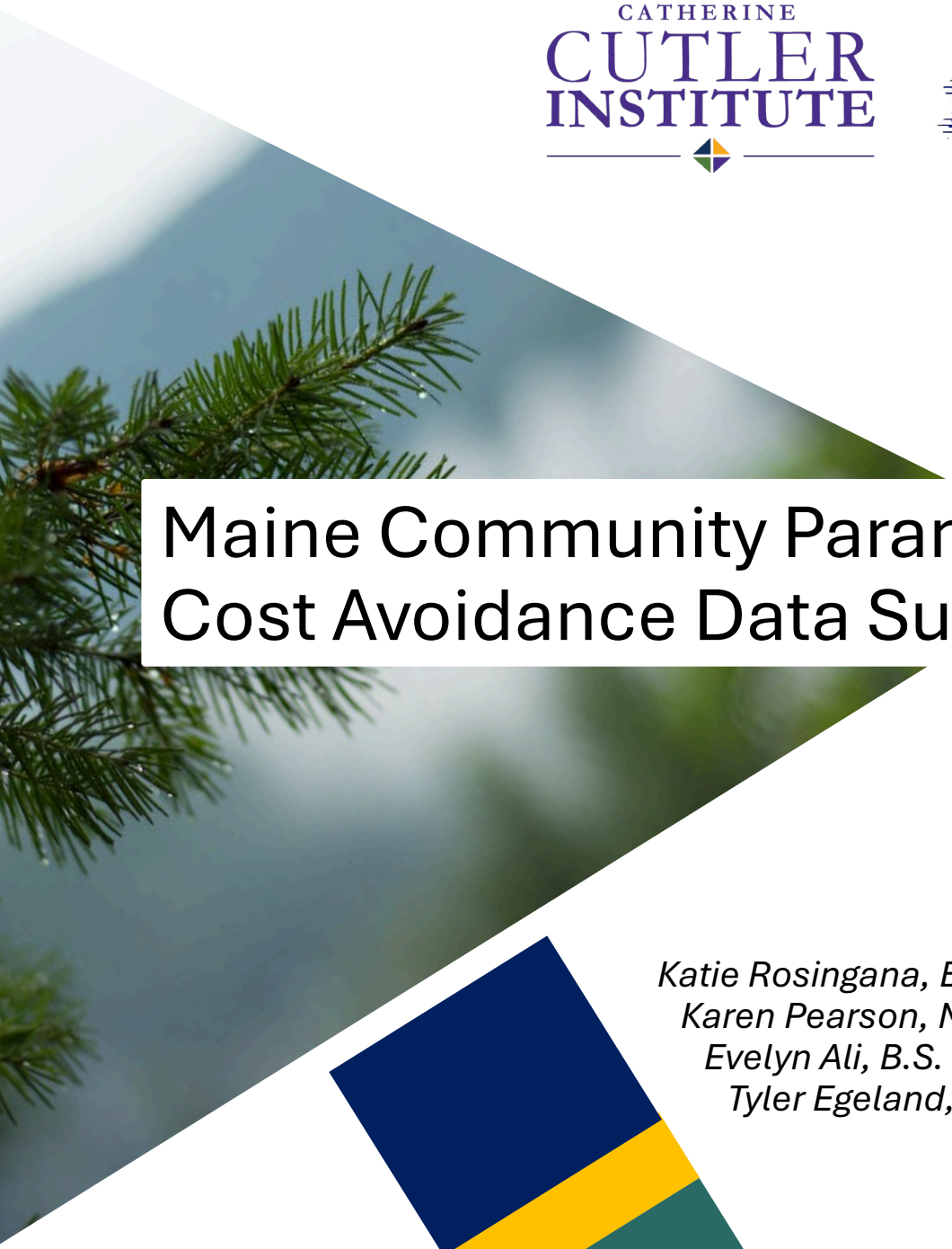

2023

Maine Community Paramedicine Cost Avoidance Data Summary

Katie Rosingana, B.S.
Karen Pearson, MLIS, MA
Evelyn Ali, B.S.
Tyler Egeland, B.A.

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Overview

In 2022, Maine Emergency Medical Services (EMS) contracted with the Catherine Cutler Institute at the University of Southern Maine to evaluate community paramedicine (CP) programs in Maine. The evaluation is mixed-methods, meaning both quantitative and qualitative data were collected and analyzed in order to share the successes, challenges, and future strategies for sustainable CP programs in Maine.

A key analysis of the evaluation was to identify the healthcare costs avoided that may be attributed to CP services. This can help illustrate the impact of the CP programs not only for patients but also on the larger healthcare system.

Cost avoidance is defined as a representation of an avoided potential increase in expenses and is not to be confused with cost savings.

The Cutler evaluation team analyzed data to determine costs avoided for CP patients in the healthcare system through decreased unnecessary ambulance transports, emergency department visits and hospital readmissions. The data analysis summarized in this report includes data obtained from both Maine EMS and the Maine Health Data Organization (MHDO) to help answer the question:

Within the study years (2018-2021), what is the estimated cost avoidance of emergency department visits and hospital readmissions for persons receiving community paramedicine services in Maine?

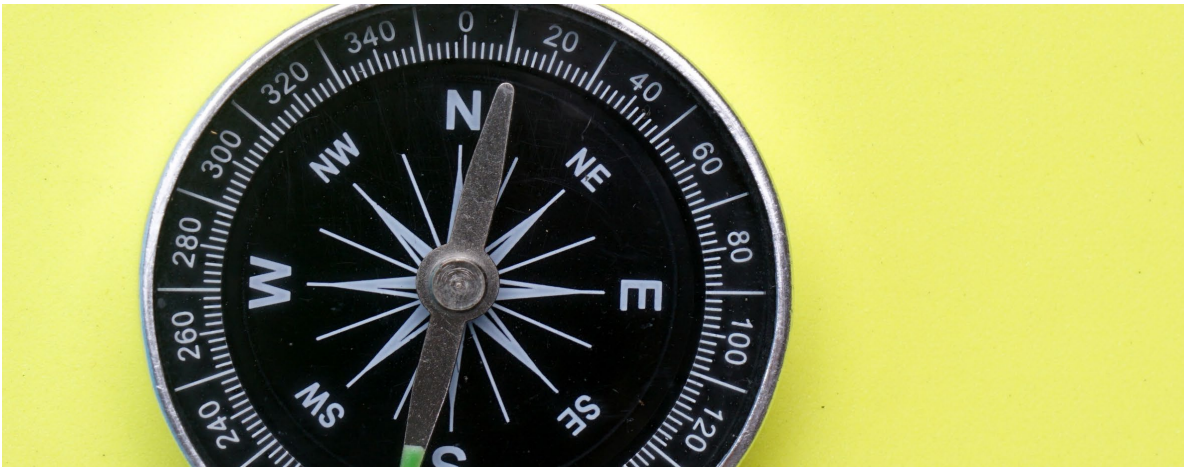
Key Findings

Two-thirds of all Community Paramedicine (CP) programs in Maine showed a decrease in ambulance transports for their CP patients after receipt of CP services, compared to the pre-CP period.

Using the cost avoidance formula for CP, there is statewide cost avoidance for CP patients (after receiving CP services) for both emergency department (ED) visits and hospital readmissions.

Cost avoidance from CP was shown for all payers (Commercial, Medicaid, Medicare) for both ED and hospital readmissions. The largest cost avoidance is seen by commercial payers in Maine.

Guide to the Data Summary



This Data Summary provides both state-level and agency-specific data describing the value of community paramedicine in reducing the number of unnecessary ambulance transports to the emergency department and in hospital readmissions for patients served by community paramedicine programs in Maine.

The charts are organized according to the formula for determining cost avoidance (see Methodology). Each section is introduced with context from our prior CP evaluation studies and peer-reviewed literature.

We look first at the number of ambulance transports avoided by agency in the study period for persons receiving community paramedicine.

The next set of charts focuses on emergency department visits with both statewide and agency-level data, including Medicaid-specific data.

The third section of charts highlights the hospital readmission cost avoidance, again aggregated at the state level, by agency, and Medicaid-specific data.

Methodology

Data Sources

1 Maine Emergency Medical Services (Maine EMS)

Maine EMS provided the Cutler CP Evaluation team with de-identified records of all community paramedicine activations among eighteen (18) CP agencies, along with 911 activations for patients who received community paramedicine services within the study years 2018, 2019, 2020, and 2021. Data fields for community paramedicine records included randomized patient ID, service agency, and date. Data fields for 911 activations included service agency, date, whether a transport occurred, and the level of transport (ALS or BLS). Activations for interfacility transport were excluded from analysis. Patients who were known to be deceased within 6 months of their last CP visit were excluded from analysis.

2 Maine Health Data Organization (MHDO)

The Cutler CP Evaluation team was interested in understanding the costs for emergency department visits and hospital readmissions for a typical CP patient at hospitals affiliated with CP programs. For the purposes of the MHDO request, the CP target population was defined as individuals 65 or older at the start of each respective study period calendar year, with a diagnosis of COPD, heart failure, and/or diabetes. In response to an ad hoc data request, MHDO provided the evaluation team with emergency department and readmission encounter numbers and their total costs by affiliated hospital. by payer. for the CP target population in 2018, 2019, 2020, and 2021. Data were aggregated across all years. Cost data disaggregated by payer and hospital where the number of encounters was less than 10 was excluded from agency-level analysis.

3 Ambulance Transport Charges

Understanding the cost of transporting a patient to the emergency room is critical to showing the value of interventions, including CP, that aim to reduce unnecessary transports and the need for ambulatory care. The Cutler CP Evaluation team requested information from EMS agencies with CP programs about their BLS and ALS transport charges. In total, 13 EMS agencies provided this information which was used to create a single weighted average. The methods are described on the next page.

Methodology

Cost Avoidance

The Cutler CP Evaluation team used the cost avoidance formula developed by MedStar Mobile Health (Ft. Worth, TX) to gain insight on the value of CP programs to the local and statewide health systems. Using Maine EMS data, evaluators analyzed data from individuals who were seen by a CP during the study period between January 1, 2018 and December 31, 2021.

Generally, cost avoidance is defined as a representation of an avoided potential increase in expenses. Using data available and the cost avoidance formula, our analyses show statewide per-patient cost avoidance in the emergency department or hospital setting based on reimbursement/payer, as well as by CP agency.

Cost Avoidance Formula for ED Use

$$\text{Cost avoided per patient} = \frac{(C_A + C_{ED}) * TA}{P}$$

Cost Avoidance Formula for Hospital Readmissions

$$\text{Cost avoided per patient} = \frac{(C_{RA}) * TA}{P}$$

TA **Transports Avoided** was derived from Maine EMS data. This variable was first calculated at the patient level by subtracting the number of EMS transports in the 6 months before their first CP visit from the number of EMS transports in the 6 months after their last CP visit, within the study period**.** This variable was aggregated at the agency-level based on the agency responsible for the patient's first CP visit; it was also aggregated at the state-level.

P **Patient** refers to the number of unique individuals who received community paramedicine, and whose first visit was between January 1, 2018, and Dec 31, 2021, according to Maine EMS data. This variable was calculated at the agency- and state-level. (Note: the published formula's denominator calls for "patients enrolled" which is not done by Maine CP agencies.)

C_A **Average Ambulance Transport Cost** is an estimate of the average cost of a 911 activation transports in Maine. This was approximated by creating an average of charges for ALS and BLS transports as reported voluntarily by 13 EMS agencies. Then, a weighted average was calculated based on the proportion of transports among CP patients that was ALS versus BLS in the Maine EMS data.

C_{ED} **Average Emergency Department Cost** was calculated from MHDO data. The total cost by hospital emergency department (ED) was divided by the number of encounters to determine mean ED cost by hospital by payer. In addition, the total cost at all requested hospitals (n=12) was divided by number of all encounters to determine mean ED cost statewide.

C_{RA} **Average Hospital Readmissions Cost** was calculated from MHDO data. The total cost by hospital was divided by the number of encounters to determine mean readmission cost by hospital by payer. The total cost at all requested hospitals (n=12) was divided by number of all encounters to determine mean readmission cost by payer statewide.

Section 1 Transports Avoided

In this section we provide data on the number of avoided ambulance transports by agency for persons receiving community paramedicine between January 2018 through December 2021.

In the 2015 evaluation of the CP pilot programs in Maine, the USM Muskie School evaluation team was unable to utilize the cost-avoidance formula to determine overall cost savings for each CP pilot site, due to incomplete or inconsistent data collection. Some of the difficulties in data collection were due to the inability of the run reporting system at the time—which did not allow for CP disposition and treatment information, especially for repeat patients, and interoperability challenges with healthcare systems and Maine EMS. While many programs ideally wanted to track referrals, avoided ambulance transports, and patient follow up for 30, 60, and 90 days to determine avoided rehospitalization and ED visits, it was difficult for many of these CP pilot programs to capture systematically.

In 2019, the USM Cutler Institute evaluation team conducted an analysis of a single CP program's data collection initiative. In this study, the evaluation team was able to use the cost avoidance formula initially presented in the 2015 evaluation.

For this current evaluation, the USM Cutler evaluation team utilized EMS activation and transport data during the study period of 2018 through 2021 to calculate an agency-level determination of avoided transports. Chart 1 shows the total number of transports before and after a patient's first CP visit across 18 different EMS agencies in Maine providing CP services. Most agencies observed an increase in the number of avoided ambulance transports, highlighting the impact of a patient's engagement with a CP program.

Chart 1.1 Transports Avoided, by Agency

Patient panels at 12 of 18 EMS agencies providing community paramedicine (CP) in Maine had a decrease in transports in the post-CP period compared to the pre-CP period.

Total Ambulance Transports Avoided, by CP Agency

Agency	N	Transports (pre)	Transports (post)	Transports Avoided
Agency 1	31	16	13	3
Agency 2	247	187	185	2
Agency 3	227	23	18	5
Agency 4	129	15	12	3
Agency 5	50	37	14	23
Agency 6	82	35	27	8
Agency 7	14	243	186	57
Agency 8	10	6	1	5
Agency 9	19	22	16	6
Agency 10	13	6	3	3
Agency 11	7	69	66	3
Agency 12	6	1	0	1
Agency 13	152	12	18	-6
Agency 14	44	107	114	-7
Agency 15	13	136	137	-1
Agency 16	30	6	8	-2
Agency 17	10	72	85	-13
Agency 18	121	1	1	0

Study Period: 2018- 2021
Data: Maine EMS

Section 2 Emergency Department Cost Avoidance

Emergency department (ED) visits are costly, but many patients are seen for non-urgent reasons and discharged. Data analyzed by Weiss et al., from the 2018 Nationwide Emergency Department Sample (NEDS) indicated that over 85 percent of ED visits involved patients who were treated and released from the ED.[1] Additionally, persons aged 65 and older, those with lower income or residing in rural areas had higher rates of ED visits.[1] Medicaid and Medicare beneficiaries had the highest rates of ED visits in 2020.[2]

Understanding these data help inform community paramedicine interventions to reduce unnecessary ED visits in Maine, which has the oldest population in the nation (median age 45.2)[3] and is rural, with 40% of residents living in census-delegated rural counties.[4]

In the 2019 CP evaluation, data on patient ED utilization was collected for the 30-day period before and after the patient's first complete CP visit. Results showed a decline in ED utilization in the month after the initial CP visit for all study years: 2016, 2017, 2018.

For this study, we used data from MHDO for emergency department costs specific to the hospitals within the CP service area and by payer (see Methodology). We determined the mean ED cost avoided statewide by payer (Commercial, Medicaid, Medicare Advantage, and Medicare Fee for Service), as well as agency-level ED costs avoided.

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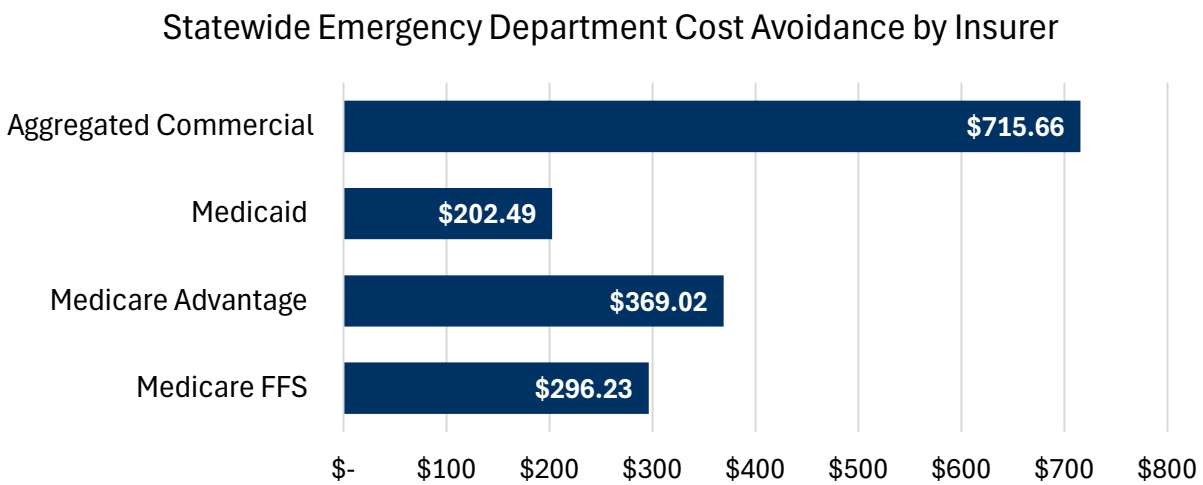
1. Weiss AJ, Jiang HJ. Most frequent reasons for emergency department visits, 2018. Agency for Healthcare Research and Quality;2021 Dec. H-CUP Statistical Brief #286.
2. Cairns C, Ashman JJ, King JM. Emergency department visit rates by selected characteristics: United States, 2020.2022 Nov. NCHS Data Brief No. 452.
3. https://www.statista.com/statistics/208048/median-age-of-population-in-the-usa-by-state/
4. Maine Center for Disease Control and Prevention. Rural health in Maine. Geography and demographics. 2024.

Chart 2.1 Statewide Emergency Department Cost Avoidance

When comparing CP per-patient Emergency Department (ED) cost avoidance statewide, the results from the cost avoidance formula suggest that commercial insurers in Maine see the most cost avoidance in the ED for CP patients. The per-patient cost avoidance is double and triple that of Medicare Advantage/Medicare FFS and Medicaid, respectively.

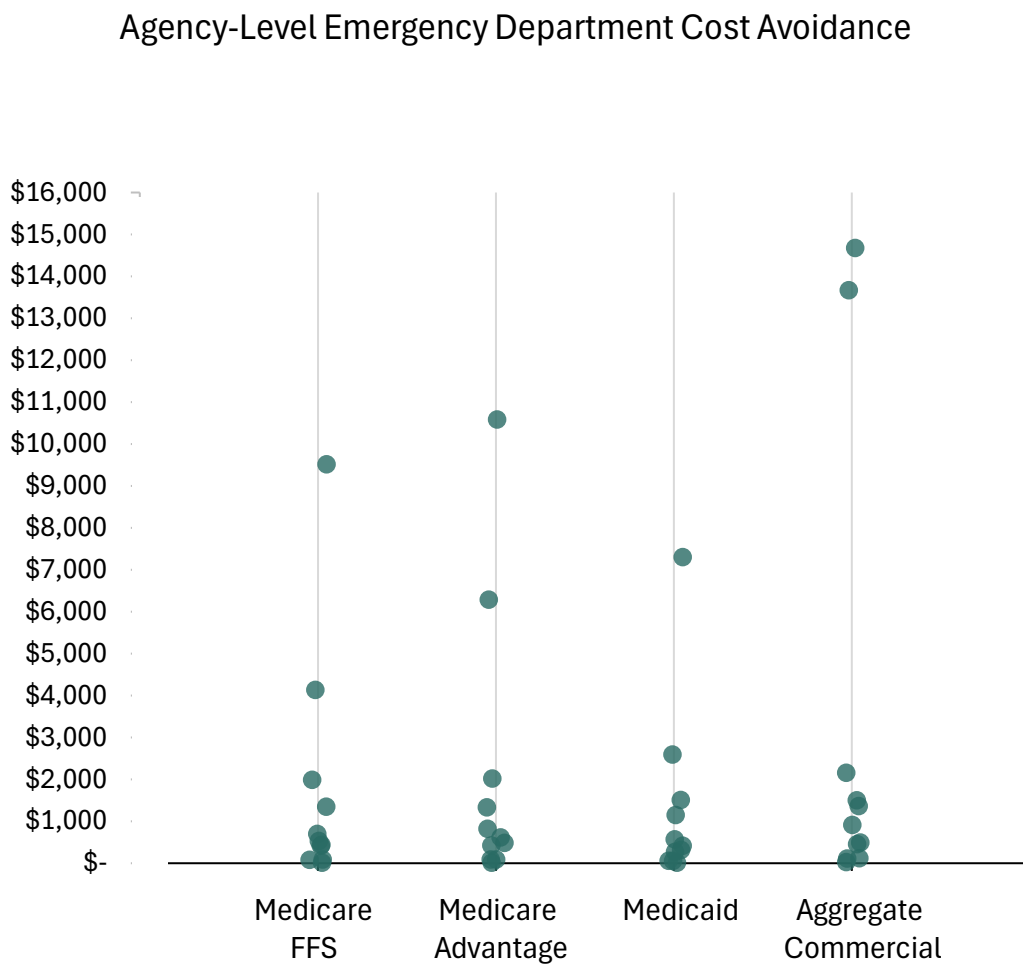


Commercial payers included Aetna; Anthem Health Plans of Maine; Cigna; Harvard Pilgrim, Maine Community Health Options; and United Healthcare Insurance Co.

Study Period: 2018- 2021
Data: MDHO, Maine EMS

Chart 2.2 Emergency Department Cost Avoidance, by Agency

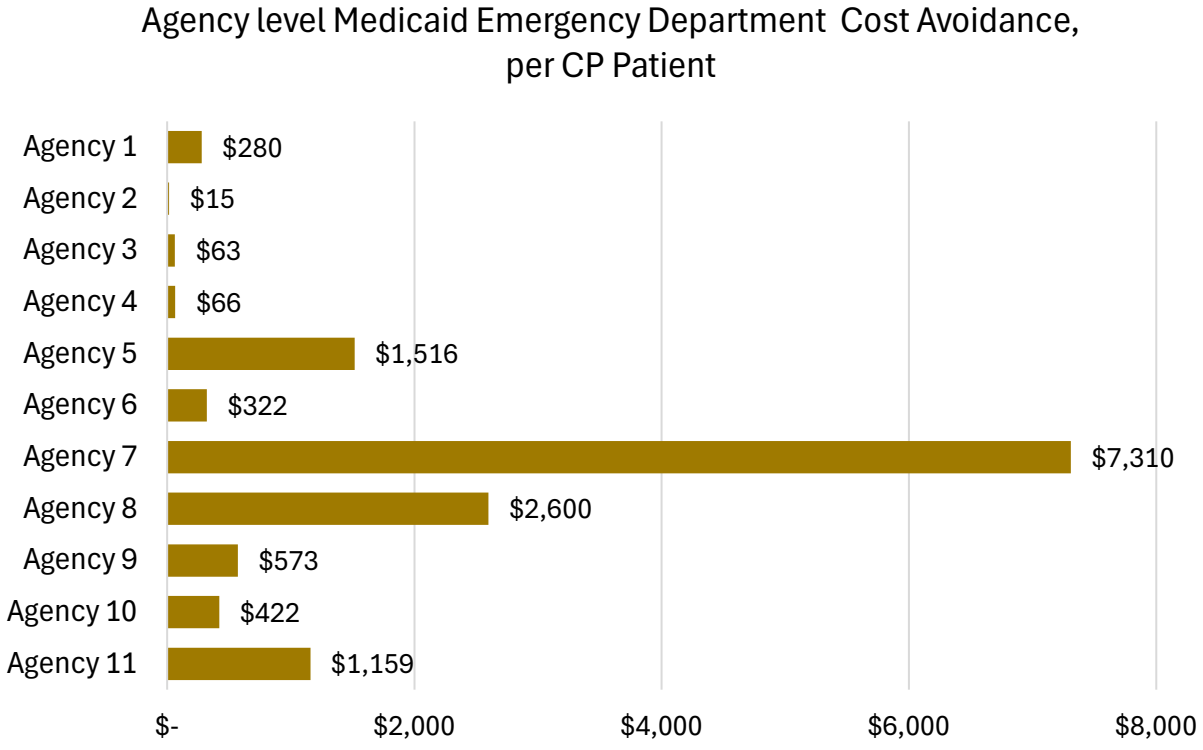
The majority of EMS agencies with CP programs saw up to $2,000 in costs avoided per CP patient across all payers. The highest amount of costs avoided were for commercial payers, with two agencies realizing a cost-avoidance of over $13,000. Both these agencies had a higher number of transports in the study period compared to the other agencies, which is a driver in the cost avoidance formula.



Study Period: 2018- 2021
Data: MDHO, Maine EMS

Chart 2.3 Medicaid ED Cost Avoidance, by Agency

Like the ED visit costs comparison across all payers, Medicaid ED cost avoidance by agency (no other payers in the analysis) indicates a very wide range of cost avoidance per patient; again, the transports avoided is driving the variation in agency cost avoidance. While the costs from the emergency department is integral to the formula, the varied results are largely driven by the transports avoided number, with agencies that had more transports avoided showing much higher cost avoidance.



Study Period: 2018- 2021
Data: MDHO, Maine EMS

Section 3 Hospital Readmissions Cost Avoidance

Reducing preventable hospital readmissions is a major goal of CP and addresses both the reduction in health system costs as well as improvement in patient care. Hospital readmissions are defined as any subsequent hospital admission for any cause within 30 days following an initial stay.[1] Analyses of data from the 2018 Nationwide Readmissions Database showed that in 2020, hospital stays where Medicare was the expected payer had the highest readmission rate (17%) followed by stays with Medicaid as the expected payer. For persons 65 years and older, the readmission rate in 2020 for Medicare was 16%.[1] Thirty-day readmissions have also been linked to increased mortality, with this risk persisting for up to two years.[2] In a current evaluation of the impact of CP on addressing health-related social needs and hospital readmissions, the authors found that patients whose medication-related needs were fully addressed had a 65% lower rate of hospital readmissions.[3]

For our 2015 CP evaluation, we looked specifically at the data collected by United Ambulance for their enrolled CP patients, in which they were able to show a reduction in both ED visits and hospital readmissions.*

In 2019, our analysis included data on patient hospitalization 30 days before and after the CP visit. Similar to ED use, the data showed a decline in hospital readmissions in the month after initial CP visit for all study years (2016, 2017, 2018).

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*See case study on United Ambulance in: Pearson KB, Shaler G. Community paramedicine pilot programs: Lessons from Maine. Symposium on community-based health care. *J Health Hum Serv Adm*. 2017;40(2):141-185.

Section 3 Hospital Readmissions Cost Avoidance

For our current evaluation, we used encounter data from MHDO on selected hospital readmissions including costs by payer for the CP patient population in our study period. Our target CP population was defined as persons 65 years or older with a chronic condition diagnosis, for two reasons: 1) this is historically the targeted population in Maine's CP programs and 2) these individuals are at the highest risk of rehospitalization. [1]

The charts in this section portray the aggregated cost avoidance at the statewide level by payer, at the agency level and Medicaid-specific cost avoidance by agency.

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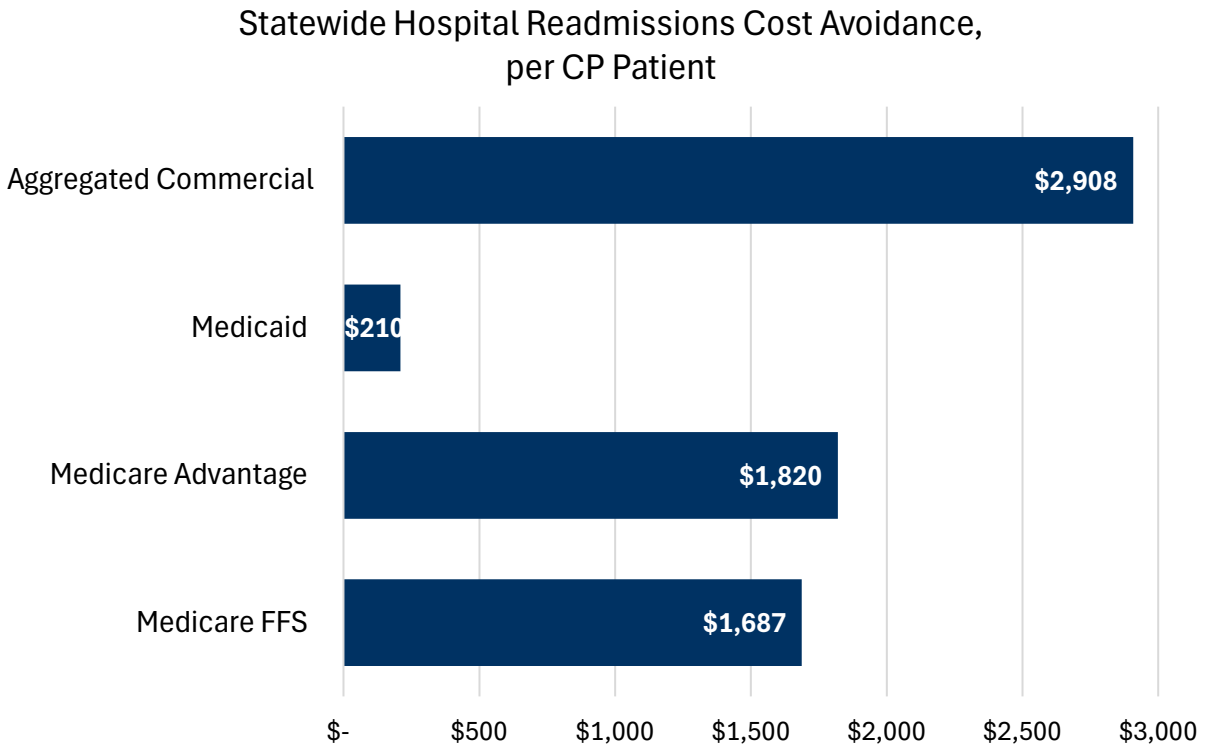
1. Weiss AJ, Jiang HJ. *Overview of clinical conditions with frequent and costly hospital readmissions by payer, 2018*. Agency for Healthcare Research and Quality;2021 July. H-CUP Statistical Brief #278.
2. Shaw JA, et al. Thirty-day hospital readmissions: A predictor of higher all-cause mortality for up to two years. *Cureus*. 2020. doi: 10.7759/cureus.9308
3. Miller G, et al. Evaluating the impact of a mobile integrated health–community paramedicine program on health-related social needs and hospital readmissions. *J Health Care Poor Underserved*. November 2023;34(4):1270-1289.

Chart 3.1 Statewide Hospital Readmissions Cost Avoidance, by Payer

When comparing CP per-patient hospital readmissions cost avoidance statewide, commercial insurers in Maine have the most cost avoidance per CP patient at nearly $3000 per patient. The cost avoidance for Medicaid members is markedly lower than both commercial payers as well as the Medicare plans, partially because MaineCare paid the least for readmissions when compared to other payers during the study period.



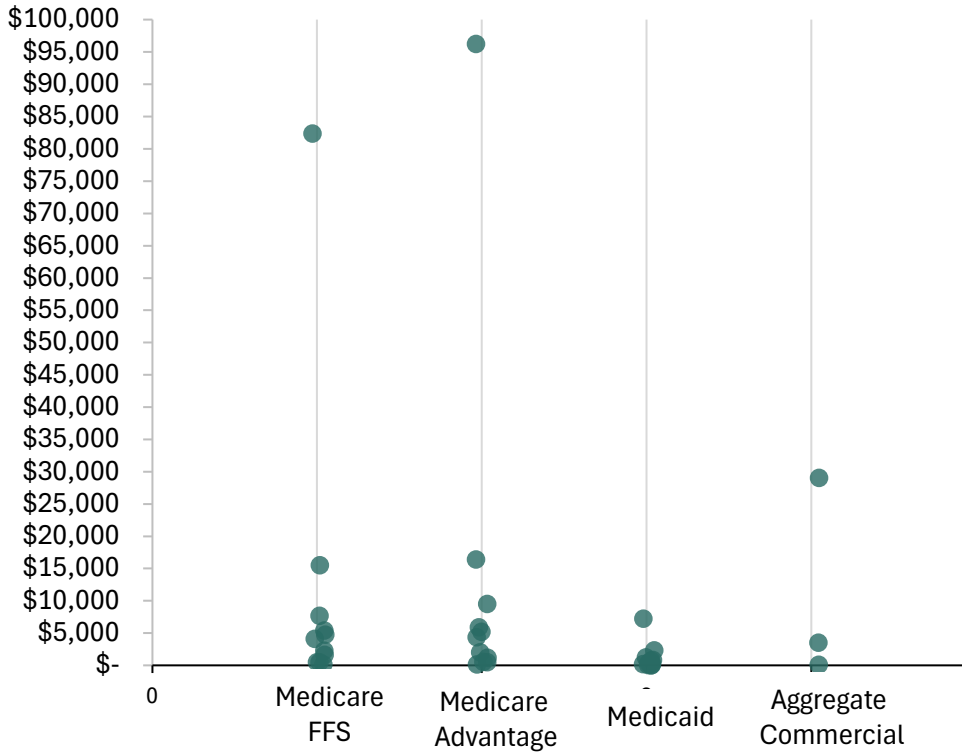
Commercial payers included Aetna; Anthem Health Plans of Maine; Cigna; Harvard Pilgrim, Maine Community Health Options; and United Healthcare Insurance Co.

Study Period: 2018- 2021
Data: MDHO, Maine EMS

Chart 3.2 Hospital Readmissions Cost Avoidance, by Agency

The majority of EMS agencies with CP programs saw hospital readmissions cost avoidance in the Medicare FFS and Medicare Advantage population of up to $15,000, with one agency realizing a substantial hospital admission cost avoidance for these payers. Commercial payers did not have as high a cost avoidance as was seen in the ED cost avoidance.

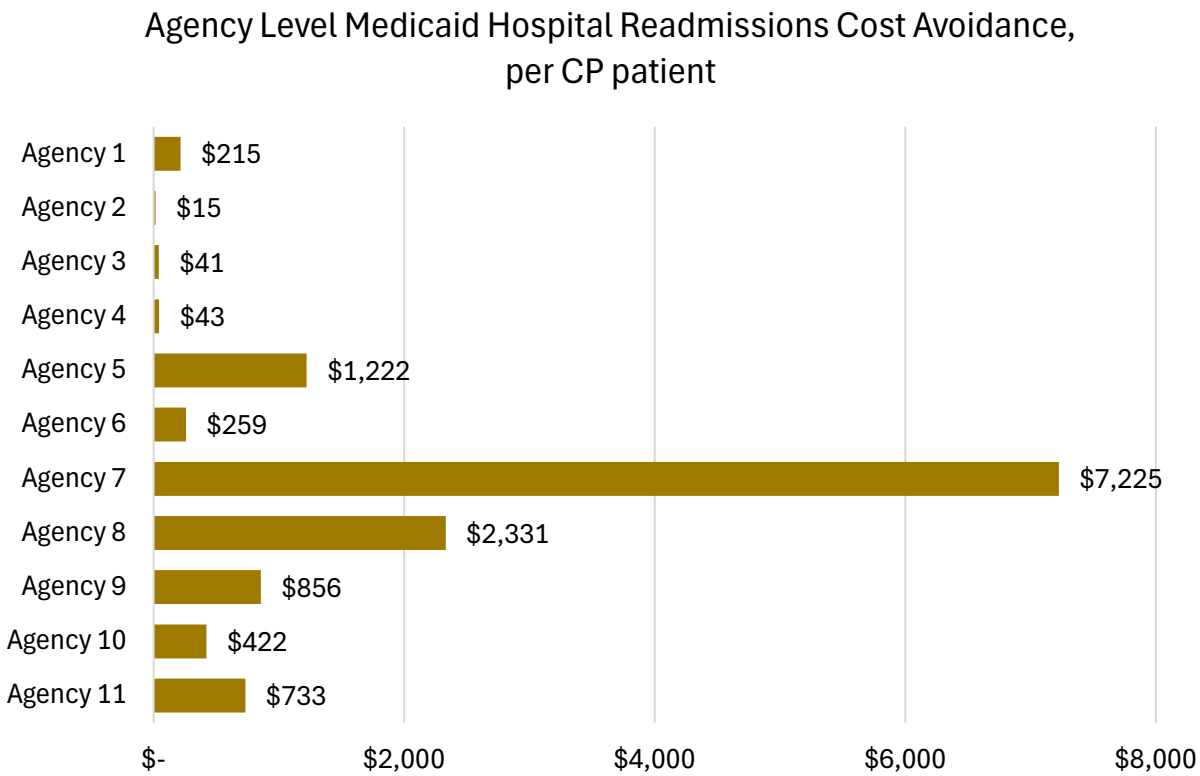
Agency-Level Hospital Readmissions Cost Avoidance, by CP Agency



Study Period: 2018- 2021
Data: MDHO, Maine EMS

Chart 3.3 Medicaid Hospital Readmissions Cost Avoidance, by Agency

Medicaid hospital readmissions cost avoidance by agency (no other payers in the analysis) indicates a wide range of cost avoidance per patient. Notably, the transport cost is not included in the hospital readmissions formula, and our analyses indicates costs are higher for hospital readmissions than for ED, and readmissions had much less patient utilization than ED use (not shown).



Study Period: 2018- 2021
Data: MDHO, Maine EMS

Summary

Absence of robust patient-level data affects the ability to obtain and retain local and statewide support for the reimbursement of services, in part because there is a lack of evidence of the efficacy of CP services.

In this Data Summary, we have provided the framework of evidence on the impact of CP services on the cost avoidance or expenditure savings per CP patient.

These data will allow targeted and specific conversations to further the evidence base for the value of CP programs in Maine.

The next and final deliverable of this evaluation will be a claims analysis of MaineCare members receiving CP services, including their demographics, service use and costs. Together with this data analysis, it aims to inform Maine EMS and state policymakers by giving a more robust picture of who is using CP services and the CP program's impact at both patient and system levels.

Limitations

- This is not an evaluation with a comparison group, and no statistical testing was conducted; rather, it is a summary of data analysis.
- Emergency department and hospital readmissions costs were specified to the CP target population (over age 65, with specified chronic conditions).
- Because we do not know the breakdown of CP patients by insurer (this is not information captured by Maine EMS), each cost avoidance equation assumes all patients in the panel are paid by said insurer to reach the per-person cost avoidance average.
- While we adhered as strictly as possible to the cost avoidance formula, it was not utilized as published (i.e., Maine CP agencies do not enroll patients, which is the denominator in the formula). There is a lack of published data using this cost avoidance formula.

For more information, please contact Katie Rosingana or Karen Pearson, Co-PIs of the CP Evaluation Study.