Flex Monitoring Team
University of Minnesota | University of North Carolina at Chapel Hill | University of Southern Maine

MAY 2025

Characteristics and Trends of Critical Access Hospitals That Own or Operate Ambulance Services

JOHN GALE, MS
KAREN PEARSON, MLIS, MA
REBECCA STEARNS, MPH, EMS-I
ZACHARIAH CROLL, MPH

KEY FINDINGS

- Slightly more than one-fifth of Critical Access Hospitals (CAHs) owned or operated ambulance services in 2022 (278 hospitals); less than 17% of these services (45) received Medicare cost-based reimbursement.
- Across all study years (2017-2022), CAHs with an ambulance service were more likely to be government-owned, in the Midwest, and/or in areas with a high degree of rurality.
- In 2022, CAHs with ambulance services tended to have better margins (i.e., total, operating, and cash flow) and lower net income, total inpatient days, and total discharges than those without.
- CAH and ambulance service leaders reported that their services provided an important community benefit that might otherwise not be available, improved quality of care and care coordination, and created staffing and cost efficiencies due to the integration of ambulance staff across hospital departments.

PURPOSE

Critical Access Hospitals (CAHs) may own or operate ambulance services directly, as a stand-alone entity owned or contractually controlled by the hospital.[1,*] To date, little information is available on the extent to which CAHs do so. This descriptive study addresses this knowledge gap by identifying trends in the number of CAH-based ambulance services using 2017 to 2022 Medicare Cost Report data and comparing the characteristics (e.g., location, ownership, and financial) of CAHs that own or operate ambulance services to CAHs that do not. Using data collected through qualitative interviews with staff from eight CAH-based ambulance services, including ambulance directors and hospital administrators, we explored the challenges of operating ambulance services, workforce recruitment and retention issues, the role of partnerships and community involvement, and lessons learned.

Hospital-based ambulance services are one of multiple models for providing ambulance services in rural communities. This model has not been extensively studied.[1] The results of this exploratory study will provide useful information to State Flex Programs (SFPs) seeking to improve the performance of CAH-based ambulance services in their states and/or explore the use of the model to expand access to ambulance services in rural communities.

[*] For this study, we used the term "CAH-based ambulance services" to describe CAHs that provide ambulance services directly or as a stand-alone entity owned or contractually controlled by a CAH.[1]

BACKGROUND

Nationwide, only 7% of ambulance services were hospital-based in 2017.[2] The advantages of hospital-based ambulance services include a positive public perception of hospitals1 and the belief that hospitals are a vital part of their communities that address identified needs.[3-5] Integrating emergency medical services into the hospital can encourage seamless care across healthcare providers and develop a common clinical agenda outside the hospital.[1,6]

Beyond responding to emergency calls, hospital-based ambulance services can provide additional services to support hospital operations. For example, hospital-based ambulance staff may perform interfacility transports to move patients to a more appropriate level of care. Rural residents are also impacted more heavily by social drivers of health (e.g., lower incomes and less education) than their urban peers[7] and are more likely to engage in risky behaviors (e.g., smoking, binge drinking, obesity, or foregoing regular exercise).[8] Like non-hospital-based ambulance services, CAH-based ambulance services may develop community paramedicine programs to reduce unnecessary readmissions and emergency department (ED) utilization, improve care of chronic illnesses, and mitigate the social drivers of health.[3-5] Hospital-based ambulance services can further enhance staff recruitment and retention efforts by providing training to encourage the advancement of ambulance staff and including them in the hospital's planning, agendas, education, and goals.[1] Hospital-based ambulance services also improve care quality by removing barriers between physicians, medical records, and pre-hospital care.[1,6] Integrating pre-hospital care goes beyond improving staff communication, as hospitals may share resources, technology, and staff to control costs across departments.[3-5]

Potential drawbacks for hospital-based ambulance services include a relatively low placement in the hierarchy of hospital priorities, resulting in isolation from top leadership and an inability to advocate for department needs.[1] Also, hospital billing systems may not be set up for ambulance services, and revenue cycle management staff may be unfamiliar with ambulance billing, resulting in reduced financial recovery for services.[1]

Rural communities are more likely to be classified as ambulance deserts or shortage areas than urban communities[9] and may not have adequate access to ambulance services.[10] Studies of hospital-based ambulance services suggest they may be better positioned to address ambulance staffing shortages, sustain local services, and coordinate local resources, particularly in counties with lower population densities.[10,11] Hospitals may also use ambulance staff to supplement workforce needs within the hospital as paramedics have skills that are transferable to the hospital setting (e.g., the ability to start IVs, provide medications, intubate, monitor patients, and provide point-of-care testing).[4,5,12] Ambulance staff may also find further opportunities to develop their careers when employed by hospitals and ambulance departments that offer community paramedicine services to their community through participation in value-based models of care.[12,13]

People living in rural areas experience greater health challenges than their urban counterparts and have higher rates of the ten leading causes of death,[6] including chronic conditions such as heart disease. These factors contribute to higher utilization of ED and ambulance services.[14] At the same time, longer travel distances associated with rural settings and fewer ambulance resources complicate the response to rural emergencies.[15]

Medicare Ambulance Reimbursement

Under Medicare, CAH-based ambulance services, with limited exceptions, are paid using Medicare's Ambulance Fee Schedule (AFS). The exceptions are CAH-based ambulance services that qualify for Medicare cost-based reimbursement as they are located more than 35 miles from another ambulance service[9] or participate in the Frontier Community Health Integration Project (FCHIP).[16] One major challenge for all ambulance services, including hospital-based providers, is that Medicare reimbursement is tied to transport, not treatment.[17]

Medicare's AFS methodology may include certain rural adjustment factors (RAFs) and other add-on payments or adjustments.[18-20] Under Medicare's AFS, payment for ambulance transport, before any RAFs or other add-on payments or adjustments, is calculated as the sum of a base payment and a mileage payment. For ground ambulance transport, the base payment consists of the product of a relative value unit (RVU), a conversion factor (CF), and a locality-based geographic adjustment factor (GAF). Each level of ground ambulance transport is assigned an RVU representing the service intensity provided. The AFS contains seven distinct ground ambulance service levels, each assigned a different RVU, with higher RVU levels indicating that the service requires more inputs or service intensity.[20] The CF is a dollar amount used to convert the RVU for each ground ambulance service level into a payment expressed in monetary terms. The locality-based GAF accounts for geographic differences in the cost of providing ambulance services in rural areas.

METHODS

Quantitative

We used data from the 2017-2022 Centers for Medicare & Medicaid Services (CMS) Medicare Cost Report public use files and the 2022 Critical Access Hospital Measurement and Performance Assessment System (CAHMPAS) financial data to examine the proportion and characteristics of CAHs that owned or operated ambulance services (i.e., census region, ownership status, and level of rurality), the financial characteristics of CAHs that owned or operated ambulance services, and trends in the number of ambulance trips. Data cleaning for this stage of the analysis (i.e., identifying trends in CAH-based ambulance services and high-level characteristics of CAHs with ambulance services) included removing duplicate cost report records and any records with missing or unusable data (e.g., inappropriate zero or negative values for cost data).

The CAHMPAS data were used to provide the mean total, operating, and cash flow margins for 2022. The 2022 Cost Report data were used to identify high-level financial characteristics of CAHs that own or operate an ambulance service compared to those that do not. We used the 2017-2022 Cost Report data to examine the financial characteristics of CAH-based ambulance services, including mean total ambulance runs for Medicare beneficiaries, mean total ambulance service charges, mean total ambulance service costs, and mean total revenue.

Across the six-year period, we had a sample ranging from a low of 1,318 CAHs in 2017 to a high of 1,334 in 2019 with usable cost reports (Table 1). Regarding CAHs with data related to ambulance services, the population of CAHs with usable ambulance cost report data ranged from a low of 278 in 2022 to a high of 287 in 2017 and 2019.

We linked the cost report data to the 2023 Rural-Urban Continuum Codes (RUCCs) to identify the level of rurality for CAHs. Sections of Cost Report Form CMS-2552-2010 with information on CAH-based ambulance services that were used for this study include:

- Worksheet A – Reclassification and Adjustment of Trial Balance of Expenses
- Worksheet B (Parts I & II) – Cost Allocation of General Service Costs and Capital-Related Costs
- Worksheet D (Part V) – Apportionment of Medical and Other Health Services Costs
- Worksheet G-2 (Part 1) – Statement of Patient Revenues and Operating Expenses
- Worksheet G-3 – Statement of Revenues and Expenses
- Worksheet S-3 (Part I) – Hospital and Hospital Health Care Complex Statistical Data

This is an exploratory study designed to provide initial insights into trends in the number of CAH-based ambulance services and the ownership, location (i.e., census region and degree of rurality), and high-level financial characteristics of CAHs with ambulance services (phase 1) and to explore the use of Medicare Cost Reports to identify the financial performance of CAH-based ambulance services (phase 2). For phase 1

of this analysis, we used the population of CAHs that provided data for the number of ambulance trips provided and/or costs, charges, and revenues related to ambulance services to identify the number of CAHs engaged in the provision of ambulance services and to describe these hospitals in terms of their broad characteristics (Table 1). For phase 2 of the analysis focused on the financial performance of CAH-based ambulance services, we further cleaned the data to eliminate CAHs that did not report any ambulance trips for Medicare beneficiaries and suppressed data for CAH-based ambulance services with outlier data on the number of ambulance trips. On the low end, this included 16 CAH-based ambulance services with three or fewer Medicare ambulance trips. On the high end, this included one CAH-based ambulance service with 10,726 Medicare ambulance trips, which was over 8,000 trips more than the next highest service. We tried to limit the number of cost report records suppressed from the analysis to maximize usable data. The data cleaning reduced our sample size for this analysis in any given year by 36 to 60 CAH-based ambulance services.

The following consolidation formula was used to group CAHs by degree of rurality at the county level:

- Urban counties - RUCCs 1, 2, and 3
- Large rural counties - RUCCs 4 and 5
- Medium rural counties - RUCCs 6 and 7
- Small rural counties - RUCCs 8 and 9

CAHs can be located in urban counties based on the RUCC consolidation formula. This is due to a special provision that allowed states to treat qualified hospital providers in urban areas as "rural" (42 CFR Section 412.103), provided they meet criteria on access to healthcare in their areas.[21] It is also possible that an area in which a CAH is located has been reclassified as urban due to population shifts since it was designated as a CAH. A CAH has a 2-year transition period to reclassify as rural if its location changes to an urban area due to changes in the Office of Management and Budget designation.[21]

Limitations

This study provides information on trends in the number of CAH-based ambulance services as well as descriptive information on key characteristics (e.g., location, ownership status, and financial characteristics) of CAHs that own or operate ambulance services. We used Medicare Cost Report data to identify CAH-based ambulance services, the financial characteristics of CAHs with ambulance services, and the financial characteristics of the ambulance services themselves. While the worksheets and schedules available through the public use cost report files allowed us to describe several key financial data points for CAH-based ambulance services (e.g., mean total costs for ambulance services, total charges, and patient revenues), they did not allow for calculation of the profitability of CAH-based ambulance services or the contribution of external funding and/or overhead costs related to the financial performance of the ambulance services.

Another limitation of using cost report data involves the accuracy and consistency of the data.[20] The ambulance fields in the public use cost reports include:

- A utilization variable capturing the number of ambulance trips for Medicare beneficiaries;
- Operating and capital cost fields, including total expenses and cost allocations by category (e.g., salaries, equipment, maintenance, and repair);
- Information on charges including total charges, charges for services subject to coinsurance and deductibles, and cost-to-charge ratios; and
- Revenue fields (inpatient, outpatient, and total).

The data should track across the fields from worksheet to worksheet. However, we found that in some cases they did not. For example, we identified hospitals that reported ambulance trips but no corresponding data in one or more of the cost, charge, or revenue fields. In other cases, hospitals reported cost, charge, and revenue data but no ambulance trips. We suspect these differences may arise from several causes. Hospitals, for example, may offer an ambulance service but contract it out to another firm or they may offer an ambulance

service but do not report the service's specific data. We cannot explain the discrepancies found in the cost report data. One of the few studies on this topic, published in a 2015 Report to Congress evaluating available ambulance data for use in setting Medicare ambulance payment rates, found similar limitations.[20]

Qualitative

We selected eight CAH-based ambulance services (two in each census region) using the Medicare Cost Report data to identify them. We sought to include a mix of CAHs that reflect differing ownership types (e.g., non-profit or governmental). Table 1 describes the eight study hospitals by census region, ownership, rurality, eligibility for cost-based reimbursement, and development of community paramedicine programs. We used a semi-structured interview protocol to ensure consistency across the interviews. All participants consented to recording the interviews, which were transcribed for reference purposes. The study team met regularly to identify key themes across the eight hospitals. This study was determined to be exempt from IRB review.

Given the limited number of study participants, it is not possible to generalize the findings from the qualitative interviews to the larger population of CAHs with ambulance services. The interviews do, however, provide insight into an ambulance service delivery model that may have utility for a wider array of CAHs.

RESULTS

Quantitative Findings

We analyzed cost report data from 2017 through 2022 and found that the number of CAH-based ambulance services remained stable (Table 2), with a slight decline from 22% to 21% of CAHs beginning in 2021. This difference may be related to the number of CAH-based ambulance services with usable cost report data in any given year, rather than a true change in the number of services.

Across the study period, the Midwest census region had the highest percentage of CAH-based ambulance services, with 51% or more of all CAH-based ambulance services from 2017 through 2022. The West census region had the next highest percentage of CAH-based ambulance services, ranging from 25% to 28% of CAH-based ambulance services, followed by the South census region at 17% to 18% of CAH-based ambulance services. The Northeast census region had the smallest percentage of CAH-based ambulance services across the study period at 4%.

Regarding ownership status, government-owned CAHs represented the highest percentage of CAH-based ambulance services in each year of the study at 57% to 58% of CAH-based ambulance services, followed by nonprofit hospitals at 32% to 33%. The remaining

TABLE 1: Characteristics of the Eight Critical Access Hospitals Selected for Interviews

Hospital (by Census Region)	Ownership Status	Rurality (2023 RUCC)*	Cost-based Ambulance Reimbursement	Community Paramedicine Program
Northeast 1	Governmental	Small Rural	N	Y
Northeast 2	Nonprofit	Large Rural	N	Y
Midwest 1	Governmental	Small Rural	N	N
Midwest 2	Governmental	Medium Rural	N	Developing
South 1	Governmental	Small Rural	N	N
South 2	Governmental	Urban	N	Developing
West 1	Nonprofit	Urban	Y	Developing
West 2	Governmental	Urban	N	Y

* Rurality based on 2023 Rural-Urban Continuum Codes (urban = 1,2,3; large rural = 4,5; medium rural = 6,7; small rural = 8,9)

TABLE 2: Characteristics of CAHs With and Without Ambulance Services, 2017-2022

Critical Access Hospitals	2017		2018		2019		2020		2021		2022	
	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without
Number	287	1,031	289	1,041	287	1,047	282	1,051	280	1,047	278	1,044
Percent	22	78	22	78	22	78	21	79	21	79	21	79
Region (%)												
Northeast	4	5	4	6	4	6	4	6	4	6	4	6
Midwest	53	46	53	45	54	45	51	45	51	45	51	45
South	17	27	17	28	17	28	18	28	17	28	17	28
West	25	21	25	21	25	21	27	21	28	21	28	20
Ownership Status (%)												
Nonprofit	32	53	32	53	33	53	32	54	33	55	32	56
For-profit	2	5	2	5	3	6	2	5	2	5	3	5
Governmental	57	36	56	36	55	35	57	35	58	34	58	34
Tribal	1	0	1	0	1	0	1	0	1	0	1	0
Other	8	6	8	6	8	6	7	5	7	5	7	5
Level of Rurality (%)*												
Urban	13	23	13	23	14	23	12	23	13	23	13	23
Large Rural	3	8	3	8	3	8	4	8	3	8	3	8
Medium Rural	25	27	25	27	23	27	24	26	24	27	23	27
Small Rural	59	42	59	43	60	42	60	42	61	42	62	42

*Rurality based on 2023 Rural-Urban Continuum Codes (urban = 1,2,3; large rural = 4,5; medium rural = 6,7; small rural = 8,9)

ownership types accounted for comparatively few CAH-based ambulance services across the study period.

In terms of rurality, the highest percentage of CAH-based ambulance services were in small rural areas at 59% to 62% across the six years of the study, followed by medium-sized rural areas at 23% to 25%. The smallest percentages of CAH-based ambulance services were in urban areas at 12% to 14% and large rural areas at 3% to 4%.

Table 3 provides a high-level descriptive comparison of the financial performance of CAHs with ambulance services to those without. It was not intended to provide an in-depth analysis of the impact of owning or operating an ambulance service on overall hospital financial performance. In 2022, the 278 CAHs with ambulance services, on average, had higher total, cash flow, and operating margins than the 1,044 without ambulance services. The performance of CAHs that own or operate ambulance services on these three measures suggests that, as a group, they are more profitable than CAHs without ambulance services.

Regarding overall financial characteristics, CAHs that own or operate ambulance services reported lower mean net income for service to patients than thosewithout ambulance services. One area of financial performance that stands out for CAHs with ambulance services is that, as a group, they had higher mean other income and expenses than those without ambulance services. Other income and expenses are unrelated to direct patient care and include financial activity such as the receipt of government appropriations and

TABLE 3: Financial Characteristics of CAHs With and Without Ambulance Services, 2022

	2022	
	With	Without
Count of CAHs with and without ambulance services (n)	278	1,044
Critical Access Hospital Measurement and Performance Assessment System (CAHMPAS) Data		
Mean total margin (%)	2.9	-0.1
Mean cash flow margin (%)	5.6	2.7
Mean operating margin (%)	1.3	-1.2
Medicare Cost Report Data		
Mean net patient revenues (G3, L3, C1) ($)	36,434,200	35,257,216
Mean total operating expenses (G3, L4, C1) ($)	39,565,346	36,772,851
Mean net income from service to patients (G3, L5, C1) ($)	-3,131,145	-1,515,635
Mean total other income (G3, L25, C1) ($)	5,393,942	3,601,635
Mean total other expenses (G3, L28, C1) (%)	2,661,693	1,666,437
Mean net income or loss for the period (G3, L29, C1) ($)	1,286,204	1,594,935
Mean number of beds (S3, L1, C2) (n)	21	21
Mean total inpatient days all patients (S3, L1, C8) (n)	1,140	1,234
Mean total discharges all patients (S3, L1, C15) (n)	367	399

operation of non-patient care services (e.g., gift shops, cafeteria, or parking). The difference in mean other income compared to mean other expenses was almost $800,000 per year higher for CAHs with ambulance services than those without. The higher mean total other income reported by CAHs with ambulance services may be due to the higher percentage of government-owned CAHs, some of which may receive financial support from the government entities that own them. Overall, CAHs with ambulance services had lower mean net income for 2022 than those without ambulance services. Finally, CAHs with ambulance services had slightly fewer mean inpatient days and discharges for all patients than those without ambulance services. Further study is necessary to determine the reasons behind these variations and the contribution of ambulance services to the overall financial performance of CAHs.

The number of CAH-based ambulance services with usable data during the study period ranged from a high of 251 in 2017 to a low of 218 in 2022, reducing the sample size for phase 2 of our analysis. The total costs of ambulance services (including salaries, benefits, operating expenses, or overhead) increased from almost $975,000 in 2017 to almost $1,450,000 in 2022. The charges for ambulance services grew from $1,606,000 to $2,063,000 in 2022. This growth in charges (49% from 2017 to 2022) exceeded the pace of growth in costs (28%) for the same period (Table 4).

It is difficult to determine the average profitability of ambulance services due to inconsistent data across the worksheets calculating costs and charges (Worksheet C-1) and patient revenues (Worksheet G-2).[†] As can be seen in Table 4, charges were higher than revenues across all six years of the study period. Caution should be used in interpreting these figures as many hospitals

[†] For hospitals, charges are the amount billed to patients while revenue is the payment received. Charges are typically higher than revenue because hospitals do not receive the full amount they bill from patients and third-party payers.

TABLE 4: CAH-Based Ambulance Service Summary Cost Report Data, 2017-2022

	2017		2018		2019		2020		2021		2022		% change 2017-2022
	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	
All CAH-Based Ambulance Services													
Medicare Ambulance Trips	251	427	247	403	244	385	235	368	230	379	218	358	-16%
Total Costs ($)	251	974,781	247	1,013,432	244	1,077,475	235	1,127,219	230	1,276,899	218	1,449,159	49%
Total Charges ($)	251	1,606,153	247	1,669,082	244	1,734,676	235	1,749,879	230	2,074,981	218	2,063,142	28%
Total Patient Revenues ($)	251	1,345,408	247	1,437,109	244	1,520,987	235	1,548,789	230	1,671,303	218	1,655,792	23%

TABLE 5: Program Charges and Costs for CAH-Based Ambulance Services That Receive Medicare Cost-Based Reimbursement*

	2017		2018		2019		2020		2021		2022		% change 2017-2022
	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	
Program Charges ($)	45	657,816	46	577,456	42	704,996	44	598,230	43	899,087	46	895,162	36%
Program Costs ($)	45	460,952	46	401,133	42	486,217	44	460,720	43	554,920	46	668,186	45%
Estimated Revenue at 101% of costs ($)	45	465,561	46	405,144	42	491,080	44	465,328	43	560,470	46	674,868	45%

*CAH-based EMS units located 35 miles from another EMS unit or that participate in the FCHIP demonstration qualify for cost-based reimbursement and report this information.

either did not report revenue data on Worksheet G-2 or reported their charges from Worksheet C-1. In 2022, for example, 51 of the 218 CAH-based ambulance services with valid data did not report any revenue. Another 167 reported revenue data on Worksheet G-2 that matched their charge from Worksheet C-1. Only five reported lower revenues than charges. We observed similar patterns across the remaining five years of the study cycle. As a result, we cannot use these data to determine the profitability of CAH-based ambulance services.

As noted earlier, a subset of CAH-based ambulance services receives 101% of their costs for their ambulance services as long as they are either located 35 miles or more from the next closest ambulance service or they participate in the Center for Medicare and Medicaid Innovation's FCHIP demonstration (three of the five FCHIP hospitals own or operate ambulance services). The costs for these ambulance services have grown faster than charges across the study period. These costs and the amount due to the CAHs are reconciled as part of the annual cost report settlement process. For the 43 to 46 CAHs with valid data across the study years, we estimated the average amount payable from services provided to Medicare beneficiaries (Table 5). Please note that the payment methodology for these hospitals allows them to break even with a slight "profit" of 1%.

Again, care must be exercised in interpreting these findings given the data issues we observed.

Qualitative Findings - Benefits and Challenges of CAH-Based Ambulance Services

Table 6 provides insight into the size and capacity of ambulance services owned or operated by the eight study participants.

TABLE 6: Service and Staffing Levels at the Eight Participating CAHs

CAH (by Census Region)	Service Levels	Staffing Levels
Northeast 1	• Basic Life Support (BLS) with some Advanced Life Support (ALS) • Service operates 2 ambulances in three communities	• 30 to 40 full-time and per diem staff • The goal is to run all ambulances at the ALS level, but there are not enough staff to do so at this time • 2 are staffed fully by hospital staff and the 3rd is housed in a fire department, occasionally a firefighter drives the truck
Northeast 2	• All ambulances operate at a paramedic level • Impact truck doesn't need to be staffed at the paramedic level, but can provide transfers and emergency care on a 7 AM to 7 PM basis, Monday through Friday • Community Paramedicine started Jul 1, 2024, focused on reducing falls in the elderly	• 32 staff (FT, PT, per diem) - 60% Paramedics, 40% EMT-Basic and Advanced • No volunteers • 24-hour shift crew staffing: 1 day on/1 off, 1 day on/5 off rotation • Community Paramedicine staffed by existing paramedics
Midwest 1	• 4 ambulances, 3 in service with one as backup	• 28 total staff (full-time and on-call) with 6 Emergency Medical Technicians (EMTs), 2 Advanced EMTs, and 16 medics
Midwest 2	• 2 trucks staffed daily with EMT/Medic team	• 9 Medics, 9 EMTs, 1 FT manager (also a medic) • Mix of full-time and per-diem staff • All are hospital employees
South 1	• 3 ALS trucks with 2 staffed 24/7 • Trucks staffed with 2 paramedics and 2 EMT-Bs	• 31 staff, majority part-time; 11 full-time • No volunteers • All are hospital employees
South 2	• 2 trucks, with a 3rd truck slated for another county's first response/MIH • Primary truck rotates 24 hours on/72 hours off	• 19 staff including director; 4 EMT-Basic; 3 EMT-Advanced, paramedics
West 1	• Two locations with 4 ambulances each, staffed by an EMT/Medic team • Partners with an air ambulance service • New Critical Care Paramedic program offers complex patient transfers without taking nursing staff from the hospital	• EMS staff are hospital employees with all rights and benefits • 56 of 82 are full-time staff, the remaining are part-time • Mental health professional to support staff, on duty 8-5 daily
West 2	• 19 full-time staff: 10 paramedics and 9 EMTs • 22 per-diems: 4 paramedics, 18 EMTs • All are hospital employees	• 7 ambulances; 2 housed in 2 different fire stations • Shifts are 48 hours on/96 off, averaging 56-hour work weeks

Staff from the eight study CAHs described benefits of their ambulance services, including improved integration between ambulance and hospital personnel, the use of ambulance personnel to supplement staffing needs in the ED and other departments, and the retention of a service that would otherwise be unavailable. Select respondents stated that their ambulance services did not generate a profit but did generate sufficient revenues to maintain the delivery of local services. They also reported challenges including a lack of hospital staff knowledge of ambulance billing, the high costs of running an ambulance service, difficulties recruiting and retaining ambulance staff, maintaining competitive benefits and work schedules, and increasing competition from local fire departments that are exploring expansion of their services. We cover each of these topic areas in the remainder of this section.

History of Local Ambulance Services

The reasons for starting their ambulance services varied across the eight participating CAHs. Four of the eight hospitals took over local services originally run by local funeral directors, one took over the service from a local fire department, and one acquired a private ambulance service. In one case, no ambulance services were available in the county until the hospital started its program in 2000. Additionally, one hospital took over a community-based service at the local government's request due to issues acquiring necessary insurance. Four study CAHs had operated their ambulance services for 22 to 25 years, with the others acquiring their services more recently.

Staffing: Recruitment and Retention

All respondents described ongoing challenges in recruiting and retaining qualified ambulance staff. They described the competition their services faced from area fire departments that, in their words, offer better pay and retirement packages. In one county, fire departments were exploring the development of their own ambulance services, which would compete with the hospital for staff and business. One respondent noted that fire-based services also promote the ability to pick up extra shifts and/or earn double time for certain shifts, which can be attractive to part-time staff. However, that individual did not explain why their hospital could not implement similar policies to support the staffing of their ambulance service. Another respondent described the competitive challenges with local fire departments as follows:

> *"And that will continue to be a threat as fire services look for other ways to maintain and expand their revenue base. And that's through doing EMS transport."*

Regarding recruitment challenges, respondents also explained that recertification numbers for EMS personnel are trending downward, and some are seeing reductions in enrollments in local community college EMS courses, negatively impacting the pipeline for new recruits.

Several respondents discussed implementing programs to overcome staffing shortages, including offering courses as incentives to help recruit new personnel and retain existing staff. One CAH offers licensing upgrade programs and pays for the training with a two-year commitment to the hospital. Recognizing the need to recruit EMTs, one CAH provides classes to prepare participants for EMT-basic level positions (with a current enrollment of 28 students as of summer 2024) and opens the courses to the public. Another CAH began a pipeline initiative to expose students to direct patient care for those interested in EMS as a career. If students realize that EMS may not be their best career option, they can train for other positions within the hospital system.

Another respondent noted that they are building career paths by providing training and support to enable EMT staff to become paramedics, pursue additional certifications such as a critical care paramedic or flight medic, or enroll in an accelerated registered nurse program if they wish to change roles. This hospital offers three levels of training to support recruitment and

retention: (1) training for EMTs with three to five years of experience to complete paramedic training including housing and salary while on duty; (2) a paramedic internship (with salary) with a 2-year commitment to the CAH; and (3) a program to reimburse paramedics for flight training in critical care. Another offers paramedic education tuition assistance to EMTs who commit to longer-term employment with the hospital while pursuing their education. Another CAH uses a Pipeline for the Advancement of the Healthcare Workforce (PATH) grant through a community college to pay for EMS student education, uniforms, and instructors.

One respondent shared that the hospital is doing more than developing educational opportunities for staff by finding ways to compete with fire-based EMS services, which offer better benefits. For example, the hospital recently implemented a 10-day per month ambulance staffing schedule, down from 15 days per month. Staff now work two days on and four days off, creating time for rest and recuperation to reduce burnout. They have also added mental health staff to support ambulance service staff and mitigate burnout. Others said they adjusted their shifts to reduce burnout and offer a more attractive work schedule. One respondent explained that the shift changes implemented for their hospital's ambulance service reduced the burden on ambulance staff, increased staff morale, and reduced overtime and associated costs. One county-owned hospital provided staff with access to the county's retirement plan and offered an enhanced contribution due to their work as first responders. Other respondents noted the importance of engaging ambulance staff as team members and seeking their input into operational and clinical decisions impacting ambulance staff to improve retention rates. As one respondent explained,

> *"Whoever oversees an ambulance department must listen to the needs of the ambulance staff and their ideas. This builds ownership of their positions and jobs. They have to be involved. They have to be part of the decision-making process. And they have to feel like they own something."*

Yet another respondent noted that their hospital has had success recruiting from volunteer ambulance services and governmental agencies, such as sheriff departments or county jails.

Integration

Respondents highlighted the benefits provided by the ability to integrate ambulance services with hospital operations. In one example, the administrative team intentionally integrated ambulance staff across hospital departments, not just the ED, and ambulance staff participated in hospital meetings and organizational planning. In another example, ambulance staff actively participated in the CAH Stroke and Trauma program and the Cardiac Arrest Registry to Enhance Survival (CARES) program. One CAH formalized the integration process by having their ambulance crew notify the CAH nursing staff of who is on duty for the next 24 hours, their certification levels, and backup crew status. In addition, the paging system for this CAH includes the ambulance station (located on the hospital campus) to allow any ambulance crew member not on duty to assist with a hospital emergency. Another respondent reported the use of ambulance staff to provide education to other hospital staff and community members.

One ongoing challenge to integrating pre-hospital and hospital care is that the run reporting systems used by ambulance services, including their own, frequently do not interface well with hospital electronic health records (EHRs). One EMS director explained that it was necessary to scan EMS data and forms into the hospital's EHR as the two systems did not communicate with each other.

Several study participants noted difficulty transferring patients to other facilities as many hospitals were operating at full capacity. This resulted in longer transfer times, which reduced the availability of ambulance services in the community. Another participant explained that EMS capacity limitations and shortages made responding to both 911 and transfer needs difficult at times.

Deployment of Ambulance Staff in the Emergency Department and Other Services

Seven CAHs stated that their ambulance staff work in their EDs or other departments to fill staffing gaps. This allows paramedics to work within their scopes of practice between runs and allows the salary and related costs to be spread across other cost centers in the hospital, thereby reducing the financial burden of operating the service. Several implemented cross-training to better position paramedics to help fill these gaps. For example, one CAH implemented protocols for its ambulance staff that educated paramedics on its EHR system. The administrator of another CAH spoke of the additional training that their hospital provided to its community paramedicine staff, which mirrors the basic training of home health nurses with the addition of mental health first aid for children and adults. Respondents noted that using staff to fill staffing gaps across the hospital allowed them to utilize ambulance crew during their downtime and allowed the shifting of costs away from the ambulance service line to other departments. One respondent noted that their hospital could not take advantage of ambulance personnel to supplement hospital staff due to staffing shortages.

Finance, Reimbursement, and Operations

The administrator for the one study CAH receiving Medicare cost-based reimbursement for its ambulance service noted that it helped improve its financial stability but did not eliminate financial pressures on the ambulance service. Another respondent explained that the 35-mile requirement makes it difficult for CAH-based ambulance services to qualify for Medicare cost-based reimbursement. They further explained that their system operated an ambulance service covering two CAHs, but only one qualified for cost-based reimbursement due to the 35-mile rule. Although they were not receiving cost-based reimbursement for their ambulance services, three study hospitals noted the importance of cost-based reimbursement for their hospitals as it allowed the hospital to be reimbursed for a share of the personnel and other costs transferred to the hospital when the ambulance staff provided coverage in the ED and other hospital departments. One administrator explained that their state Medicaid program also provided cost-based reimbursement for hospital services. They noted that while cost-based reimbursement for their ambulance service would be ideal, their hospital still transfers approximately $600,000 annually from the ambulance service to the hospital cost center.

Although other respondents noted that their ambulance services were not profitable, they were strongly committed to providing this service to their rural communities, as ambulance services would otherwise not be available if the hospital were to discontinue its service. Only one respondent indicated that their hospital's ambulance service operated profitably. It did so by allocating appropriate costs across other hospital departments, reducing ambulance-related service costs. They explained that the hospital's capital budget funded capital costs for the ambulance service and the hospital used grants, donations, and fundraising to help cover equipment costs. As a result, staff worked to build relationships with donors and funding organizations to support the hospital and ambulance services. Another explained that their hospital needed to increase salaries, add additional staffing, and upgrade equipment to run a quality ambulance service. They further explained that these increased costs exceeded what the ambulance service could generate through billing. The charitable foundation in another CAH funded non-capital expenses for their ambulance service.

One important funding source for government-owned hospitals can be government payments to the local hospital, often funded by local tax levies, to support hospital operations. One administrator noted that their hospital received $65,000 from the county for the ambulance service. Another received $3.6 million in tax levies, of which $2.5 million can be used operationally. They explained that the largest portion of the tax levy is for EMS services at $1.8 million. Another hospital contracts with surrounding communities to cover the costs of serving their EMS needs. A third hospital is considering whether to approach local community leaders in its service area to ask for contributions to

support services in their communities. As one hospital respondent remarked about the importance of the tax levy their hospital receives:

> *"If our hospital hadn't been treated similarly to a utility, there probably wouldn't be a hospital in our community right now, because it's just extremely difficult with our size, financially, to keep things moving the way they need to be."*

Other respondents highlighted interfacility transport revenue as an important funding source, with one respondent stating that their hospital generated approximately $835,000 annually for interfacility transports.

Grant funding is also an important source of support for ambulance services. One CAH leveraged United States telehealth funding to build relationships with an EMS service in another community, facilitating access to primary care and community paramedicine services. As noted earlier, another used a PATH grant to support training costs for EMTs. Another CAH used COVID-19 money to build an EMS station on the hospital campus.

Study hospitals struggled to cover large service areas, often hundreds of square miles, with extended travel distances and low population densities. Three respondents stated that their hospitals offered the only ambulance service in their counties, and one reported providing mutual aid to surrounding counties despite their limited resources and staff. Three respondents explained that they tried to place ambulances in different communities to address time delays due to the size of their service areas.

All respondents noted the difficult financial situations facing CAHs and other rural hospitals and explained that maintaining financial and operational viability is increasingly difficult. None of the CAH administrators or ambulance directors indicated that they would drop ambulance services in their communities; they all felt strongly that having a CAH-based ambulance service was critically important to the long-term health of their community.

One respondent noted that meeting rising ambulance staff salaries was particularly challenging. They explained that the hospital had to compete in the open market for ambulance staff, many of whom might move to a different job with a higher pay scale. This county-owned hospital received annual county funding for the ambulance service, but these funds were restricted to replacing ambulance equipment. The hospital also received Flex grant funds which it used for EMS education.

Respondents noted that the differences in the ambulance coding, reporting, and billing requirements required their hospital billing departments to work closely with their ambulance services to ensure accurate and appropriate revenue recovery. Failure to do so resulted in a failure to collect revenues due to the CAH for the provision of ambulance services. Others stated that their billing departments did not always understand ambulance service billing. One respondent recognized the benefit of having ambulance personnel fill out charge forms, rather than the CAH business office, to ensure accuracy and efficiency in billing and coding. While initially seen as a redundant administrative burden, it turned things around financially for the service. Another respondent discussed the challenges of collecting payment for ambulance services and noted that their hospital reported ambulance-related bad debt on its annual community benefit report. Still another respondent stated that reimbursement levels were a problem. They explained that Medicaid rates in their state were low, and the hospital received only $100 per Medicaid transport. They further explained that due to billing issues, their hospital had not fully received an anticipated increase in Part A funding of $800,000 for ambulance services. They reflected that they should have hired a consultant with better knowledge of cost reporting before taking on ambulance services.

Community Benefit and Impact

All respondents spoke of the benefit to the community of having an ambulance service that is operationally connected to the CAH. For many, it is a trust issue for the community as they know a consistent and reliable service is available when needed. That trust is built on

relationships between the ambulance staff and other first responders in their service area. One ambulance director emphasized the importance of personalized care in rural hospitals and the positive impact of the CAH and its ambulance service on the community. Another noted that their ambulance service had grown based on the community's needs and that the community took pride in having an ambulance service. They further noted that collaboration with community-based organizations improves community relationships and enhances care coordination. Another respondent described the community connection as follows:

> *"The ambulance service's presence is something that everyone takes pride in. And we are so fortunate, and our community is so fortunate, to have this service. The ambulance team has evolved and become a highly reputable and skilled team that continues to evolve in response to the 911 needs of our catchment area and the transfer needs within the community, region, and state. COVID challenged many of us to think about how we can be more collaborative and nimble to meet the needs of our patients. The fact that we can do this is unique."*

Study participants identified several benefits to their communities and local delivery systems. One common theme was that their ambulance staff worked closely with other first responders and that most provided mutual aid to surrounding communities despite the stress of doing so. Another universal theme was that their CAH-based ambulance services were able to stabilize and preserve local EMS capacity.

One respondent explained that they considered the cost of unreimbursed community paramedicine services to be part of their hospital's community benefit activity. Another emphasized the benefits of their hospital's community paramedicine service:

> *"One of the biggest benefits I see with EMS in our region is the way we have community paramedicine set up here as it is truly a way to make longitudinal care and community work. We do it more for the community's benefit than anything else. And because it's the right thing to do for our community."*

Improvements in Quality of Care and System Performance

Although the evidence is anecdotal, study participants identified several ways their ambulance services improved patient care and the functioning of local delivery systems. One common theme is that ambulance staff working within their hospitals have better insight into the needs of their patients and communities. One respondent explained that their ambulance staff followed up with the primary care staff, discharge planning social workers, and other members of a patient's care team to mitigate the reasons for repeat ambulance and ED use. An EMS director emphasized the importance of personalized care in rural hospitals and the impact of the hospital's ambulance services on the community. They believed that having ambulance staff who also work in the hospital supports improved clinical continuity. One hospital administrator explained that EMS is the "hospital's face to the community" and "can be a hospital's best public relations." They further explained that the preventive care provided by community paramedics is likely to reduce high-cost readmissions. Another administrator stated that the ambulance service helped the hospital maintain compliance with the Emergency Medical Treatment and Labor Act (EMTALA) by stabilizing patients and arranging timely and appropriate transfers to higher-level services.

Respondents stated that their ambulance services provided better control over patient transfers. This allows timely transfers so patients can receive the appropriate level of care. Another explained that better patient care comes from knowing more about patient needs, which came from ambulance staff being part of the hospital. In their words, it is necessary for local delivery systems to "de-silo," be holistic, mitigate the social drivers of health (e.g., lower incomes and less education), and address health-related social needs.

In terms of improving the quality of care, one administrator emphasized that the operation of hospital-based ambulance services allows hospitals to verify that training meets their standards, exercise quality control over transports, and ensure that the service best meets hospital needs. One example of this is one hospital that uses telehealth to evaluate patients who present at the hospital with psychiatric issues. If the consulting mental health professional deems the patient to be unsafe, hospital staff can arrange transfer to a more appropriate facility using the hospital's ambulance service.

Lessons Learned

Respondents shared the importance of teamwork and collaboration in the ongoing vitality of CAH-based ambulance services. Several respondents reported that hospital-based ambulance services are more involved in the overall patient care experience than stand-alone services, and their staff are more aware of the local social drivers of health (e.g., lower incomes and less education) and health-related social needs. One respondent stated that this is a different approach to service delivery than the focus on acute care and transport adopted by stand-alone ambulance services.

As a resource to their communities, study participants stated that their ambulance services provide consistent access to emergency health care. Study participants also noted the importance of focusing on the communities they serve and including ambulance services as part of the community safety net. Respondents pointed out the tension between the risk and value of healthcare for CAHs and their communities and argued that CAHs must make decisions through the lens of the value of care provided to their communities.

While several respondents explained that their ambulance services did not generate a profit, all respondents mentioned that financial and operational integration between their hospitals and ambulance services helped reduce the financial burden of operating them. They also stated that their ambulance services provided significant non-financial benefits, including improved community support, enhanced community benefits, better utilization of staff, and improved quality of care. One suggested that focusing on transfers over emergency response was an important strategy, while others reinforced the need for accurate cost reporting and billing mechanisms. One administrator stated,

> *"From a leadership and financial standpoint, you've got to be brave enough to weigh the financial impact that it might have on one particular area—maybe ambulance salaries and wages—and you've got to be able to give it time so that you can see that reflected in other departments, such as reductions in unnecessary readmissions."*

Respondents stated that securing funding to sustain the provision of ambulance services remains challenging and typically involves multiple funding streams, including grants, fee-for-service income, fundraising revenue, and public funding. One respondent noted that their CAH receives an annual allotment from the state EMS office; however, there are restrictions on the use of the funds. Two respondents explained that they relied on grants and fundraising efforts to support their ambulance services, which they described as helpful in the short term but did not provide long-term financial sustainability. Finally, one respondent explained that their hospital used COVID-19 funding to build a new ambulance station on the hospital campus.

Respondents spoke in detail about the evolution of their ambulance services to robust hospital departments with paid staff. All spoke about the need for ongoing training and education of ambulance staff to support the delivery of high-quality services or as a recruitment and retention tool. Respondents described multiple approaches to providing necessary education for ambulance staff through internal education programs, partnering with other agencies, or using ambulance staff to train hospital personnel. Regardless of the source of training, ongoing education was described as central to the success of their ambulance services and the ability to integrate these services into hospital operations.

One respondent cautioned that hospital-based ambulance services must focus on caring for their communities and avoid trying to be all things to all people. They further noted the need to be aware of the mental health of their ambulance staff to avoid burnout and suggested that it was necessary to budget for mental health resources to support their ambulance staff.

DISCUSSION

This study focused on identifying and quantifying the trends in CAH-based ambulance services from 2017 through 2022. We found that slightly more than 20% of CAHs owned or operated ambulance services during this period. Although a small percentage of all CAHs, the model of a CAH-based ambulance service can be a potential option for maintaining rural ambulance services, particularly in small and medium-sized rural communities. Through qualitative interviews with staff from eight CAH-based ambulance services, we sought to understand the benefits and challenges experienced by these CAHs.

Although most respondents stated that their ambulance services did not generate a profit, they also described multiple benefits of providing these services. A number suggested that ambulance coverage would not be available in their communities or reduced if their hospitals had not taken over the provision of ambulance services. They also described challenges to managing their ambulance services, including the difficulty of recruiting and retaining staff, maintaining competitive wages and benefits, and managing the financial operations of the services (i.e., billing and coding for services and proper cost reporting). Despite these challenges, respondents from all eight CAH-based ambulance services highlighted their services' value and willingness to continue providing them.

As it becomes increasingly difficult to maintain adequate ambulance coverage in rural communities, a CAH-based ambulance service may provide a viable model to maintain this essential service for appropriate CAHs and their communities. CAHs contemplating the development or acquisition of ambulance services would benefit from technical assistance, training, and other resources to assist them in evaluating the model's suitability for their hospitals and, if appropriate, implementing and operating a sustainable CAH-based service. Some resources already exist related to ambulance service workforce issues, such as the Flex Monitoring Team's Workforce Toolkit's Module on Emergency Medical Services Workforce[22] and the National Rural Health Resource Center's webinar on Building a Sustainable Rural EMS Workforce.[23] Other useful resources would include materials on billing, coding, and financial management; proper cost reporting; clinical and operational management; regulatory and licensure issues; opportunities for CAH/community collaboration; community funding options; quality improvement processes; and hospital/ambulance integration opportunities. Given the data challenges identified in the quantitative analysis of the cost reports and the feedback from study participants, technical assistance on cost reporting for their hospital-based ambulance services is another clear need.

Another useful resource would be technical assistance to support CAHs in assessing and quantifying local needs and the market context for developing ambulance services, identifying available resources, examining opportunities for collaboration and regionalization, and securing funding support. One existing resource to assess and quantify local needs is the Informed Community Self-Determination (ICSD) tool.[24] ICSD is a framework for community leaders to make informed decisions regarding local ambulance services by working through four steps: (1) an assessment to detail the reality and adequacy of a community's EMS system; (2) an examination of alternative models of EMS services targeting the community's needs and cost impacts of the models; (3) a decision-makers forum to review the information from steps 1 and 2; and (4) choosing and funding a model based on the deliberation of the decision-makers in step 3. Through the ICSD process, CAHs can work with their communities to assess the benefits and opportunities of developing a

hospital-based service, quantify its costs, and identify local resources and funding streams. This can create an opportunity to improve the hospital–community partnership to ensure the availability and viability of ambulance services.

State Flex Programs can also include CAHs with ambulance services in their projects under Program Areas 1 (Quality Improvement), 2 (Financial and Operational Improvement), and 4 (Rural EMS Improvement) to target the unique needs of these facilities and improve their overall viability and performance. Investing resources in developing targeted assistance to support communities and CAHs in exploring and adopting this model would be helpful, as would assisting these hospitals in telling their stories to demonstrate the benefits of ambulance service ownership by CAHs.

CONCLUSION

This exploratory study examined an ambulance service delivery model that has not been extensively studied. As described, there are significant limitations to using cost reports to assess the profitability of CAH-based ambulance services and the impact of these services on the financial operations of their hospitals. As previously described, CMS's FCHIP demonstration is evaluating the expansion of cost-based reimbursement for CAH-based ambulance services in frontier areas. Prior Flex Monitoring Team briefs have highlighted and discussed the lack of robust national data sources on EMS operations and performance which has limited the ability to effectively monitor the scope and quality of ambulance services in rural areas.[25-27]

While it may not be an option for all CAHs and communities, the results of this study demonstrate that CAH ownership or operation of an ambulance service is a model that can work for government-owned facilities or in areas with a high degree of rurality. As respondents from our eight study participants described, their CAH-based ambulance services provided enhanced benefits over traditional fire or public safety-based ambulance services. Although they all identified challenges to managing a CAH-based ambulance service, all respondents from these eight study CAHs reported they planned to continue providing ambulance services.

Given the limitations of the cost report data used for this study, we cannot conclusively comment on the financial and quality performance of CAH-based ambulance services. The anecdotal evidence from our qualitative interviews does suggest however that this model has helped to maintain ambulance services in their communities. Respondent feedback further suggests that CAH-based ambulance services have contributed to improved emergency response and transport capacity and enhanced quality of patient care. Further studies are needed to understand and document financial, billing, and cost-reporting issues for CAH-based ambulance services, their long-term viability, and the impact on clinical outcomes for patients using these services.

The current model provides an option for some CAHs and their communities to collaborate to improve access to high-quality, sustainable ambulance care. State Flex Programs can play a role in working with the CAH-based ambulance services in their states and exploring opportunities to implement this model in appropriate CAHs and communities.

For more information on this report, please contact John Gale, john.gale@maine.edu.

This report was completed by the Flex Monitoring Team with funding from the Federal Office of Rural Health Policy (FORHP), Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services (HHS), under PHS Grant No. U27RH01080. The information, conclusions and opinions expressed in this document are those of the authors and no endorsement by FORHP, HRSA, or HHS is intended or should be inferred.

REFERENCES

1. Williams DM. The myth of the perfect model. *EMS World*. September 2006.
2. Calams S. Private vs. Public ambulance services: What's the difference? *EMS 1*. October 23, 2017.
3. Hodgson NR, Kwun R, Gorbatkin C, Davies J, Fisher J, ACEP Emergency Medicine Practice Committee. Emergency department responses to nursing shortages. *Int J Emerg Med* April 5, 2024;17(51). doi: https://doi.org/10.1186/s12245-024-00628-y
4. Oglesby R. Recruitment and retention benefits of EMT--paramedic utilization during ED nursing shortages. *J Emerg Nurs*. Feb 2007; 33(1):21-5; quiz 92-3. doi: 10.1016/j.jen.2006.10.009
5. Reilly MJM, David. Utilizing paramedics for in-patient critical care surge capacity. *Am J Disaster Med*. May-Jun 2010 2010;5(3):165-8. doi: 10.5055/ajdm.20 10 .00 18
6. Curtin SCS, Merianne Rose. *Trends in death rates in urban and rural areas: United States, 1999-2019*. National Center for Health Statistics;2021 September. NCHS Data Brief No. 417. Accessed https://www.cdc.gov/nchs/data/databriefs/db417.pdf
7. Rural Health Information Hub. *Social determinants of health for rural people overview*. 2024. Updated July 16. 2024. https://www.ruralhealthinfo.org/topics/social-determinants-of-health
8. Shirey L, Summer L. *Rural and urban health*. Georgetown University, Health Policy Institute. 2003. Accessed August 19, 2024. https://hpi.georgetown.edu/rural/
9. Spectrum News Staff. USM researchers: Millions in U.S. live in 'ambulance deserts,' putting lives at risk. Spectrum News, 2023, June 27. Accessed February 24, 2024. https://spectrumlocalnews.com/me/maine/health/2023/06/27/usm-researchers--millions-in-u-s--live-in--ambulance-deserts---putting-lives-at-risk
10. Panizzi T. *Unsustainable funding model, shrinking workforce leave ambulance services in critical condition*. online news article. Valley News Dispatch. 2023. Updated October 8. Accessed August 22, 2024. https://triblive.com/local/valley-news-dispatch/unsustainable-funding-model-shrinking-workforce-leave-ambulance-services-in-critical-condition
11. Freeman VA, Howard HA, Lavergne R. *Rural hospital support for emergency medical services*.2010 November. Final Report No. 100. Accessed August 22, 2022. https://www.shepscenter.unc.edu/wp-content/uploads/2014/10/FR100.pdf
12. Clarke A. What are the clinical practice experiences of specialist and advanced paramedics working in emergency department roles? A qualitative study. *Br Paramed J*. Dec 1, 2019;4(3):1-7. doi: 10.29045/14784726.2019.12.4.3.1
13. Rahim F, Jain B, Patel T, Jain U, Jain P, Palakodeti S. Community paramedicine: An innovative model for value-based care delivery. *J Public Health Manag Pract*. 1 Dec 2022 2022;29(2):E65-E68. doi: 10.1097/PHH.0000000000001683
14. McCarthy ML, Zheng Z, Wilder ME, Elmi A, Li Y, Zeger SL. The influence of social determinants of health on emergency departments visits in a Medicaid sample. *Ann Emerg Med*. May 2021;77(5):511-522. doi: 10.1016/j.annemergmed.2020.11.010
15. RUPRI Health Panel, MacKinney AC. *Characteristics and challenges of rural ambulance agencies: A brief review and policy considerations*. RUPRI;2021 January. Accessed February 17, 2021. https://rupri.org/wp-content/uploads/Characteristics-and-Challenges-of-Rural-Ambulance-Agencies-January-2021.pdf
16. Centers for Medicare & Medicaid Services. *Frontier community health integration project demonstration*. CMS. 2024. Accessed September 24, 2024. https://www.cms.gov/priorities/innovation/innovation-models/frontier-community-health-integration-project-demonstration
17. Centers for Medicare & Medicaid Services. *Medicare claim processing manual chapter 15-ambulance*. CMS. 2023. Accessed September 18, 2024. https://www.cms.gov/regulations-and-guidance/guidance/manuals/downloads/clm104c15.pdf
18. Centers for Medicare & Medicaid Services. *Ambulance fee schedule & zip code files*. CMS. 2024. Updated September 10. Accessed September 27, 2024. https://www.cms.gov/medicare/payment/fee-schedules/ambulance
19. MedPAC. *Ambulance services payment system*. MedPAC;2021 November. Accessed September 12, 2022. https://www.medpac.gov/wp-content/uploads/2021/11/medpac_payment_basics_21_ambulance_final_sec.pdf
20. U.S. Department of Health and Human Services. *Report to Congress: Evaluations of hospitals' ambulance data on Medicare cost report and feasibility of obtaining cost data from all ambulance providers and suppliers as required by the American taxpayer relief act of 2012*. US DHHS;2015 September. Accessed September 12, 2022. https://www.hhs.gov/guidance/document/report-congress-evaluations-hospitalsacaac-ambulance-data-medicare-cost-reports-and
21. Centers for Medicare & Medicaid Services. *Information for critical access hospitals*. CMS, Medicare Learning Network;2023 December. MLN Booklet. Accessed December 13, 2024. https://www.cms.gov/files/document/mln006400-information-critical-access-hospitals.pdf
22. Lemieux A, Barclay R, Crane C, MacDougall H, Moscovice I, Lahr M. *Module 3: Emergency medical services workforce.* Flex Monitoring Team;2024 September Accessed December 13, 2024. https://www.flexmonitoring.org/sites/flexmonitoring.umn.edu/files/media/Emergency_Medical_Services_Workforce.pdf
23. National Rural Health Resource Center, Morton T, Wasmund B. *Building a sustainable rural EMS workforce*. Webinar. National Rural Health Resource Center. 2024. Updated November 6. Accessed December 13, 2024. https://www.ruralcenter.org/events/building-sustainable-rural-ems-workforce
24. Lichtenberg T. *Making informed decisions about rural EMS*. The Rural Monitor. 2019. Updated April 3. Accessed September 28, 2024. https://www.ruralhealthinfo.org/rural-monitor/ems-self-determination
25. Gale J, Coburn A, Pearson K, Croll Z, Shaler G. Developing program performance measures for rural emergency medical services. *Prehosp Emerg Care*. 2016:1-9. doi: 10.1080/10903127.2016.1218978
26. Gale J, Jewell C, Pearson K. *Identifying a consensus set of EMS agency licensure elements and definitions to support rural EMS data collection*. Flex Monitoring Team;2023 November. Accessed December 13, 2024. https://www.flexmonitoring.org/sites/flexmonitoring.umn.edu/files/media/Identifying_consensus_set_of_EMS_agency_licensure_elements.pdf
27. Gale J, Pearson K, Jonk Y. *Exploring state data sources to monitor rural emergency medical services performance Improvement*.2020 March. Briefing Paper #43. Accessed https://www.flexmonitoring.org/sites/flexmonitoring.umn.edu/files/media/fmt-bp-43-2020.pdf