Comparison of EMD Selection of Sick Person Chief Complaint Protocol with On-Scene Responder Findings

Rich Lindfors; Myoshi Bolton; Isabel Gardett, PhD[1]

IAED RESEARCH WORKSHOP STUDY

1. Richmond Ambulance Authority, Virginia, USA
2. Fulton County Emergency Services 911, Georgia, USA
3. International Academies of Emergency Dispatch, Utah, USA

Corresponding Author
Rich Lindfors
Richmond Ambulance Authority
2400 Hermitage Road
Richmond, VA 23220
Phone. (804) 254-1193
Email. rlindfors@raaems.org

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ABSTRACT

Introduction: The Emergency Medical Dispatcher's (EMD's) selection of the most appropriate Chief Complaint Protocol is one of the most important elements in emergency dispatching. Choosing the correct Chief Complaint ensures that the correct information is gathered, the correct instructions and help provided, and the right resources sent. The selection of the MPDS Sick Person Protocol is often one of the most difficult for EMDs.
Objectives: The primary objective of this study is to compare the EMD's selection of the Sick Person Protocol with on-scene responders' findings when patient contact is made. The secondary objective is to compare specific details gathered on the Sick Person Protocol with on-scene responders' findings.
Methods: This is a retrospective study using data from a single, urban, high-performance emergency medical services (EMS) system in central Virginia, USA.
Results: Overall, 44,163 ProQA cases were collected for the study period, of which 6,732 (15.2%) were handled on the Sick Person Protocol. The strong majority (62.1%) of calls fell into the ALPHA Priority Level. For most of the cases, the Primary Impression type was "pain," a "GI/GU" (gastrointestinal or genitourinary) problem, or "weakness." However, three Key Question answers predicted another Primary Impression: "neuro," or neurological complaint.
Conclusions: These findings indicate that the EMDs at this agency are appropriately selecting the Sick Person Protocol and that when used correctly (by an ACE-accredited agency), the Sick Person Protocol correctly triages the few higher-acuity conditions, such as altered level of consciousness, into higher Priority Levels.

INTRODUCTION

In medicine, identification of the patient's primary or presenting problem drives the rest of the decision-making process. For physicians, this process is called diagnosis and involves the determination of the underlying clinical cause of a symptom or set of symptoms. Emergency Medical Dispatchers (EMDs) do not diagnose. Instead, for the EMD, the process is called Chief Complaint Selection, and it involves determining the highest-priority symptom (such as chest pain), condition (such as stroke), or situation (such as electrocution) the patient is currently experiencing. To determine the Chief Complaint, EMDs using the Medical Priority Dispatch System (MPDS®) ask the caller to "Tell me exactly what happened." Then, based on the information provided, the EMD determines the most appropriate Chief Complaint—generally the complaint most likely to need advanced clinical care or a fast or high-level emergency resource response, if one exists.

However, the importance of Chief Complaint selection is not limited to the initial portion of the emergency call. Once the Chief Complaint is selected, the logic of the MPDS directs the EMD through the questions and instructions most relevant to that Chief Complaint. For example, if the EMD selects the Traffic/Transportation Incidents Chief Complaint, they will ask the caller whether anyone is pinned or trapped and whether any chemical or other hazards are involved—in addition to gathering other information. On the other hand, if the EMD selects the Traumatic Injuries Chief Complaint, they will ask the caller what part of the body was injured and when the injury occurred. Thus, a caller who reports a broken arm resulting from a car accident will (appropriately) receive different interrogation and instruction than one who reports

a broken arm resulting from a sports impact, with each targeted to the specifics of the reported incident type. Just as every treatment decision for a disease will be determined by the physician's diagnosis, everything that happens throughout an emergency call depends on the correct selection of the initial Chief Complaint.

It is true that the EMD can change their mind later in the call and select a new Chief Complaint, but this is both unlikely and less than ideal. In the first place, significant evidence has shown that even the most highly-trained experts find it difficult to change decisions that have already been made, especially in time-constrained or high-stress situations. For example, physicians have been shown to engage in what is known as "cognitive fixation," which is the insistence on an initial interpretation despite new evidence. As a result, they become involved in "plan continuation," in which later decisions are all based on the earlier assumption, despite mounting data showing that the initial decision was incorrect.[1,2] Thus, they fix onto the first diagnosis they came to, even if later evidence suggests they should change their minds—with the potential result of mistakes in treatment down the line. Similar results have been documented in other high-stress, fast-moving fields, such as aviation,[3,4] where many pilot errors are attributed to cognitive fixation and plan continuation. EMDs are likely to find themselves in similar situations, making highly important decisions under time pressure, and may succumb to the same unwillingness to reconsider issues (such as Chief Complaint selection) that they consider already decided.

Also, although it may sometimes be necessary given new information, changing Chief Complaint selection partway through a call is less than ideal, compared to taking the time to select the correct Chief Complaint at the outset. Changing directions can lead to asking more questions (which can frustrate callers), missing information, or creating confusion for responders receiving the information. As the EMD's First Law of Prioritization puts it, "The MPDS prioritizes the actions of the dispatcher, not just the response." In other words, the logic of the MPDS is designed not only to get information for responders, but to lead the EMD along the most appropriate series of steps. "Therefore," as the Corollary to the First Law puts it, "the MPDS is an action plan, not a menu."[5] Selecting the most appropriate Chief Complaint at the outset of the call leads the EMD through the best question and instruction sequence and helps avoid the need to rethink decisions later.

One of the most difficult Chief Complaint selection situations for EMDs is the selection of the Sick Person (Specific Diagnosis) Protocol. According to the MPDS, a "sick person" is "a patient with a non-categorizable Chief Complaint who does not have an identifiable priority symptom."[5] Because of this broad definition, the Sick Person Protocol is sometimes used by EMDs as a "catch-all," potentially causing them to miss higher-acuity symptoms or conditions. Therefore, it is critical to identify whether EMDs are in fact using the Sick Person Protocol as designed, to handle patients presenting without any priority symptoms. This study provides insight into that question by connecting MPDS data from an emergency communication center (ECC) with on-scene data from electronic Patient Care Records (ePCRs).

OBJECTIVES

The primary objective of this study is to compare the EMD's selection of the Sick Person Protocol with on-scene responders' findings when patient contact is made. The secondary objective is to compare specific details gathered on the Sick Person Protocol with on-scene responders' findings.

METHODS

Design and Setting

This is a retrospective study using data from a single, urban, high-performance emergency medical services (EMS) system in central Virginia, USA. EMD data from ProQA (the logic inference engine software version of the MPDS) were matched with ePCR data for fiscal year 2017 (July 2016 – June 2017). Data was collected for every case initially handled by the EMD on the MPDS Sick Person Protocol. ProQA data collected included determinant code (dispatch code) and answers to Key Questions gathered by the EMD. The ePCR data collected included paramedic primary impression, paramedic final case disposition (such as "treated and transported by EMS" or "refused transport"), and final Computer-Aided Dispatch (CAD) disposition (final determination of the true nature of the situation).

The studied system, Richmond Ambulance Authority (RAA), has been an International Academies of Emergency Dispatch (IAED) Accredited Center of Excellence (ACE) since 2001. RAA provides Emergency Medical Services to the citizens and visitors of Richmond, Virginia, since 1991. Its mission is to deliver patient centered care through measurable clinical and operational excellence with efficiency, outstanding customer service and employee engagement. RAA covers an area of approximately 63 square miles, for a population of nearly 250,000, and it averages about 70,000 responses and over 50,000 transports (emergency and non-emergencies combined) per year.

Outcome Measures

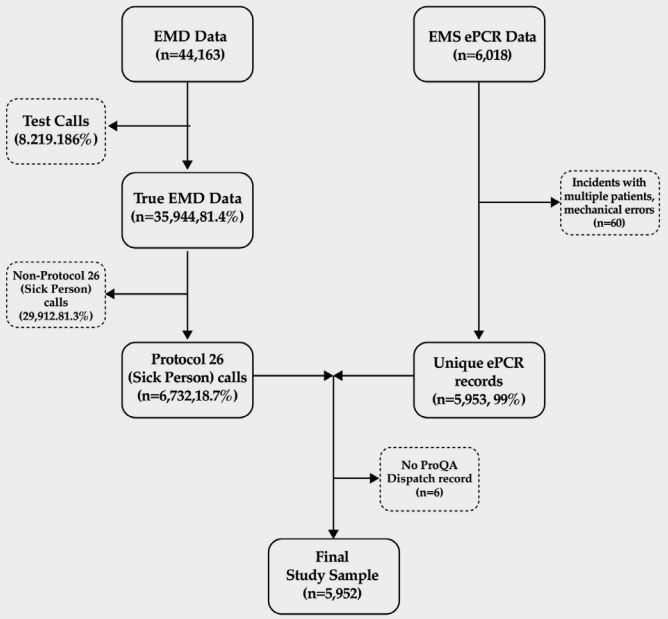
The primary outcome measures were (1) basic caller demographics; (2) the percentage of calls for which the EMD selected the Sick Person Protocol; (3) the answers to Key Questions input by the EMD in those cases; (4) the Priority Level and specific determinant code for those cases; and (5) specific patient care information from ePCRs.

Data Analysis

R project for statistical computing software version 3.5.1 (R Core Team. ©2000-2018, R Foundation for Statistical Computing, Vienna, Austria) was used for data analysis. In the data preprocessing phase, cases that had been handled in Protocol 26 (Sick Person) were selected and test calls were excluded. The cleaned dataset was then linked with corresponding records in the CAD (computer-aided dispatch) dataset, using ProQA incident number, which existed in both datasets. Finally, the resulting dataset was linked with corresponding records in the electronic patient care report (ePCR) dataset, using the ePCR incident number, which existed in both datasets. All the ePCR records that could not be matched with dispatch records were excluded.

RESULTS

Overall, 44,163 ProQA cases were collected for the study period, of which 6,732 (15.2%) were handled on the Sick Person Protocol. Of these, 5,952 had matched ePCR cases and made up the final study sample (Fig. 1).



EMD, Emergency Medical Dispatcher; ePCR, electronic patient care report.

Figure 1. Study data sampling process

The majority (55.6%) of patients were female, and most (66.5%) were over 45 years old. Almost all callers were first (34.5%) or second party (55.9%) (Table 1).

The strong majority (62.1%) of calls fell into the ALPHA Priority Level, with the lowest percentages of calls handled in the DELTA (8.0%) and OMEGA (6.0%) levels (Fig. 2).

The most common on-scene Paramedic Primary Impression types were the same across almost all of the calls handled on the Sick Person Protocol, regardless of the specific answers to Key Questions. For most of the cases, the Primary Impression type was "pain," a "GI/GU" (gastrointestinal or genitourinary) problem, or "weakness" (Table 2). However, three Key Question answers predicted another Primary Impression: "neuro," or neurological complaint. Overall, these "neuro" indications were most likely to be recorded when the caller reported that the patient was "not alert" (a "No" answer to Key

Measure		N=5,952 n (%)
Gender	Female	3,310 (55.6)
	Male	2,632 (44.2)
	Unknown	10 (0.20)
Age Group	0-15	303 (5.1)
	16-30	791 (13.3)
	31-45	896 (15.0)
	46-60	1,474 (24.8)
	61-85	1,916 (32.2)
	86+	563 (9.5)
	Unknown*	9 (0.20)
Caller Party Type	1st Party	2,055 (34.5)
	2nd Party	3,328 (55.9)
	3rd Party	546 (9.2)
	4th Party	21 (0.40)
	Unknown	2 (0.03)

Table 1. Characteristics of the study population.

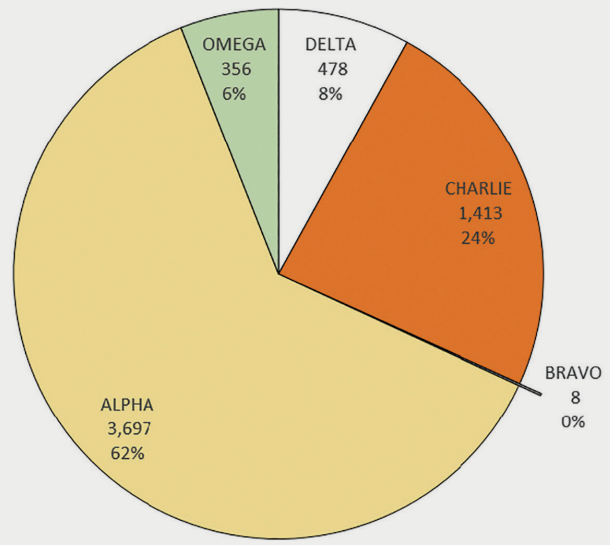


Figure 2. Distribution of cases categorizing by dispatch priority levels

Key Question (KQ)	KQ Response	EMS Primary Impression	n (%)
Is s/he completely alert? (KQ1)	Yes (n=5,033)	Pain	1,342 (26.67)
		GI/GU	1,133 (22.52)
		Weakness	456 (9.06)
	No (n=476)	Neuro	122 (25.63)
		Weakness	69 (14.5)
		GI/GU	43 (9.03)
Is s/he breathing normally? (KQ2)	Yes (n=4,787)	Pain	1,190 (24.86)
		GI/GU	965 (20.18)
		Weakness	486 (10.15)
	No (n=1,079)	GI/GU	233 (21.59)
		Pain	197 (18.26)
		Weakness	101 (9.36)
Is s/he bleeding or vomiting blood? (KQ3)	No (n=5,872)	Pain	1,384 (23.57)
		GI/GU	1,186 (20.2)
		Weakness	590 (10.05)
	Unknown (n=80)	GI/GU	27 (33.75)
		Pain	9 (11.25)
		Neuro	6 (7.5)
Does s/he have any pain? (KQ4)	No (n=1,631)	GI/GU	319 (19.57)
		Weakness	261 (16.01)
		Neuro	121 (7.42)
	Unknown (n=255)	GI/GU	40 (15.69)
		Neuro	36 (14.12)
		Fever	35 (13.73)

GI/GU, Gastrointestinal/Genitourinary.

Table 2. Primary Impression by Key Question.

Dispatch Priority Level	EMS Primary Impression Type	n	Within priority level %	Out of all cases (N=5,952) %
Delta (n=478)	Neuro Weakness GI/GU	123 69 44	25.7 14.4 9.2	2.1 1.2 0.74
Charlie (n=1,413)	GI/GU Pain Weakness	254 235 148	18.0 16.6 10.5	4.3 4.0 2.5
Bravo (n=8)	GI/GU Weakness Fever	2 2 1	25.0 25.0 12.5	0.03 0.03 0.02
Alpha (n=3,697)	Pain GI/GU Weakness	1,028 811 360	27.8 21.9 9.7	17.3 13.6 6.1
Omega (n=356)	Pain GI/GU Infectious	103 102 28	28.9 28.7 7.9	1.7 1.7 0.47

GI/GU, Gastrointestinal/Genitourinary.

Table 3. Top EMS Primary Impression types by Priority Level

Priority Level	Determinant	n (N=5,952)	Top 3 EMS Primary Impressions
Delta (n=478)	26-D-1	477	Neuro, Weakness, GI/GU
Charlie (n=1,413)	26-C-1 26-C-2 26-C-3	410 884 119	Neuro, Weakness, Behavioral GI/GU, Pain, Weakness Sickle, Pain, GI/GU
Bravo (n=8)	26-B-0 26-B-1	1 7	Neuro GI/GU, Weakness, Fever
Alpha (n=3,697)	26-A-1 26-A-2 26-A-3 26-A-4 26-A-5 26-A-6 26-A-7 26-A-8 26-A-9 26-A-10 26-A-11 26-A-12	1145 109 161 211 134 78 114 885 26 425 408 1	Pain, GI/GU, Weakness CV, Weakness, Behavioral Weakness, GI/GU, Neuro Fever, Infectious, Weakness Weakness, Pain, GI/GU GI/GU, Pain, Neuro Pain, Weakness, GI/GU Pain, GI/GU, Injury GI/GU, Pain, Weakness GI/GU, Pain, Infectious GI/GU, Infectious, Weakness GI/GU
Omega (n=356)	26-O-2 26-O-3 26-O-4 26-O-5 26-O-6 26-O-7 26-O-8 26-O-9 26-O-10 26-O-11 26-O-12 26-O-14 26-O-15 26-O-17 26-O-18 26-O-19 26-O-20 26-O-21 26-O-22 26-O-23 26-O-24 26-O-25 26-O-26 26-O-27 26-O-28	22 5 3 12 30 36 49 2 1 35 21 11 7 1 2 4 13 2 13 18 10 2 9 18 30	Pain, GI/GU, Infectious Pain, Environment Behavioral, Malaise GI/GU, Pain, Behavioral GI/GU, Weakness, Pain GI/GU, Pain, CV Pain, Injury, Mobility Injury, Pain EENT GI/GU, Weakness, Malaise Pain, EENT, Malaise Pain, Abuse of Alcohol and Drugs, CV Pain, GI/GU, Malaise Malaise Allergic, Malaise Behavioral, Weakness EENT, Respiratory, Injury Injury, Pain GI/GU, Infectious, CV Pain, GI/GU, Injury Allergic, Pain, Infectious GI/GU, Injury Infectious, Pain, Behavioral Dental/Tooth, Pain Infectious, Pain, Injury

GI/GU, Gastrointestinal/Genitourinary; CV, Cardiovascular; EENT, Eye, Ears, Nose, and Throat. *Two "override" cases were excluded (one for 26-D-0 and one for 26-B-).

Table 4. Top EMS Primary Impression types by determinant code

Question 1) or that an "alert" patient was reporting no specific pain (a "No" answer to Key Question 4).

In general, the "neuro" Primary Impressions appeared most often in the DELTA Priority Level ("Not Alert") (Table 3) and when the final Determinant Code was 26-CHARLIE-1: ALTERED LEVEL OF CONSCIOUSNESS (Table 4).

Within the general Primary Impression types, the specific Primary Impressions were also largely the same across all Key Question answers. "Extremity (non-traumatic)" was the most commonly-recorded "pain" impression, while "abdominal generalized" and "nausea" were the most commonly-recorded "GI/GU impressions." The most common "neuro" impression was "altered mental status" (Table 5).

The final EMS outcome was the same for almost all of the cases: 92.34% were treated and transported by EMS. Approximately 7% of patients refused transport, and in 20 cases, paramedics determined that no EMS was needed. Of the 5,952 cases included in the study, only seven were transported "hot" to the hospital.

The final CAD disposition for the cases—the final determination of the "true nature" of the case, taking into account all EMD and EMS information—agreed that the case was a "sick person" 77.07% of the time (Fig. 3).

DISCUSSION

EMD selection of the Sick Person Protocol in this agency appears to be appropriate to the original intent of the Protocol, which is to handle low-acuity, otherwise non-categorizable complaints with no priority symptoms. Overall, EMS on-scene findings indicate that the majority of the patients EMDs coded on the Sick Person Protocol had vague, non-traumatic extremity pain, nausea, or general abdominal pain. More than two-thirds of the Sick Person cases were coded with ALPHA- or OMEGA-level determinants, indicating low-acuity conditions such as fever, feeling "unwell/ill," earache, or other similar problems. This assignment of generally low-acuity codes is validated by the fact that only seven cases total—or 0.1%—were transported "hot"

Key Question	Response	Pain	GI/GU	Neuro
KQ1	Yes	Extremety (Non-traumatic) -PCR	Abdominal Generalized - PCR	Headache - PCR
		Not Elsewhere Mentioned Sudden Onset - PCR	Nausea (With Vomiting) - PCR	Neuro Problem Not Otherwise Listed - PCR
		Chronic - PCR	Nausea (Without Vomiting) - PCR	Altered Mental Status - PCR
	No	Extremety (Non-traumatic) - PCR	Nausea (With Vomiting) - PCR	Altered Mental Status - PCR
		Not Elsewhere Mentioned Sudden Onset - PCR	Abdominal Generalized - PCR	Stroke/CVA - PCR
		Back (Non-traumatic) - PCR	GI Problem Not Otherwise Listed - PCR	Neuro Problem Not Otherwise Listed - PCR
KQ2	Yes	Extremety (Non-traumatic) - PCR	Abdominal Generalized - PCR	Altered Mental Status - PCR
		Not Elsewhere Mentioned Sudden Onset - PCR	Nausea (With Vomiting) - PCR	Headache - PCR
		Chronic - PCR	Nausea (Without Vomiting) - PCR	Neuro Problem Not Otherwise Listed - PCR
	No	Extremety (Non-traumatic) - PCR	Abdominal Generalized - PCR	Altered Mental Status - PCR
		Not Elsewhere Mentioned Sudden Onset - PCR	Nausea (With Vomiting) - PCR	Headache - PCR
		Chronic - PCR	Nausea (Without Vomiting) - PCR	Stroke/CVA - PCR
KQ3	No	Extremety (Non-traumatic) - PCR	Abdominal Generalized - PCR	Altered Mental Status - PCR
		Not Elsewhere Mentioned Sudden Onset - PCR	Nausea (With Vomiting) - PCR	Headache - PCR
		Chronic - PCR	Nausea (Without Vomiting) - PCR	Neuro Problem Not Otherwise Listed - PCR
	Unknown	Extremety (Non-traumatic) - PCR	Nausea (With Vomiting) - PCR	Altered Mental Status - PCR
		Chronic - PCR	Abdominal Generalized - PCR	Neuro Problem Not Otherwise Listed - PCR
		Not Elsewhere Mentioned Sudden Onset - PCR	Abdominal Pain Acute Onset - PCR	Seizure - PCR
KQ4	No	Extremety (Non-traumatic) - PCR	Nausea (With Vomiting) - PCR	Altered Mental Status - PCR
		Not Elsewhere Mentioned Sudden Onset - PCR	Abdominal Generalized - PCR	Neuro Problem Not Otherwise Listed - PCR
		Back (Non-traumatic) - PCR	Nausea (Without Vomiting) - PCR	Headache - PCR
	Unknown	Extremety (Non-traumatic) - PCR	Nausea (With Vomiting) - PCR	Altered Mental Status - PCR
		Not Elsewhere Mentioned Sudden Onset - PCR	Abdominal Generalized - PCR	Headache - PCR
		-	Diarrhea - PCR	Seizure - PCR

KQ1 = Is s/he completely alert? KQ2 = Is s/he breathing normally?
KQ3 = Is s/he bleeding or vomiting blood? KQ4 = Does s/he have any pain?
GI/GU, Gastrointestinal/Genitourinary; CV, Cardiovascular; PCR, Polymerase chain reaction; CVA, Cerebrovascular accident.

Table 5. Top EMS specific Primary Impression types for each Key Question response

(lights-and-siren) to the hospital from the scene, a generally-recognized indicator of emergency status.

Review of the conditions listed as Primary Impressions by the paramedics indicated that some cases could, perhaps, have been handled on more specific MPDS Chief Complaints, such as Abdominal Pain or Headache. However, as these were low-acuity complaints with no priority symptoms, it is acceptable for the EMD to handle them on the Sick Person Protocol, since the MPDS provides "safety net" features, or the ability to rule out high-acuity conditions, on all Chief Complaint Protocols. If the caller reported those specific conditions at Case Entry, it would be ideal for the EMD to select the more specific Chief Complaint Protocol, but many conditions that are specifically identified or pinned down by EMS on scene are reported as vague low-acuity complaints at dispatch. In general, none of these indicated missed high-acuity conditions or priority symptoms, and the Final CAD Dispositions indicated that the best-fit descriptor for the large majority of the cases was, in fact, Sick Person, with Abdominal Pain/Problems a very distant second (not counting the almost 7% of cases in which the patient refused transport to the hospital).

Two subsets of cases, however, did suggest areas for possible concern. The first subset was the group of cases for which the EMS Primary Impression type was "neuro," or neurological problem. Many of these were headaches, but some were identified

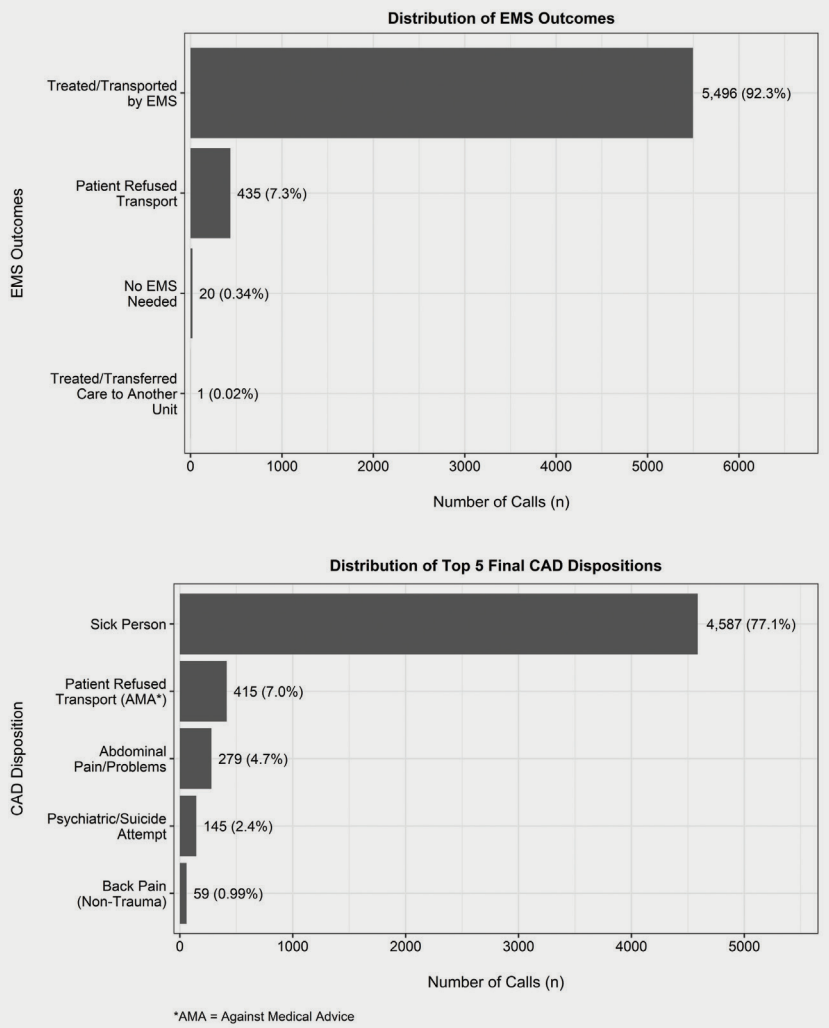


Figure 3. Final EMSoutcome and Top 3 CAD Dispositions.

by EMS as "altered mental status" or "stroke/CVA," potentially higher-acuity conditions that ideally would be identified at the dispatch point. Fortunately, the only determinant codes for which "neuro" was listed as one of the top Primary Impression types were 26-DELTA-1 and 26-CHARLIE-1, which are specifically designed to identify "not alert" patients and those with an "altered level of consciousness," respectively. Even if conditions changed between the initial call and EMS arrival on scene—and even if another, more specific Chief Complaint Protocol would have been more appropriate—these potentially higher-acuity conditions were identified even on the Sick Person Protocol, placed in higher Priority Levels, and accurately described by the determinant descriptors.

The second subset of cases that might be cause for concern was the set of 145 cases (2.4%) for which the Final CAD Disposition was identified as "Psychiatric/Suicide Attempt." The most common Primary Impression types for these events were "behavioral," "abuse of alcohol and drugs," and "GI/GU." These are still mostly low-acuity conditions, but given the potential for violence and scene safety issues with behavioral and drug- or alcohol-related problems, these cases may have been better handled on other Chief Complaint Protocols, depending on the information the caller provided. The difficulty is that many of these types of calls are reported as third- or fourth-party calls, in which the caller is not with the patient being described, and so information may be limited. In those cases, the Unknown Problem Protocol may, in some cases, be a better fit.

Limitations

This study was conducted in a single agency with a very long history of high compliance to protocol and ACE achievement. Other agencies may find different results, depending on local application of quality assurance practices, training, and so on. The study was also limited by the type of data accessed; although EMS on-scene findings provide significant insight into the true nature of a patient's problem, connecting all the way through to hospital data and longer-term patient outcomes would provide a more detailed picture of the prognosis for these patients.

CONCLUSION

Overall, patients in this study were nearly 70 times more likely to refuse transport than to be taken to the hospital with lights-and-siren. Most were found to have generalized abdominal complaints, extremity pain, nausea, headache, and other low-acuity concerns without priority symptoms. These findings indicate that the EMDs at this agency are appropriately selecting the Sick Person Protocol and that when used correctly (by an ACE-accredited agency), the Sick Person Protocol correctly triages the few higher-acuity conditions, such as altered level of consciousness, into higher Priority Levels. This study also provides a blueprint for other agencies to study the appropriateness of their own EMDs' selection of this sometimes overused Chief Complaint.

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