program design. However, Stucky, et al<sup>46</sup> demonstrated that measures can be shortened and users may select item options that are particularly relevant without loss in validity. The researchers used recall periods of 3- and 6-months in order to assure better response rates and more accurate participants' recall, though the CG-CAHPS Survey can be conducted more frequently (including quarterly or even monthly), to allow continuous identification of opportunities for improvement within a healthcare program or plan.<sup>47</sup>

## Conclusions

CP programs mobilize existing resources and collaborate with existing community healthcare services to deliver active patient management in the most appropriate setting. Frequent ED users participating in the CP program report important benefits in patient experience (100% program recommendation at 6-months) and cost savings (51% ROI) – two of the three dimensions of the IHI Triple Aim framework. Participants were not particularly different from any other low income, suburban community patients who frequent EDs for non-emergent reasons, and they seemed to need consistent and dependable follow-ups, health reassurance/coaching and frequent wellness monitoring. As evidenced in this study, 95% of CP interventions were unscheduled and occurred on-demand, although there was a wide disparity in paramedics' adherence to program intake protocol. To this end, assuring access to high quality and well-coordinated care is essential to improving patient care experience and population health outcomes while reducing wasteful spending, all desirable results that a carefully designed and managed CP program can deliver. This study can guide/encourage pilot sites in adopting CAHPS items to develop their own CP patient experience instrument, which would be useful in demonstrating the efficacy of CP to potential partners or payers. Also, the findings could help guide future CP program design, reinforce its capacity to deliver positive patient experience and financial outcomes, and support expanding the EMS role as a community-based, patient-centered care provider.

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**Appendix**

**Table 4. Modified CG-CAHPS Patient Experience Scores**

Scales and Items	T <sub>1</sub> (n = 28)			T <sub>2</sub> (n = 17)			Change in Top Box Score (T <sub>2</sub> – T <sub>1</sub> )	p-value
	% Lower Proportion Score (Never, Sometimes)	% Middle Proportion Score (Usually)	% Top Box Score (Always)	% Lower Proportion Score (Never, Sometimes)	% Middle Proportion Score (Usually)	% Top Box Score (Always)		
<i>Access</i>	2	-	98	-	27.3	72.7	-25.8%	0.6612
Urgent care	6	-	94	-	45	55		
Routine care	-	-	100	-	20	80		
During office hours	-	-	100	-	17	83		
<i>Provider communication</i>	5.8	6.0	88.2	1.5	4.5	94	+6.6%	0.1541
Understand	3	7	90	-	6	94		
Listen	7	3	90	-	-	100		
Respect	3	7	90	-	-	100		
Spend enough time	10	7	83	6	12	82	-16.3%	0.6810
<i>Care coordination</i>	17.5	12.0	70.5	3	12	82		
Medical History	6	10	84	-	6	94		
Prescription medicines	29	14	57	6	18	76	-8.88%	0.1568
Global ratings	Bottom Box (0-6)	Middle proportion (7-8)	Top Box Score (9-10)	Bottom Box (0-6)	Middle proportion (7-8)	Top Box Score (9-10)		
Provider rating	3	7	90	6	12	82	+3.1%	1.000
	Definitely no, Probably no	Probably yes	Definitely yes	Definitely no, Probably no	Probably yes	Definitely yes		
Program recommendation <sup>†</sup>	-	3	97	-	-	100		

<sup>†</sup>Not part of CG-CAHPS core items

Figure 1. Pictorial Distribution of Type vs. Mode of Interventions

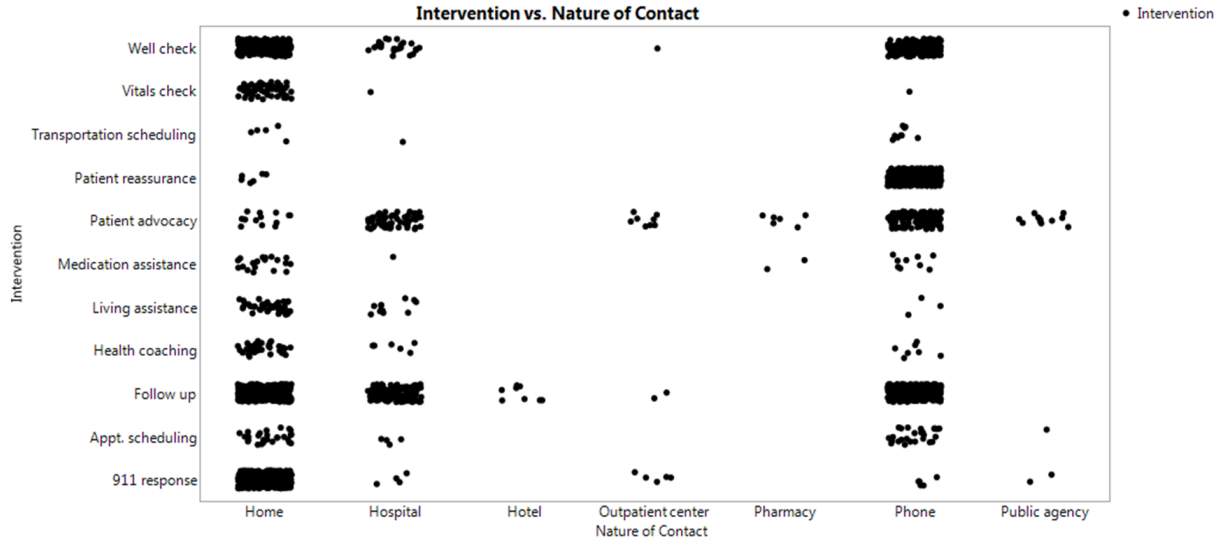


Table 5. CP Interventions by Gender & Ethnicity

Place of Contact	Gender		Ethnicity	
	Female	Male	African-American	Caucasian
Home	927	342	1137	132
Phone	814	318	956	176
Hospital	202	41	192	51
Outpatient center	7	9	13	3
Public agency	5	9	14	0
Hotel	0	8	0	8
<b>Intervention Type</b>				
Follow up	636	188	684	140
Well check	357	156	459	54
Patient reassurance	350	86	388	48
911 response	293	120	376	37
Patient advocacy	152	78	178	52
Vitals check	51	14	65	0
Appt. scheduling	33	26	48	11
Living assistance	27	29	33	23
Health coaching	31	17	45	3
Medication assistance	20	11	31	0
Transportation scheduling	11	4	13	2
<b>ED Transports</b>				
Transported	207	74	257	24
No Transport	86	45	118	13

**Table 6. Frequency of Same Day & Next Day Follow-Up Visits for All Patients Within a 2-Yr Period (2017-18)**

<b>Intervention</b>	<b>Frequency (n)</b>	<b>Same-day Follow-up and/or Vitals check (n, %)</b>	<b>Next day Follow-up and/or Vitals check (n, %)</b>
Patient Reassurance Calls	436	223, 51.1%	29, 6.7%
911 response by CP	413	91, 22.0%	63, 14.4%

**Table 7. Associations Between Participant Variables And Intervention Types, Frequency and ED-Transport Urgency (*p*-Values For Wilcoxon Signed-Rank Tests)**

<b>Variable</b>	<b>Intervention type</b>	<b>Frequency of intervention</b>	<b>ED-transport urgency</b>
Gender	< .0001	<.0001	0.7182
Ethnicity	0.2957	<.0001	0.0080
Age	< .0001	<.0001	< .0001
Number of chronic conditions	<.0001	<.0001	0.1235
Chief complaint	<.0001	<.0001	<.0001
Heart Disease	0.0788	<.0001	0.4591
Mental Health Conditions	0.7541	<.0001	0.0702
Diabetes	0.0002	0.0329	0.0003
Kidney Disease	0.0003	<.0001	0.0003
Lung Disease	0.9606	<.0001	0.2946
ED: Emergency Department			



**Table 8. Chi-Square Output Of Chief Complaints By Type Of Intervention. Each table cell presents the actual count, expected count, and chi-square statistic. Statistically significant results are in bold with an asterisk (\*).**

	911 response	Appointment sched	Follow up	Health coaching	Living asst	Med asst	Patient advocacy	Patient reassure	Transport sched	Vitals check	Well check	Total
Chronic Kidney Disease	31 23.95 2.07	3 3.42 0.05	52 47.78 0.37	4 2.78 0.53	2 3.24 0.47	0 1.79 1.79	13 13.33 0.00	15 25.28 4.18	0 0.869 0.86	2 3.76 0.83	34 29.75 0.60	156
Chronic Pain	21 16.27 1.37	1 2.32 0.75	39 32.46 1.31	1 1.89 0.42	1 2.20 0.66	0 1.22 1.22	7 9.06 0.46	14 17.18 0.58	0 0.59 0.59	2 2.56 0.12	20 20.21 0.00	106
COPD	43 62.48 6.07	13 8.92 1.85	151 124.67 5.55	1 7.26 5.40	1 8.47 6.59	6 4.69 0.36	37 34.79 0.13	102 65.96 19.68	1 2.26 0.71	16 9.83 3.86	36 77.61 22.31	407
Diabetes	29 35.61 1.23	4 5.08 0.23	99 71.06 10.97	3 4.13 0.31	0 4.82 4.82	1 2.67 1.04	11 19.83 3.93	19 37.60 9.20	1 1.29 0.06	0 5.60 5.60	65 44.24 9.73	232
Drug/Alcohol Abuse	55 59.57 0.35	15 8.51 4.94	147 118.85 6.66	6 6.92 0.12	4 8.07 2.05	0 4.47 4.47	32 33.17 0.04	85 62.88 7.77	2 2.16 0.01	0 9.37 9.37	42 73.99 13.83	388
Gastro	12 7.36 2.90	2 1.05 0.85	13 14.70 0.19	3 0.85 5.36	0 0.99 0.99	1 0.55 0.36	7 4.10 2.04	6 7.77 0.40	0 0.26 0.26	0 1.15 1.15	4 9.15 2.90	48
Heart Failure	106 110.69 0.19	5 15.81 7.39	159 220.9 17.32	20 12.86 3.95	36 15.01 29.35	17 8.30 9.09	54 61.64 0.94	129 116.9 1.26	0 4.02 4.02	37 17.42 22.00	158 137.5 3.05	721
HIV/AIDS	8 5.68 0.94	0 0.81 0.81	16 11.33 1.92	0 0.66 0.66	0 0.77 0.77	0 0.42 0.42	3 3.16 0.00	3 5.99 1.49	0 0.20 0.20	0 0.89 0.89	7 7.05 0.00	37
Hypertension	22 12.12 8.03	1 1.73 0.30	16 24.19 2.77	2 1.40 0.24	0 1.64 1.64	0 0.91 0.91	1 6.75 4.90	14 12.80 0.11	1 0.4405 0.7106	1 1.909 0.4328	21 15.06 2.33	79
Morbid Obesity	1 13.20 11.27	3 1.88 0.65	20 26.34 1.52	4 1.53 3.96	4 1.79 2.72	0 0.99 0.99	18 7.35 15.41	1 13.93 <b>12.01*</b>	2 0.4796 <b>4.82*</b>	1 2.078 0.55	32 16.40 14.83	86
MS	2 5.68 2.38	0 0.81 0.81	18 11.33 3.92	0 0.66 0.66	2 0.77 1.96	0 0.42 0.42	8 3.16 7.39	5 5.99 0.16	0 0.20 0.20	0 0.89 0.89	2 7.05 3.62	37
Mental Health Disorders	57 39.61 7.63	4 5.65 0.48	69 79.03 1.27	2 4.60 1.47	4 5.37 0.35	3 2.97 0.00	16 22.05 1.66	24 41.81 7.59	0 1.43 1.43	6 6.23 0.00	73 49.20 11.51	258
Seizures	9 8.29 0.06	3 1.18 2.78	6 16.54 6.71	2 0.96 1.11	2 1.12 0.68	3 0.62 <b>9.08*</b>	12 4.61 11.80	2 8.75 <b>5.20*</b>	0 0.30 0.30	0 1.30 1.30	15 10.29 2.14	54
Sickle Cell	17 12.43 1.67	5 1.77 5.84	19 24.81 1.36	0 1.44 1.44	0 1.68 1.68	0 0.93 0.93	11 6.92 2.39	17 13.12 1.14	8 0.45 <b>126.1*</b>	0 1.95 1.95	4 15.44 <b>8.48*</b>	81
Total	413	59	824	48	56	31	230	436	15	65	513	2690