



Original Contribution

Paramedic determination of appropriate emergency department destination☆

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ABSTRACT

Background: Freestanding emergency departments (FSED) are equipped to care for most emergencies, but do not have all the resources that hospital-based emergency departments (ED) offer. As the number of FSEDs grows rapidly, emergency medical services (EMS) must routinely determine whether a FSED is an appropriate destination. Inappropriate triage may delay definitive care, potentially increasing morbidity, mortality, and resource utilization. We sought to evaluate paramedics' ability in determining whether a FSED is the most appropriate destination.

Methods: We conducted a retrospective study of two county EMS agencies and two FSEDs over a 25-month period in Alachua and Levy County, Florida, USA. Both EMS agencies allow paramedic discretion in determining transport destination. To determine whether paramedics can correctly identify patients that can be cared for fully at a FSED, our primary outcome was the percentage of patients transported to FSEDs by EMS that were discharged without additional hospital-based resources.

Results: We identified 1247 EMS patients that had a selected destination of FSED. We excluded patients that did not arrive at their selected FSED destination, left before FSED disposition, or were transferred from the FSED to unaffiliated hospitals. A total of 1184 patients were included for analysis, and 885 (74.7%) did not require additional hospital resources. Comparing the two EMS agencies yielded similar results.

Conclusion: In this study, involving two EMS agencies over a 25-month period, we found that 3 out of 4 patients deemed appropriate for transport to a FSED by a paramedic did not require additional hospital-based services.

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1. Introduction

Throughout the United States, emergency departments (ED) have witnessed an increase in patient volume and complexity, while the number of EDs has decreased, further burdening the EDs that have remained open [1–5]. Until recently, most EDs were hospital-based [6, 7]; however, in response to the ever-increasing demand for timely emergency care, freestanding emergency departments (FSED) have become a rapidly growing alternative to the traditional hospital-based ED by promising shorter wait times at the same level of emergency care [8, 9]. FSEDs were introduced in the 1970s, but there has been a rapid and accelerating growth more recently — 80 FSEDs existed nationwide in 2007, growing to 566 in 2016 (a 600% increase over 10 years) [7, 10, 11].

Abbreviations: ALS, advanced life support; ED, emergency department; FSED, freestanding emergency department.

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A FSED, as defined by the American College of Emergency Physicians (ACEP), is a facility that is “structurally separate and distinct from a hospital and provides emergency care” [12]. FSEDs function similarly to hospital-based EDs and are equipped to care for most emergencies that may present to the facility [13]. However, because of their separation from a hospital, FSEDs do not have all the resources that hospital-based EDs have to offer, namely, wards to admit patients, advanced imaging (e.g., magnetic resonance imaging), consultants, and procedural capabilities (e.g., catheterization labs or operating rooms). Therefore, any FSED that presents itself as an ED “should have policy agreements and procedures in place to provide effective and efficient transfer to a higher level of care if needed” [12].

Previous studies have found paramedics to be accurate in their ability to triage patients [14–18], while others have found their accuracy to be unacceptable [19–23]. Moreover, some studies demonstrated that paramedics are unable to determine medical necessity of ambulance transport or ED care [19, 21, 24].

As the number of FSEDs continues to grow rapidly, EMS prehospital providers will regularly face a new dilemma — whether a patient can adequately be cared for at a FSED. Inappropriate triage and transport to a FSED can delay definitive care and may affect morbidity and

mortality, especially for time-sensitive conditions. Moreover, the mobilization of additional resources needed to transfer the patient to a higher level of care increases system costs.

We sought to evaluate the ability of paramedics in determining whether a FSED was the most appropriate destination.

2. Methods

2.1. Study setting

This was a retrospective observational study conducted in Alachua County and Levy County, contiguous counties in north-central Florida. Alachua County is an urban county that encompasses 969 mile² and has a resident population of 247,336 (2010 census). Alachua County is served by Alachua County Fire Rescue (ACFR), which is a fire-department-based EMS system and the sole advanced life support (ALS) transport agency that responds to all 9-1-1 medical emergencies. The agency's paramedics have an average length of service of 8.7 years and their mean age is 37 years old. At the time of the study, ACFR staffs 12 full-time ALS ambulances and 4 critical care ambulances that respond to approximately 50,600 requests for emergency medical assistance annually and transports approximately 26,200 patients to emergency departments.

Levy County is a rural county, encompassing 1413 mile² with a resident population of 40,801 (2010 census). Levy County is served by Levy County Department of Public Safety (LCDPS), which is a third-service EMS system and the sole ALS transport agency that responds to all 9-1-1 medical emergencies. The paramedics have an average length of service of 6.3 years and their mean age is 37 years old. LCDPS staffs 7 full-time ALS ambulances that respond to approximately 7400 requests for emergency medical assistance annually and transports approximately 5300 patients to emergency departments.

During the study, the only FSEDs available to ACFR and LCDPS as patient destinations were the Kanapaha ED (KED) and Springhill ED (SHED) in Gainesville, Florida. KED (a 15-bed ED) and SHED (a 12-bed ED) are affiliated to UF Health, a large urban university-based teaching hospital. The annual census at KED and SHED is approximately 18,000 and 37,000, respectively. Patients that require additional resources are typically transferred to the affiliated teaching hospital; although uncommon, patients do have the option to be transferred to several unaffiliated regional hospitals. The overall transfer rate from the FSEDs to the main hospital is approximately 12%.

ACFR and LCDPS are under the direction of different medical directors, but the two agencies have identical "Determination of Hospital Destination: Free Standing Emergency Department (FSED)" policies. Both agencies give paramedics discretion with respect to transport destination. The official protocol reads "Any patient potentially requiring admission in the paramedic's best judgment (ex. elderly, weakness, dizziness, dialysis, etc.) will be excluded and not considered eligible for transport to a FSED".

2.2. Study design

We reviewed prehospital care records of both agencies (EmergencyPRO, Documed Systems International Inc.®, Jacksonville, FL) between January 1, 2015 and February 6, 2017 for all patients transported by the two agencies to KED or SHED, and linked these to hospital records (Epic, Epic Systems, Madison, WI). Each agency's EmergencyPRO was queried for all patients that had a selected destination of KED or SHED between January 1, 2015 and February 6, 2017. For each patient, collected data from EmergencyPRO included patient age and sex, EMS protocol used, and chief complaint. Collected data from Epic included chief complaint, patient's FSED, and the patient's final disposition if the patient was transferred to the main hospital ED.

Patients were excluded if there was a discrepancy between the selected destination and the arrival destination, or if a patient did not

stay for a complete ED evaluation (left against medical advice, left without being seen, eloped). We also excluded patients transferred to another unaffiliated receiving facility. Patients that were transferred to a psychiatric facility were treated as "discharge", because the patients had been medically cleared. This study was reviewed and approved as exempt by the University of Florida Institutional Review Board.

2.3. Measurements and outcomes

To determine whether paramedics can correctly identify patients that can be cared for fully at a FSED, our primary outcome was the percentage of patients transported to KED and SHED by ACFR and LCDPS that were discharged without additional hospital-based resources. Based off of previous studies, including a meta-analysis that demonstrated paramedic undertriage rates may be as high as 29% [14, 18, 19, 24], we selected 70% as an a priori threshold for reasonable paramedic triage ability.

2.4. Data analysis

We entered data from the study into a Research Electronic Data Capture (REDCap, Vanderbilt University, TN) database for analysis. Descriptive statistics were used to characterize the study population.

3. Results

We identified a total of 1247 patients that had a selected destination of FSED between January 1, 2015 and February 6, 2017. We excluded 63 (5.1%) patients; 31 patients did not arrive at their selected FSED destination, 26 patients left before FSED disposition, and 6 patients were transferred to unaffiliated hospitals. Thus 1184 patients were included for analysis. Complete patient characteristics are reported in Table 1.

Table 1
Characteristics of patients, chief complaints, and disposition ("Other" refers to chief complaints with $n < 10$ in this cohort).

<i>Characteristic</i>	
Median age (yr)	47
Male sex – no. (%)	457 (38.6)
<i>EMS chief complaint – no.</i>	
Abdominal pain	70
Allergic reaction/anaphylaxis	10
Altered mental status	13
Chest pain	51
Diabetic emergencies	13
Dizziness	19
Fever	13
Headache	10
Hypertension	18
Musculoskeletal	127
Nausea and vomiting	77
Genitourinary	25
Other	92
Overdose/poisoning	33
Pain management	32
Psychiatric disturbance	72
Seizure	23
Shortness of breath	56
Syncope	17
Trauma	399
Weakness	14
<i>Disposition – no. (%)</i>	
Discharge	834 (70.4)
Transfer to psychiatric facility	51 (4.3)
Transfer for consult	79 (6.7)
Transfer for direct admission	192 (16.2)
Transfer for additional imaging studies	24 (2.0)
Transfer for additional laboratory studies	1 (0.1)
Transfer for additional medication	1 (0.1)
Transfer for extra security/hospital staff	2 (0.2)

Table 2
Comparison between two different EMS agencies. Abbreviations: (1) ACFR: Alachua County Fire Rescue; (2) LCDPS: Levy County Department of Public Safety.

	ACFR	LCDPS	Combined
<i>Characteristic</i>			
<i>n</i>	1085	99	1184
Median age (yr)	47	45	47
Male sex — no. (%)	419 (38.6)	38 (38.4)	457 (38.6)
<i>Disposition — no. (%)</i>			
Discharge	765 (70.5)	69 (69.7)	834 (70.4)
Transfer to psychiatric facility	49 (4.5)	2 (2.0)	51 (4.3)
Transfer for consult	73 (6.7)	6 (6.1)	79 (6.7)
Transfer for direct admission	173 (15.9)	19 (19.2)	192 (16.2)
Transfer for additional imaging studies	21 (1.9)	3 (3.0)	24 (2.0)
Transfer for additional laboratory studies	1 (0.1)	0 (0)	1 (0.1)
Transfer for additional medication	1 (0.1)	0 (0)	1 (0.1)
Transfer for extra security/hospital staff	2 (0.2)	0 (0)	2 (0.2)

Of 1184 patients, 834 (70.4%) patients were discharged and 51 (4.3%) patients were transferred to a psychiatric facility, for a total of 885 (74.7%) patients that did not require additional hospital-based resources. Besides the 192 patients that were transferred for direct admission, an additional 56 patients were admitted after ancillary services at the hospital-based ED (e.g., laboratory testing, imaging, consultation).

As shown in Table 2, of 1085 patients transported by ACFR, 765 (70.5%) patients were discharged and 49 (4.5%) patients were transferred to a psychiatric facility, for a total of 814 (75.0%) patients that did not require additional hospital-based resources. Of 99 patients transported by LCDPS, 69 (69.7%) patients were discharged and 2 (2.0%) patients were transferred to a psychiatric facility, for a total of 71 (71.7%) patients that did not require additional hospital-based resources.

As shown in Table 3, trauma was the most common EMS chief complaint presenting to the FSEDs. Patients presenting with musculoskeletal complaints were transferred least frequently at 17.3%, while patients presenting with weakness were transferred most frequently at 71.4%.

4. Discussion

Paramedics provide a wide spectrum of prehospital care, ranging from critical care to mobile integrated healthcare and community

paramedicine. The increasing number of FSEDs provides yet another evolving facet in paramedic decision-making.

The primary goal of field triage is “determining how best to get the right person to the right place at the right time using the right amount of resources” [25, 26]. The burgeoning of FSEDs highlights the significance and implications of this critical concept. If EMS transports a patient that requires hospital-level care to a FSED, morbidity, mortality, costs, and resource utilization are expected to rise. Inaccurate triage by prehospital providers may result in the patient being brought to the “wrong place” (FSED versus hospital-based ED), or at the “wrong time” (delay in care), or with the “wrong number of resources” (e.g., additional transports, staff demands, testing).

We sought to evaluate whether paramedics can correctly determine if a FSED can adequately care for a patient. Our study included more than two years of data from two different EMS agencies from an urban and a rural county, under different medical directors, and the only two FSEDs that these EMS agencies transported to during the study period. Both counties' EMS protocols allowed paramedics to decide which patients to bring to FSEDs versus hospital-based EDs. We found that paramedics have a reasonable ability in triaging patients to the FSEDs, especially when considering the limited information and resources available in the prehospital setting; we found that 74.7% of patients brought by EMS to the FSEDs were discharged from the FSED without requiring additional hospital-based resources.

Both EMS systems exist in different settings but had similar results, suggesting the standard paramedic without additional training will generally select the FSED as a transport destination when it is appropriate.

Richards et al. [18] asked EMS providers to predict admission to the hospital, and their predictions were compared to actual patient disposition. Although the study was a prospective study using a questionnaire and EMS was asked to determine disposition (admit versus discharge), they found that EMS providers had an accuracy rate of 79%, similar to our findings.

Previous studies evaluating paramedic medical decision-making have yielded equivocal results. Some studies have demonstrated paramedics are able to accurately triage patients [14–18], while others have found their triage accuracy to be unacceptable [19–23]. Several studies have found that paramedics were unable to determine whether a patient needs transport at all [19, 21, 24]. The discrepancy between

Table 3
Patient disposition for commonly presenting EMS chief complaints (“Other” refers to chief complaints with $n < 10$ in this cohort).

EMS chief complaint	Number of patients (n)	Discharge (n)	Transfer for direct admission (n)	Transfer for consult (n)	Transfer for imaging (n)	Transfer for other (n)	% of patients transferred (%)
Trauma	399	324	25	38	9	3	18.8%
Musculoskeletal	127	105	12	7	1	2	17.3%
Nausea and vomiting	77	60	14	1	2	0	22.1%
Psychiatric disturbance	72	59	11	2	0	0	18.1%
Abdominal pain	70	47	17	5	1	0	32.9%
Shortness of breath	56	32	22	0	1	1	42.9%
Chest pain	51	37	13	1	0	0	27.5%
Overdose/poisoning	33	27	6	0	0	0	18.2%
Pain management	32	18	10	3	0	1	43.8%
Genitourinary	25	20	3	2	0	0	20.0%
Seizure	23	17	2	2	0	2	26.1%
Dizziness	19	13	4	1	1	0	31.6%
Hypertension	18	15	2	0	0	1	16.7%
Syncope	17	10	6	1	0	0	41.2%
Weakness	14	4	8	1	0	1	71.4%
Fever	13	9	4	0	0	0	30.8%
Altered mental status	13	9	3	0	0	1	30.8%
Diabetic emergencies	13	8	5	0	0	0	38.5%
Headache	10	8	2	0	0	0	20.0%
Allergic reaction	10	7	3	0	0	0	30.0%
Other	92	56	20	14	2	0	39.1%

our results and those found in other studies appears to lie in the question being asked. The studies that demonstrated unacceptable paramedic triage accuracy evaluated whether paramedics could determine if transport needed to occur [19, 21, 22, 24]. However, once it is decided that the patient needs transport, it appears paramedics are able to differentiate the different levels of care available at hospital-based EDs versus FSEDs.

4.1. Limitations

There are several limitations to our study. First, data validity is limited by the retrospective nature of our study. Second, the decision to transfer a patient for further testing is based upon numerous factors that are not routinely available to paramedics. Paramedics in this study were neither formally nor routinely trained in what services are available in the different ED settings. Third, we did not assess paramedic reasoning for transport destination decisions, limiting the conclusions regarding paramedics' true ability to predict FSED appropriateness. Fourth, we did not assess the number of patients potentially inappropriately triaged to the main hospital ED.

In our study, we have identified chief complaints that are consistently associated with transfer to a hospital-based ED. Additional studies are needed to further characterize clinical presentations or diagnoses that are consistently associated with transfer to a hospital-based ED. Although paramedics are not expected to make clinical diagnoses in the prehospital environment, incorporating dedicated training programs and decision tools may improve transport destination decisions. Future studies should evaluate how inappropriate triage to a FSED affects costs, resource utilization, morbidity, and mortality.

5. Conclusion

In this study involving two EMS agencies over a 25-month period, we found that 3 out of 4 patients deemed appropriate for transport to a FSED by a paramedic did not require additional hospital-based services.

Declarations of interest

None.

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References

- [1] Moskop JC, Sklar DP, Geiderman JM, Schears RM, Bookman KJ. Emergency department crowding, part 2—barriers to reform and strategies to overcome them. *Ann Emerg Med* 2009;53(5):612–7.
- [2] Herring A, Wilper A, Himmelstein DU, Woolhandler S, Espinola JA, Brown DF, Camargo CA. Increasing length of stay among adult visits to U.S. emergency departments, 2001–2005. *Acad Emerg Med* 2009;16(7):609–16.
- [3] McCaig LF, Burt CW. National hospital ambulatory medical care survey: 2002 emergency department summary. *Adv Data* 2004;340:1–34.
- [4] Nawar EW, Niska RW, Xu J. National hospital ambulatory medical care survey: 2005 emergency department summary. *Adv Data* 2007;386:1–32.
- [5] Medicine Io. Hospital-based emergency care: at the breaking point. Washington, DC: The National Academies Press; 2007.
- [6] Kellermann AL, Hsia RY, Yeh C, Morganti KG. Emergency care: then, now, and next. *Health Aff (Millwood)* 2013;32(12):2069–74.
- [7] Schuur JD, Baker O, Freshman J, Wilson M, Cutler DM. Where do freestanding emergency departments choose to locate? A national inventory and geographic analysis in three states. *Ann Emerg Med* 2017;69(4) (383–392.e385).
- [8] Rogers J. Freestanding emergency departments: brief overview and considerations. Available from: <http://www.karlsberger.com/downloads/FreestandingED-06.pdf>; 2017. (Accessed: July 1).
- [9] Appleby J. More emergency rooms open away from hospitals. Available from: http://www.usatoday.com/money/industries/health/2008-04-24-emergency-rooms-stand-alone_N.htm; 2017. (Accessed: July 1).
- [10] Sullivan AF, Bachireddy C, Steptoe AP, Oldfield J, Wilson T, Camargo CA. A profile of freestanding emergency departments in the United States, 2007. *J Emerg Med* 2012; 43(6):1175–80.
- [11] Stand-alone emergency departments. Available from: http://www.medpac.gov/docs/default-source/reports/jun17_ch8.pdf; 2018. (Accessed: January 22).
- [12] Freestanding emergency departments. Policy statement. *Ann Emerg Med* 2014;64(5):562.
- [13] Birnbaum PS. Cost containment: freestanding emergency centers and the emergency department. *Am J Emerg Med* 1985;3(3):259.
- [14] Clesham K, Mason S, Gray J, Walters S, Cooke V. Can emergency medical service staff predict the disposition of patients they are transporting? *Emerg Med J* 2008;25(10): 691–4.
- [15] Emerman CL, Shade B, Kubincanek J. A comparison of EMT judgment and prehospital trauma triage instruments. *J Trauma* 1991;31(10):1369–75.
- [16] Ornato J, Mlinek EJ, Craren EJ, Nelson N. Ineffectiveness of the trauma score and the CRAMS scale for accurately triaging patients to trauma centers. *Ann Emerg Med* 1985;14(11):1061–4.
- [17] Fries GR, McCalla G, Levitt MA, Cordova R. A prospective comparison of paramedic judgment and the trauma triage rule in the prehospital setting. *Ann Emerg Med* 1994;24(5):885–9.
- [18] Richards JR, Ferrall SJ. Triage ability of emergency medical services providers and patient disposition: a prospective study. *Prehosp Disaster Med* 1999;14(3):174–9.
- [19] Hauswald M. Can paramedics safely decide which patients do not need ambulance transport or emergency department care? *Prehosp Emerg Care* 2002;6(4):383–6.
- [20] Qazi K, Kempf JA, Christopher NC, Gerson LW. Paramedic judgment of the need for trauma team activation for pediatric patients. *Acad Emerg Med* 1998;5(10):1002–7.
- [21] Silvestri S, Rothrock SG, Kennedy D, Ladde J, Bryant M, Pagane J. Can paramedics accurately identify patients who do not require emergency department care? *Prehosp Emerg Care* 2002;6(4):387–90.
- [22] Levine SD, Colwell CB, Pons PT, Gravitz C, Haukoos JS, McVane KE. How well do paramedics predict admission to the hospital? A prospective study. *J Emerg Med* 2006;31(1):1–5.
- [23] Pointer JE, Levitt MA, Young JC, Promes SB, Messana BJ, Adèr ME. Can paramedics using guidelines accurately triage patients? *Ann Emerg Med* 2001;38(3):268–77.
- [24] Brown LH, Hubble MW, Cone DC, Millin MG, Schwartz B, Patterson PD, Greenberg B, Richards ME. Paramedic determinations of medical necessity: a meta-analysis. *Prehosp Emerg Care* 2009;13(4):516–27.
- [25] Mackersie RC. History of trauma field triage development and the American College of Surgeons criteria. *Prehosp Emerg Care* 2006;10(3):287–94.
- [26] Hunt RC, Jurkovich GJ. Field triage: opportunities to save lives. *Prehosp Emerg Care* 2006;10(3):282–3.