Community Paramedicine & Medicaid: MaineCare Claims Data Analysis Summary

Maine Community Paramedicine Evaluation

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Overview

Community Paramedicine Evaluation

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

This report is the final quantitative data summary from the evaluation, focused on the state's Medicaid program, MaineCare, and CP patients served.

Background

Absence of robust patient-level data affects the ability to obtain and retain local and statewide support for the reimbursement of community paramedicine services in Maine by commercial and public payers, in part because of the historic lack of evidence of the efficacy of CP services.

Since their inception in 2012, community paramedicine services in Maine have been largely grant funded and never reimbursed by commercial nor public insurance. While 2024 begins more robust data collection for Maine EMS, during the study period (2018-2022), information on CP patients' medical insurance provider was not routinely collected. For this study, the Cutler team worked closely with Maine EMS and the state's Medicaid office (Office of MaineCare Services) to match, extract, and analyze data from CP patients who were also receiving MaineCare during these years. This report contains the analysis of these claims.

This claims analysis of MaineCare members receiving CP services includes findings on these patients' demographics, service use, and costs. Together with a previous cost avoidance analysis conducted by the Cutler team (December 2023), it aims to inform Maine EMS and state policymakers by giving a more robust picture of who is using CP services and how the CP program might impact patient-level and systems of care.

Research Questions

Study Period: 2018-2022

How many people used CP services during the study period?

How many of the **people who used CP services were also covered by MaineCare insurance (the Study Group)** during the study period?

- What were their demographics (age, gender, geography)?
- What types of chronic conditions do they have claims for?
- How often did they utilize the emergency department, and for what diagnoses?
- How often were they hospitalized, and for what diagnoses?
- How much did their ED use and hospitalizations cost, and diagnoses were most costly?

Key Findings Overview

Study Group: Persons Receiving Community Paramedicine and MaineCare, 2018 - 2022

Demographics

Well over half (58%) of CP patients were also covered by MaineCare over the course of the study period.

Between 10%-28% of MaineCare members who received CP services were under the age of 45.

On average, 3 out of 4 of CP patients receiving MaineCare were dually eligible for both MaineCare & Medicare.

Diagnoses

The most common chronic condition found in ED and hospitalization claims for the study group was depressive disorders (11%).

Arthritis was the second most common chronic condition (9%).

On average, 42% of the Study Group had at least one of the "targeted" chronic conditions documented in claims each study year.

Emergency Department (ED) Use & Costs

Diagnoses related to alcohol use were the most frequent primary diagnoses in the ED.

82% of CP patients receiving MaineCare visited the ED at least once during the study period.

Sepsis was the 10th most frequent primary diagnosis in the ED but the costliest.

Hospital Use & Costs

Sepsis was the most frequent and most costly hospitalization diagnosis during each study year.

58% of CP patients receiving MaineCare were hospitalized at least once during the study period.

The highest per-patient hospitalization diagnosis was alcohol use disorder (average of 3.9 hospitalizations per patient).

Chronic Conditions

The study flagged eight chronic conditions that are typically targeted by CP programs: chronic obstructive pulmonary disorder (COPD), diabetes, asthma, dementia, congestive heart failure (CHF), depression, arthritis, and chronic kidney disease. COPD was the only chronic condition in the top ten most frequent diagnoses for both ED use and hospitalizations for the Study Group. Five of the top ten hospitalization diagnoses were lung-related and that could be associated with COPD. Along with COPD, there were three other diagnoses in the top ten most prevalent diagnoses for both ED and hospitalizations: alcohol-related disorders, cellulitis/lymphangitis, and sepsis.

Methodology

Study Period 2018-2022

Data Curation

Through the execution of a Business Associate Agreement, a Data Use Agreement and a Memorandum of Understanding, Maine EMS provided the Maine Department of Health and Human Services' Office of MaineCare Services (OMS) with a dataset of Community Paramedicine (CP) patients for the years of study (2018-2022). This dataset included variables for name (first and last) and birth date. Initially, an OMS data analyst attempted to manually match patients from the Maine EMS CP dataset to MaineCare patients, as there is no existing primary key variable to match patients between the EMS and OMS databases.

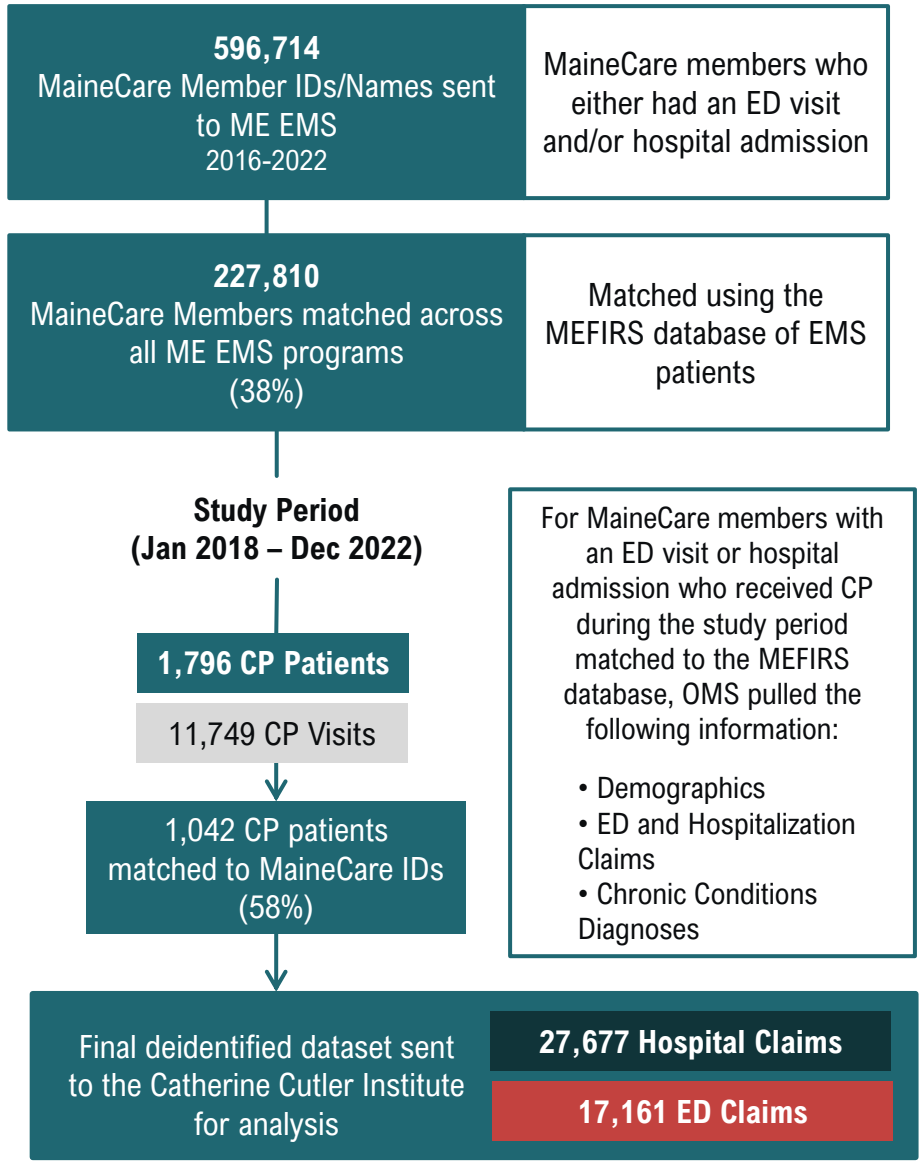
The manual matching was labor intensive, so the methodology shifted (see Figure 1):

- OMS sent EMS list of MaineCare IDs (i.e., members) with ED visit and/or hospital admission (2016-2022).
- EMS matched MaineCare list against the Maine EMS & Fire Incident Reporting System (MEFIRS) database and assigned unique identifiers for matched patients.
- EMS refined matched list to **include only those MaineCare members who had a CP visit during the study period, 2018 - 2022. This is the Study Group**.
- Refined list (Study Group) sent back to OMS to pull datafiles for demographics, claims, and selected diagnoses which were then sent to EMS.
- EMS sent final deidentified list with OMS datafiles to Cutler for analysis.

A flow chart depicting the data curation is shown to the right.

Data analysis was conducted using Microsoft Excel.

Figure 1



Terminology and Defining the Study Group

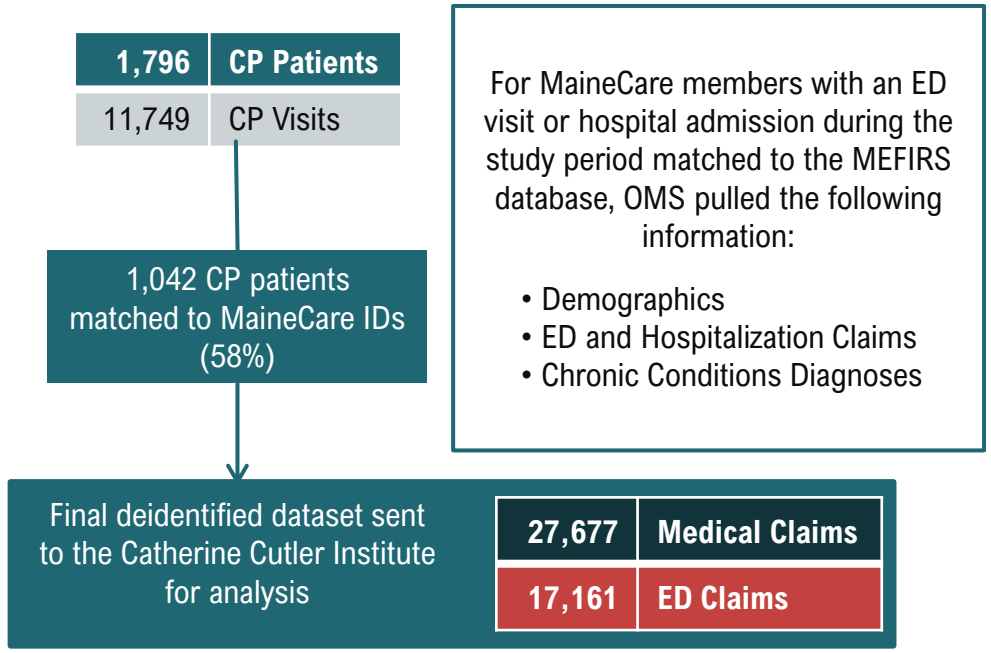
CP Patient Panel

There were 1,796 patients with at least one CP visit during the study years (2018-2022)—this group is the **CP Patient Panel**. The CP Patient Panel contains persons who received services covered by MaineCare, as well as persons who were not covered by MaineCare during the study period (e.g., they may have been privately insured, uninsured or insured under Medicare). The CP Patient Panel had 11,479 CP visits which was an average of 15 visits per patient over the five-year study period.

Study Group

Most of the analysis and findings in this report are on the 1,042 unique individuals in the **Study Group,** consisting of persons that received services covered by MaineCare during any point during the study period, *and* had an ED visit or hospitalization during the study period, *and* were matched to the EMS MEFIRS database as having at least one CP visit during the study period. This is the group selected to explicate the demographics, chronic conditions diagnoses, and ED/hospital utilization of CP patients who are also receiving MaineCare-reimbursed services.

Study Period Jan 2018 – Dec 2022



Data analysis was conducted using Microsoft Excel.

Section I

Findings: Demographics

Demographics: CP Patient Panel and Insurance

Overall Community Paramedicine (CP) Utilization

There were a total of **1,796 unique patients** who interacted with CP services across the study period (2018-2022). On average, there were 437 patients who received CP services each year.

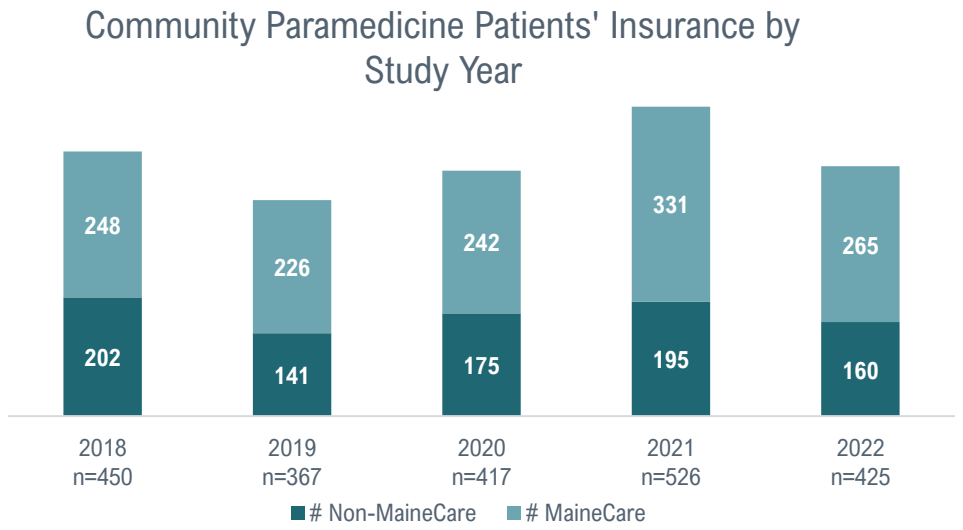
MaineCare Member CP Utilization

Over the study period, nearly two-thirds of the unique CP patients had MaineCare for insurance. The percentage of dually eligible MaineCare Members (eligible for Medicare and Medicaid) dropped in 2021 and 2022, as the percentage of younger patients using CP services increased from previous study years, and thus may have been less likely to be eligible for Medicare.

An average of 72% of the MaineCare Members receiving CP services (Study Group) were dually eligible for MaineCare and Medicare across the study period (data not shown).

CP Patient Panel: MaineCare and Medicare Insurance Coverage

	2018	2019	2020	2021	2022	CP Patient Panel Total
% MaineCare Members	55%	62%	58%	63%	62%	**58%**
% Dually Eligible (MaineCare & Medicare)	83%	82%	80%	63%	51%	**69%**

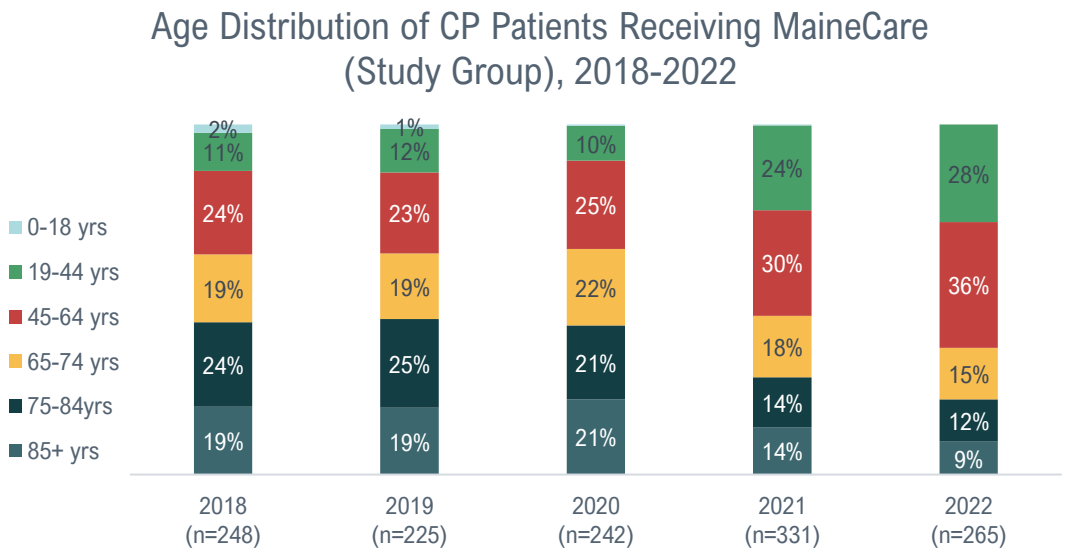


Study Group Demographics: Age, Gender, Location

While most CP programs in Maine target older adults (age 65+), it is interesting to note the large percentage of patients under 65 within the Study Group, which consists of those receiving both MaineCare and CP during the study period. Every study year, more than one-third of CP patients who received MaineCare were under the age of 65. Nearly two-thirds of the Study Group are under the age of 65 in 2022.

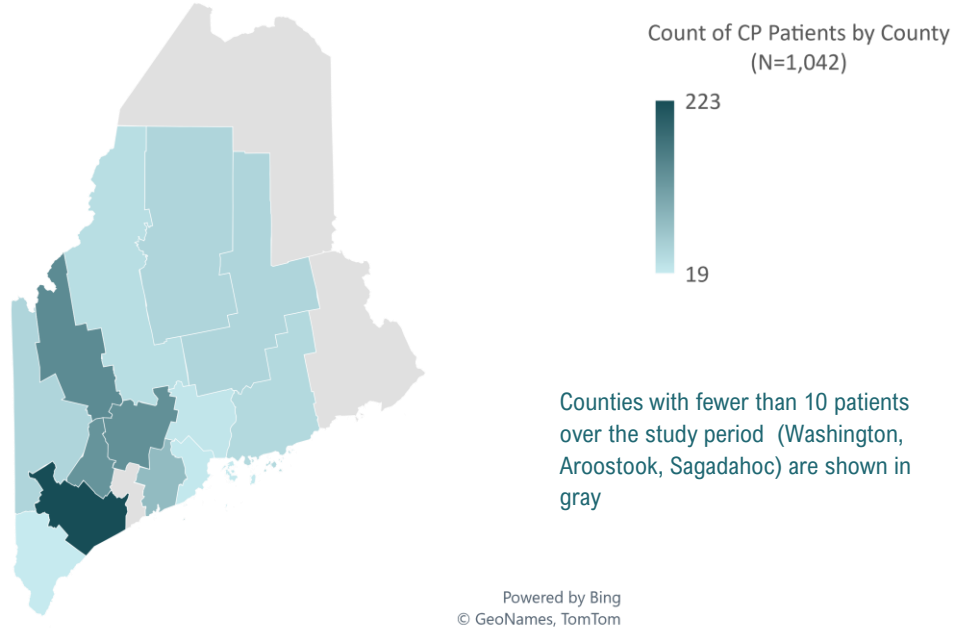
The percentage of patients under the age of 65 increased (37% to 64%) over the study period while for those aged 75+ it decreased (43% to 21%). The average age of the Study Group was 67.7 in 2018 and 57.3 in 2022.*

Throughout the study period, between 10%-28% of the Study Group was under the age of 45. Overall, this analysis shows a much younger demographic receiving CP services than anecdotally assumed for CP patients.



* Average age & age distribution is calculated by age at end of the first year of the Study Period (12/31/2018) and not based on birth dates.

The CP Study Group—MaineCare Members receiving CP services—were most likely to reside in Cumberland or Androscoggin Counties. Well over half of the Study Group (58.6%) were female.



Section II.

Findings: Diagnoses

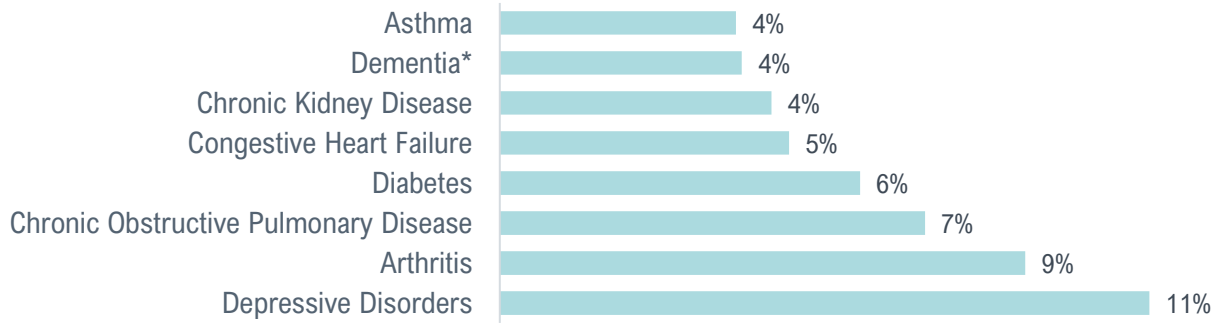
Study Group: Chronic Conditions Diagnoses

Our analysis of MaineCare claims examined a set of eight chronic conditions hypothesized to be common for the demographics of people who utilize CP services (see chart at right).

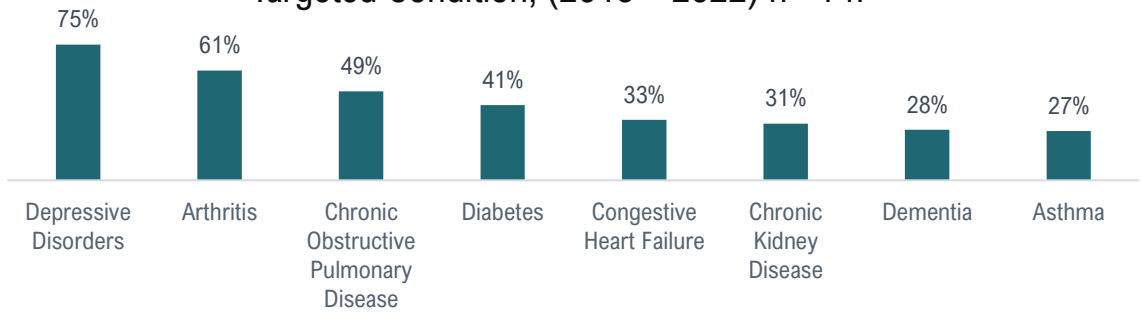
Across the study period, depressive disorders were the most common chronic condition, with 11% of MaineCare Members having this condition documented in a claim while receiving CP services. Arthritis was the next most common chronic condition at 9%.

Looking at the 147 people in the Study Group who had at least one of the targeted chronic conditions documented on a claim over the course of the study period, the most prevalent chronic conditions were depressive disorders (75%), arthritis (61%), and COPD (49%). Additional percentages are shown in the second (bottom) chart.

Percent of MaineCare Members Receiving CP Services with Chronic Condition Claims (2018-2022) n=1,042



Prevalence of Chronic Conditions amongst Study Group with at least one Targeted Condition, (2018 – 2022) n =147

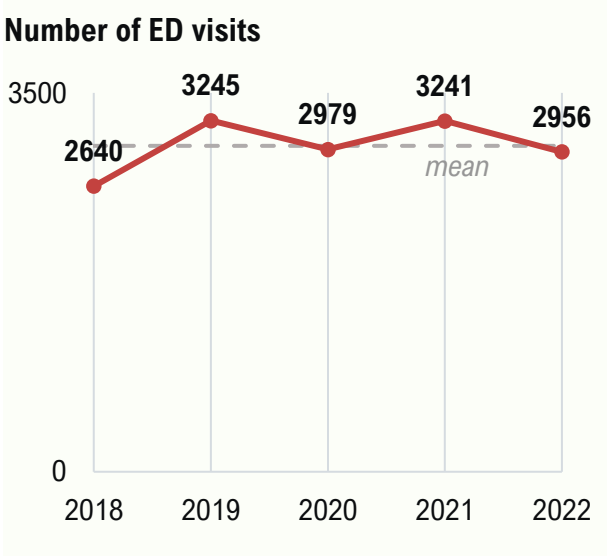


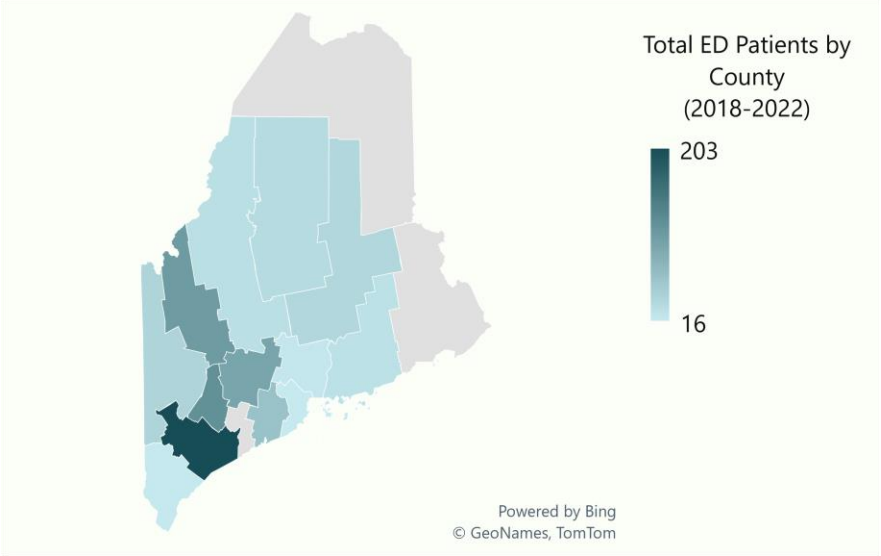
*Dementia includes Alzheimer's Dementia and Non- Alzheimer's Dementia

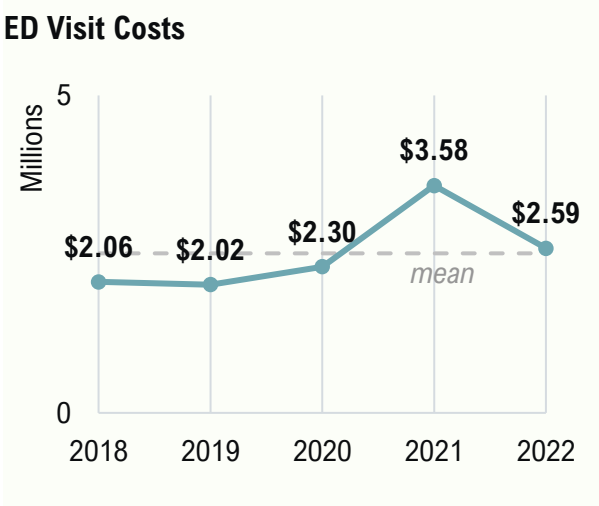
Section III

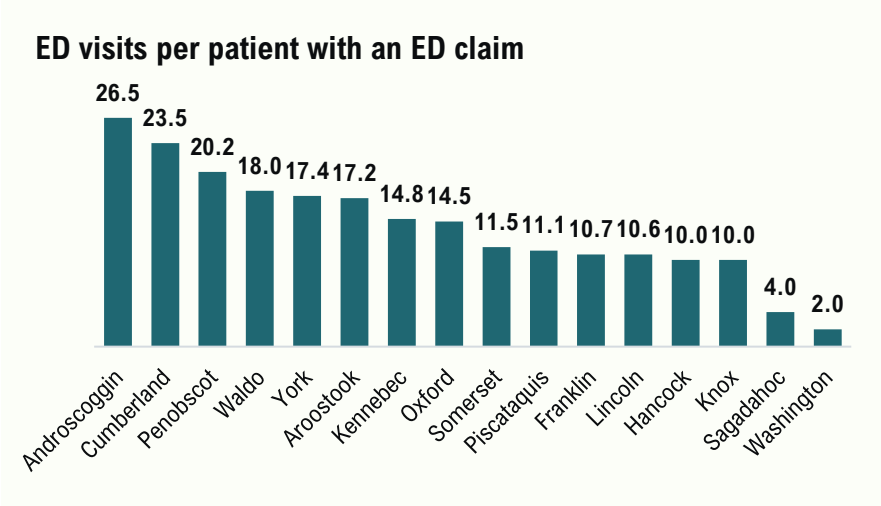
Emergency Department Claims Analysis

Emergency Department (ED) Visits and Claims: Study Group









Overall, 82% of the Study Group had an ED visit at least once between 2018- 2022.

There were 15,061 distinct ED visits with a total of 17,161 claims (including those that were revised or adjusted). There were 858 CP patients within the Study Group who had ED claims. Costs of ED visits rose in 2021, corresponding with two low-frequency, high-cost diagnoses, with such low *n*'s the diagnoses have been suppressed. These accounted for ED costs of over $800,000 in 2021.

Androscoggin, Cumberland, and Penobscot Counties had the highest rates of ED visits.

Cumberland County had the highest number (n=203) of patients visiting an ED.

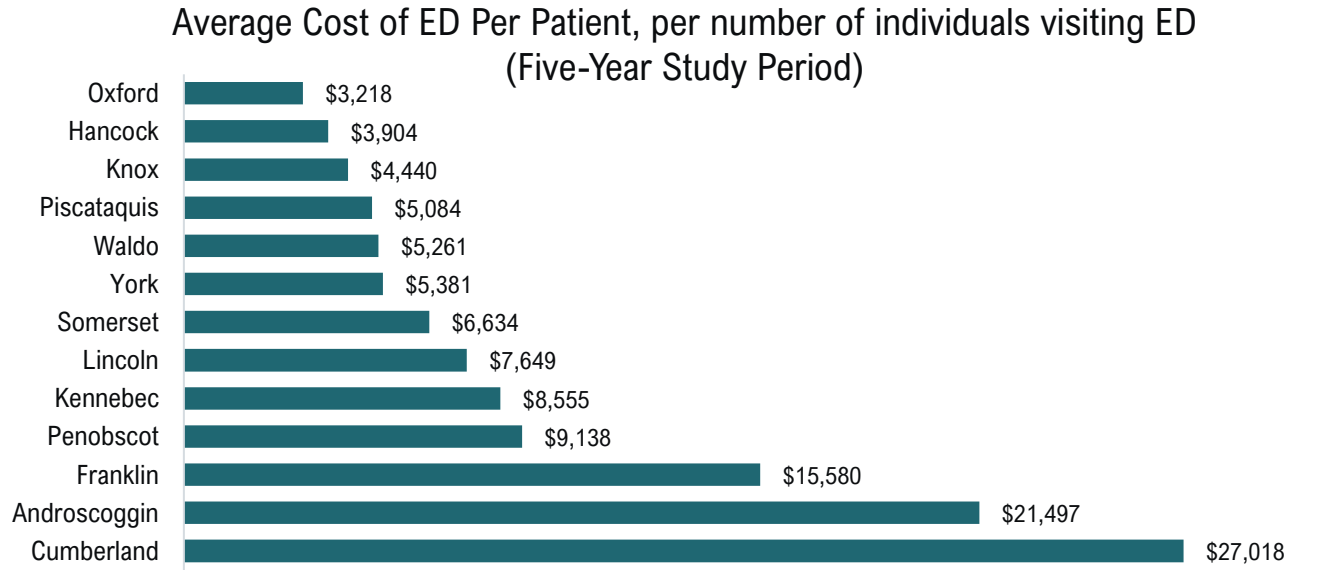
Note: Distinct ED visits were identified via claims with a unique Claim ID, service date, and billing provider name. Since service discharge dates were not a part of the dataset, service dates that were next to each other (e.g., January 1 and January 2) were each counted as distinct ED visits.

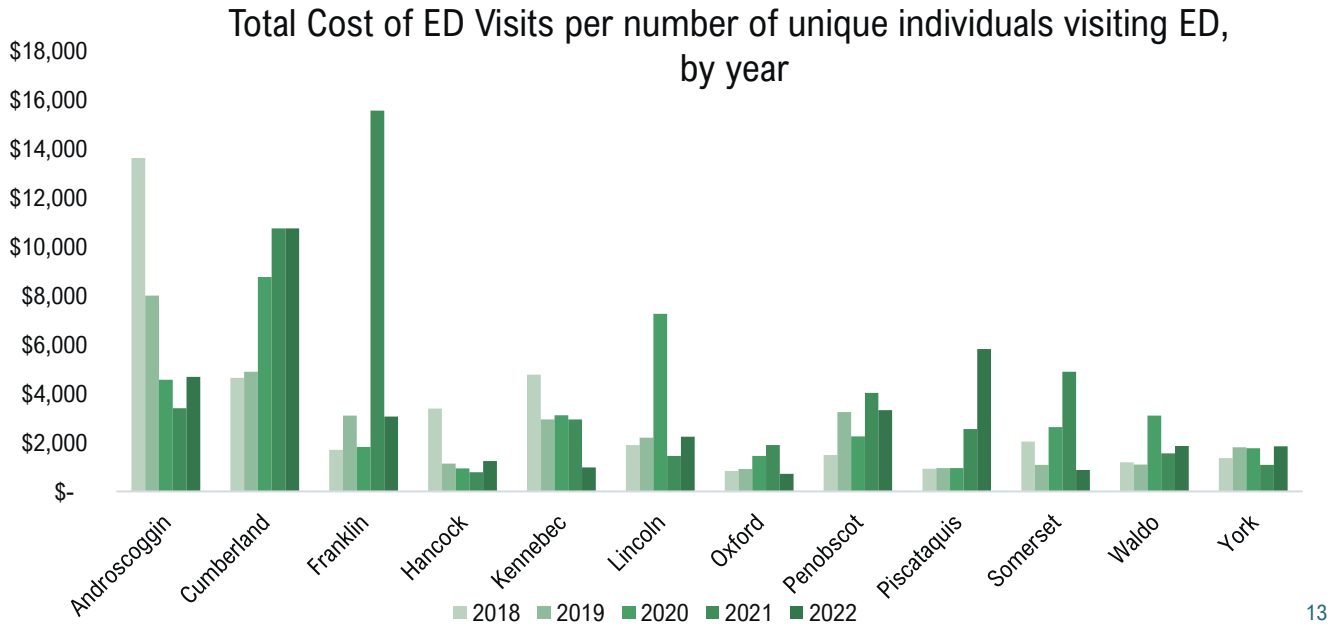
Costs by Location

Cumberland and Androscoggin were the costliest counties for the Study Group's ED utilization, on an average per-patient basis for persons utilizing the ED (top chart).

The three most costly counties (Cumberland, Androscoggin, and Franklin) had much higher annual costs, on average, than other counties. (bottom chart). One contributing factor may be that hospitals in these Counties, Cumberland in particular, have greater ED resources and see more people from within these counties while possibly drawing patients from other counties.

Total costs for ED visits fluctuated year to year in each county. The costs in Cumberland County rose steadily in 2020, 2021, and 2022; Androscoggin County had higher costs at the beginning of the study period (2018, 2019). Franklin County saw a spike in costs in 2021 that drove the average cost per patient higher for the study period.





Washington, Sagadahoc, and Aroostook <10 patients

Most Frequent Primary Diagnoses

Alcohol use disorders were the most frequent diagnoses in the ED for the Study Group, with 98 unique patients visiting the ED for this, on average of 13 times during the study period.

Alcohol related disorders were the primary diagnosis for over twice as many visits than the next most frequent diagnosis category (COPD).

While alcohol related disorders are the most frequent presentation in the ED, chronic conditions such as diabetes and COPD were also common, in addition to pain and infection. Hypertension or other vein disorders had fewer patients diagnosed, but the most frequent average ED visits per patient (14.5).

Rank	Primary diagnosis code category	Total	Unique patients with diagnosis	Avg ED visits/ patient
1	Alcohol related disorders	**1190**	98	13.2
2	Pain in throat or chest	517	178	2.9
3	COPD	434	123	3.5
4	Abdominal and pelvic pain	398	142	2.8
5	Type 2 diabetes mellitus	396	95	4.1
6	Cellulitis	381	167	2.2
7	Hypertension or other vein disorders	335	23	**14.5**
8	Lower back pain	303	143	2.1
9	Emotional Problems including suicidality	281	86	3.26
10	Sepsis	260	147	1.7

Emergency Department

Diagnosis Frequency by Year

Rank	Diagnosis Code Category	2018	2019	2020	2021	2022
1	Alcohol related disorders	140	238	319	258	238
2	Pain in throat or chest	84	85	85	149	114
3	COPD	99	132	103	56	44
4	Abdominal and pelvic pain	87	95	60	81	75
5	Type 2 diabetes mellitus	56	58	76	126	80
6	Cellulitus	43	83	62	107	86
7	Hypertension or other vein disorders	18	30	81	131	75
8	Lower back pain	64	79	48	50	62
9	Emotional Problems including suicidality	29	39	49	80	84
10	Sepsis	41	61	49	52	57

When looking at the frequency of claims across the study years, alcohol related disorders were consistently the most frequent diagnoses in the ED for the Study Group.

Overall, the most frequent diagnoses in the ED across the study period were varied. We noted both chronic conditions (e.g., Type 2 diabetes, COPD) as well as other more emergent and acute conditions (e.g., suicidality, pain in throat or chest) in the list of the top ten most frequent diagnoses.

Emergency Department

Diagnosis Prevalence by Year

Rank	Diagnosis Code Category	2018	2019	2020	2021	2022	Total Unique Inviduals
1	Pain in throat or chest	54	63	47	53	53	178
2	Cellulitis	26	38	45	61	56	167
3	Sepsis	24	35	32	38	47	147
4	Lower back pain	31	45	33	33	42	143
5	Abdominal and pelvic pain	43	49	42	42	42	142
6	Joint pain or instability	27	31	33	30	33	125
7	COPD	47	57	39	28	31	123
8	UTI or other urinary system disorders	37	34	30	27	27	115
9	Soft tissue pain	24	28	26	32	25	110
10	Malaise and fatigue	25	18	23	38	24	105

When unique individuals' ED diagnoses were counted annually and in total, the most prevalent diagnosis across the Study Group who were in the ED was pain in the throat or chest. The next two most prevalent diagnoses deal with infection (cellulitis and sepsis).

When comparing with the most frequent diagnoses in the ED, COPD is on both the most frequent and most prevalent lists, but Type 2 diabetes is only listed within the top ten most frequent diagnoses and is not included in the ED prevalence top ten.

Emergency Department

Most Costly Diagnoses

In the ED, sepsis and alcohol related disorders were the costliest diagnoses for the Study Group over the duration of the study period. The high cost for alcohol related disorder(s) was driven by the large number of visits for those diagnoses (1,190)—almost three times as often as cellulitis or lymphangitis (381), which had a similar average cost per patient.

The most expensive encounters are not necessarily most frequent. Only alcohol related disorders, Type 2 diabetes, and cellulitis/lymphangitis also fall in the top 10 most frequent ED encounters.

There were also some outlying costs that affected very few in the Study Group but were extremely costly; all costs were included in the study.

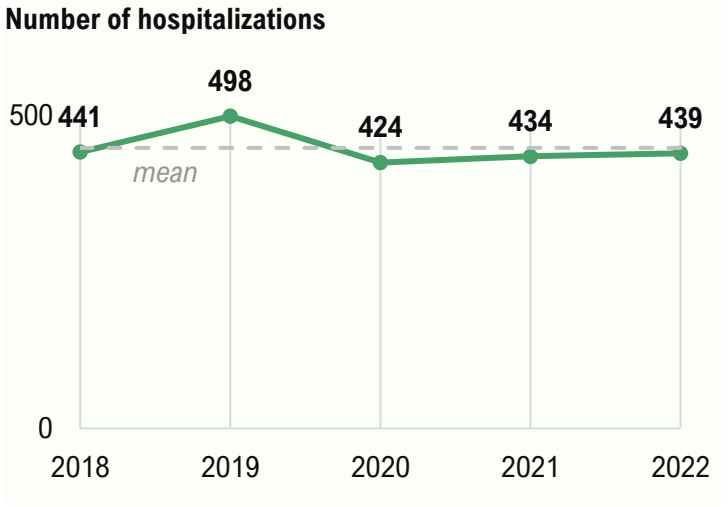
Rank	Primary diagnosis code category	Total	ED visits with diagnosis	Avg cost per visit
1	Sepsis	$2,594,504	260	$9,979
2	Alcohol related disorders	$813,739	1190	$683
3	*<Suppressed>^*	$668,376	<5	^
4	Type 2 diabetes	$532,878	396	$1,346
5	Failure to thrive	$522,021	14	$37,287
6	Respiratory failure	$475,814	96	$4,956
7	Acute pancreatitis	$305,221	50	$6,104
8	*<Suppressed>^*	$285,744	<5	^
9	Complications of cardiac implant	$269,616	15	$17,974
10	Cellulitis or lympangitis	$264,649	381	$695

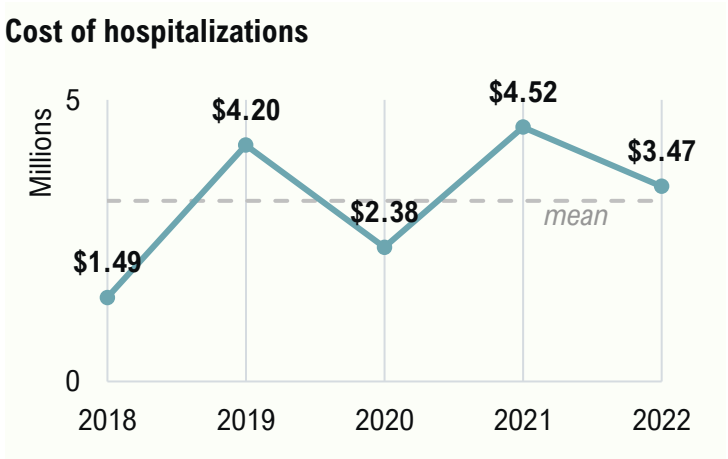
^ Diagnoses suppressed because *n* = <5

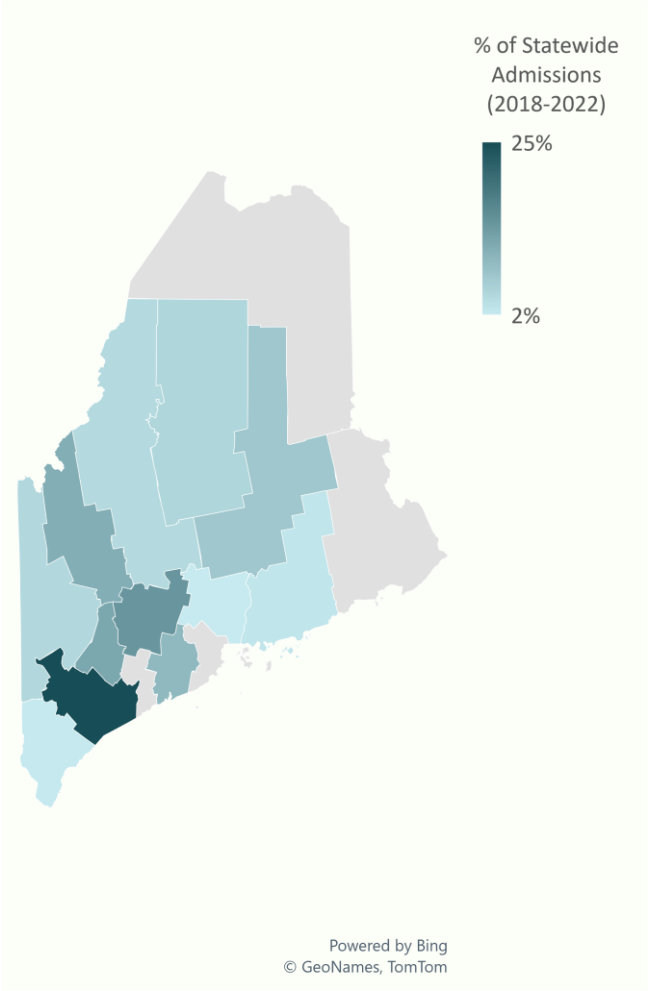
Section IV

Hospitalization Claims Analysis

Hospitalization Claims and Visits: Study Group







58% of the Study Group had at least one hospitalization in the study years 2018 – 2022.

Over the study period, there were 25,417 admission claims representing 2,236 distinct hospitalizations. Distinct hospitalizations were identified via claims with a unique patient identifier, admission date, and discharge date.

On average, there were 447 Study Group patients who were admitted to a hospital each year.

The overall cost of hospitalizations was approximately 16 million dollars over the course of the study period. Year to year, total costs fluctuated.

Cumberland and Kennebec Counties had the highest number of hospitalizations.

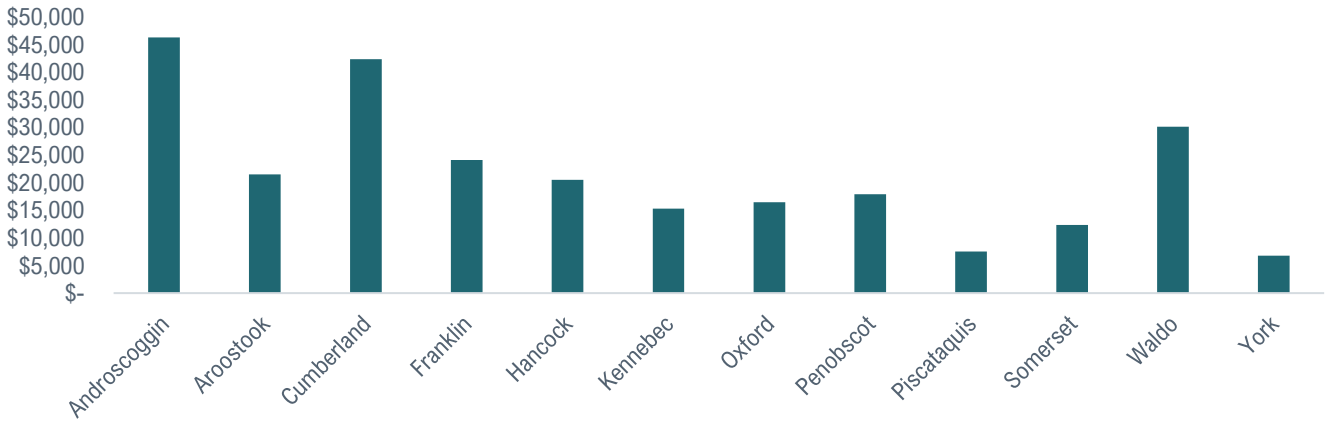
Costs by Location

Mirroring analysis for ED costs, Cumberland and Androscoggin were the costliest counties for the Study Group's hospitalizations, on an average per-patient basis for persons hospitalized (top chart). Waldo County was the third costliest county for hospitalizations.

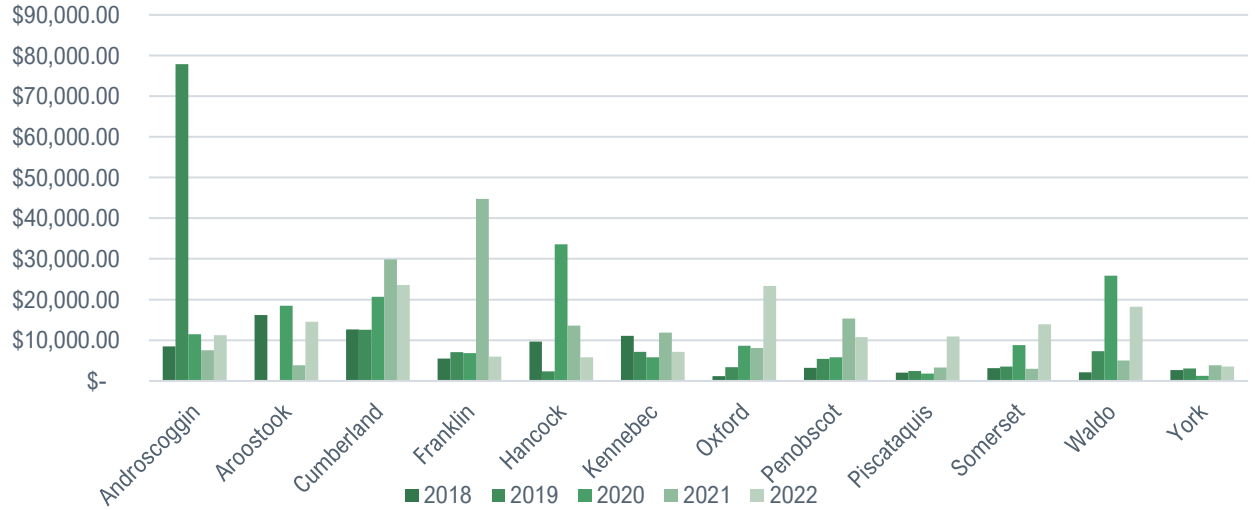
Waldo County had fewer people in the Study Group hospitalized than the other high-cost counties during the study period, but the costs of those hospitalizations drove the average admissions cost higher than other counties with similar numbers of people hospitalized.

Hospitalizations include index (initial) admission as well as readmissions. All costs (including outliers) were included in the study.

Average Cost of Admissions per number of unique individuals hospitalized (Five-Year Study Period)



Total Cost of Admissions per number of unique individuals hospitalized, by year



Washington, Sagadahoc, Knox, and Lincoln Counties <10 patients

Most Frequent Diagnoses

Sepsis was the most frequent primary diagnosis for hospitalizations of the Study Group (CP patients who were MaineCare members). However, if diagnoses were grouped, of the ten most frequent primary diagnosis categories on hospitalization claims, five involved lung problems. These five if grouped together would easily surpass sepsis as the most frequent diagnosis.

Lung problems were frequent reasons for hospitalization, affecting 607 patients in the study group.^ Alcohol related disorders affected relatively few people, but often, according to hospitalization documentation; patients hospitalized with alcohol related disorder(s) typically had an average of four (4) hospitalizations during the study period.

^ This number is not de-duplicated, meaning a person could have been seen in one instance for COPD, and another for pneumonia, and been counted both times.

Rank	Primary diagnosis code category	Total hosp. visits	Unique patients with diagnosis	Average hospital visits per patient
1	Sepsis	271	167	1.6
2	Abnormal breathing	264	149	1.8
3	Respiratory failure	242	127	1.9
4	Alcohol related disorders	230	59	**3.9**
5	Abnormal lung imaging	208	133	1.6
6	Heart failure	180	92	2.0
7	COPD	168	89	1.9
8	Pneumonia	164	109	1.5
9	Cellulitis or lymphangitis	154	97	1.6
10	Throat or chest pain	144	100	1.4

Yellow highlighted rank indicates that the diagnosis category involves infection, while red-highlighted rank indicates that the diagnosis category involves lung problems.

Diagnosis Frequency by Year

Rank	Diagnosis Code Category	2018	2019	2020	2021	2022	Total Claims
1	Sepsis	49	55	44	58	65	271
2	Abnormal breathing	72	80	45	34	33	264
3	Respiratory failure	46	60	48	48	40	242
4	Alcohol related disorders	28	43	61	47	51	230
5	Abnormal lung imaging	14	59	43	44	48	208
6	Heart failure	44	53	25	29	29	180
7	COPD	41	54	44	14	15	168
8	Pneumonia	39	49	25	20	31	164
9	Cellulitis or lymphangitis	25	25	24	40	40	154
10	Pain in throat or chest	41	45	23	21	14	144

Yellow highlighted rank indicates that the diagnosis category involves infection, while red-highlighted rank indicates that the diagnosis category involves lung problems.

When looking at the frequency of claims across the total study years for hospitalizations, sepsis was the most frequent diagnosis for the Study Group, though it was not the most frequently diagnosed every year. In some years, both the second and third most frequent diagnoses (abnormal breathing, respiratory failure) were the most frequent; in 2020, alcohol related disorders were the most frequent hospitalization diagnoses.

Overall, the most frequent diagnoses for hospitalizations is not as varied as were the diagnoses for ED visits, with five of the hospitalization diagnoses associated with lung issues.

Hospitalizations

Diagnosis Prevalence by Year

Rank	Diagnosis Code Category	2018	2019	2020	2021	2022	Total Unique Individuals
1	Sepsis	32	37	36	49	55	167
2	Cough	53	59	33	29	30	149
3	Pulmonary node or abnormal lung imaging	12	39	34	33	42	133
4	Respiratory failure	34	39	29	30	33	127
5	Pneumonia	27	39	23	15	28	109
6	Pain in throat or chest	32	37	21	20	13	100
7	Cellulitis or lymphangitis	17	18	19	32	32	97
8	Cognitive function problem	25	27	24	21	19	94
9	Heart failure	27	38	17	19	21	92
10	COPD	27	38	27	11	14	89

Yellow highlighted rank indicates that the diagnosis category involves infection, while red-highlighted rank indicates that the diagnosis category involves lung problems.

When unique individuals' hospitalization diagnoses were counted annually and in total, sepsis was the most prevalent diagnosis across persons in the Study Group who were hospitalized. This aligns with the frequency of sepsis as the primary diagnosis for hospitalizations.

When combining or grouping diagnoses, there are five diagnoses that can be rooted in lung problems (cough, abnormal imaging, respiratory failure, pneumonia, and COPD). However, COPD is the only chronic condition on this list.

Most Costly Diagnoses

Sepsis was the costliest primary diagnosis for persons hospitalized in the Study Group, with total costs 50% higher than the second highest diagnosis (respiratory failure). Sepsis had a relatively high average cost per visit of almost $9890, and the most hospital visits for any diagnoses (325).

When considering chronic conditions, costs associated with Type 2 diabetes were the third costliest primary diagnosis in hospitalization claims, and alcohol related disorders were fifth costliest.

There were very expensive outliers in this analysis, and while they were included in total costs, the type of diagnoses have been suppressed for this report because the *n* was very small.

Rank	Primary diagnosis code category	Total	Hospital visits with diagnosis	Average cost per visit
1	Sepsis	$3,214,439	325	$9,890
2	Respiratory failure	$1,977,795	313	$6,318
3	Type 2 diabetes mellitus	$693,626	142	$4,884
4	<*Suppressed*>^	$680,786	<5	^
5	Alcohol related disorders	$653,927	300	$2,179
6	Failure to thrive	$554,165	17	$32,597
7	<*Suppressed*>^	$326,952	<5	^
8	Complications of cardiac/vascular implants	$325,537	15	$21,702
9	Lower leg fracture	$312,284	40	$7,807
10	Major depressive disorder	$307,780	90	$3,419

^ Visits with diagnosis suppressed because *n* = <5

Section IV

Summary & Future Considerations

Summary

Community Paramedicine and MaineCare

Well over half (58%) of CP patients received services covered by MaineCare during the study period, and it is notable that throughout the study period, between 10% and 28% of CP patients who received MaineCare (Study Group) were under the age of 45. This is a younger demographic than what has typically been targeted by the CP program in Maine over the last twelve years. The average age of the Study Group in 2018 was 67.7 and in the final year was down to 57.3; the Study Group were 58.6% female.

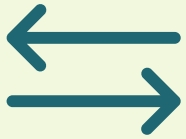
Eighty-two percent (82%) of the Study Group visited the ED at least once during the study period. Notably, the most frequent diagnoses in the ED for the Study Group was alcohol related disorders. On the hospitalization side, alcohol related disorders were the highest per-patient hospitalization diagnosis (average of 3.9 hospitalizations per patient), which could correlate to a chronic condition not typically targeted by Maine's CP programs: alcohol use disorder (AUD). Fifty-eight percent (58%) of the Study Group were hospitalized at least once during the study period, and sepsis was the most frequent and most total costly diagnosis for hospitalizations.

COPD was in the top 10 most frequent diagnoses for both ED use and hospitalizations for the Study Group, and there were five lung-related diagnoses in the top ten hospitalization diagnoses that could be associated with to COPD. Along with COPD, there were three other diagnoses in the top ten most prevalent diagnoses for both ED and hospitalizations: alcohol related disorders, cellulitis/lymphangitis, and sepsis.

Future Exploration and Recommendations to Consider

Given the high prevalence and costs of depressive disorders and alcohol related diagnoses among CP patients who receive MaineCare, both Maine EMS and Maine OMS could consider targeting/ covering CP services for these conditions.

Continued programmatic targeting of patients with COPD has the potential to affect systematic improvements in health and costs, as COPD and lung conditions had the most claims for ED and hospitalization utilization. Sepsis was the costliest diagnosis, and future considerations for CP programming might include sepsis mitigation, perhaps after index hospitalizations, and/or for persons who are more prone to wounds from injectable drugs.



While this study contains findings about CP patients who were MaineCare members during a discrete period, there is no comparison group. Future evaluations with comparison group(s), would provide for a robust test of the CP intervention, as well as compare MaineCare members receiving CP services with CP patients under private insurance.

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Thank You

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