

This article was downloaded by: [UPEC - Prehospital Emergency Care]

On: 5 September 2009

Access details: Access Details: [subscription number 768277147]

Publisher Informa Healthcare

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Prehospital Emergency Care

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713698281>

Prospective Evaluation of an Emergency Medical Services-Administered Alternative Transport Protocol

Barry J. Knapp ^{ab}; Sara N. Tsuchitani ^a; Jonathan M. Sheele ^a; Jennifer Prince ^a; James Powers ^a

^a Department of Emergency Medicine, Eastern Virginia Medical School, Norfolk, Virginia ^b Department of Emergency Physicians of Tidewater, Eastern Virginia Medical School, Norfolk, Virginia

Online Publication Date: 01 January 2009

To cite this Article Knapp, Barry J., Tsuchitani, Sara N., Sheele, Jonathan M., Prince, Jennifer and Powers, James(2009)'Prospective Evaluation of an Emergency Medical Services-Administered Alternative Transport Protocol',*Prehospital Emergency Care*,13:4,432 – 436

To link to this Article: DOI: 10.1080/10903120902935256

URL: <http://dx.doi.org/10.1080/10903120902935256>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

PROSPECTIVE EVALUATION OF AN EMERGENCY MEDICAL SERVICES—ADMINISTERED ALTERNATIVE TRANSPORT PROTOCOL

Barry J. Knapp, MD, Sara N. Tsuchitani, MD, Jonathan M. Sheele, MD, MHS, Jennifer Prince, RN, BA, James Powers, DO

ABSTRACT

Background. The ability of emergency medical services (EMS) providers to offer an alternative means of nonemergent transport for patients with minor medical complaints is a rarely sanctioned concept in U.S. EMS systems. **Objective.** To prospectively determine if paramedics using transport guidelines can identify patients with minor medical problems who can be safely transported by a nonmedical alternative transport mechanism (taxi). **Methods.** Paramedics in the city of Norfolk, Virginia, who had more than one year of experience and who had completed the study orientation course were eligible to enroll subjects in the study. Pre-determined alternative transport exclusion criteria as well as inclusion guidelines were provided to paramedics. After on-scene evaluation, paramedics identified subjects who met the enrollment criteria and were deemed safe for emergent ambulance transport. Enrolled subjects were provided a prepaid taxi voucher, which allowed for transport to the closest emergency department (ED). Patients who refused study participation were transported to the ED by ambulance. **Results.** Ninety-three subjects were enrolled and transported to the ED via taxi. Eleven patients identified by EMS as meeting enrollment criteria refused study participation. The average time from taxi dispatch to ED triage was 43 minutes (95% confidence interval [CI] = 38 to 48). Nine (10%) subjects transported by taxi were ultimately admitted to the hospital. None of the study participants required ED blood transfusions or emergent procedures or suffered an adverse event that could be directly attributed to the delay in ED arrival by taxi. **Conclusions.** The ability of EMS to safely triage patients who activate the 9-1-1 system to an alternative transport mechanism remains an unproven concept. Our study adds to the concerns of other published literature that EMS providers underestimate the potential severity of illness. **Key words:** EMS; triage; prehospital; alternative transport; taxi

PREHOSPITAL EMERGENCY CARE 2009;13:432–436

Received August 4, 2008, from the Department of Emergency Medicine (BJK, SNT, JMS, JP, JP), Emergency Physicians of Tidewater (BJK), Eastern Virginia Medical School, Norfolk, Virginia. Revision received January 4, 2009; accepted for publication January 5, 2009.

Dr. Sheele is currently at the Department of Emergency Medicine, Johns Hopkins School of Medicine, Baltimore, Maryland; and Dr. Powers is currently at the Department of Emergency Medicine, Edward Via Virginia College of Osteopathic Medicine, Blacksburg, Virginia.

Address correspondence and reprint requests to: Barry J. Knapp, MD, Raleigh Building, Room 304, Department of Emergency Medicine, Eastern Virginia Medical School, Norfolk, VA 23507-1999. e-mail: loriandbar@aol.com

doi: 10.1080/10903120902935256

INTRODUCTION

Emergency medical services (EMS) systems are designed to provide rapid treatment and transport of acutely ill or injured patients to the emergency department (ED). As public use of the 9-1-1 system has grown, an increasing number of patients with low-acuity illness or injury are utilizing emergency services.^{1–3} The majority of EMS systems are designed to provide ED transport for all patients who activate the 9-1-1 system.⁴ In the authors' opinion, this "transport all" philosophy encourages overuse of the 9-1-1 system and potentially leads to delays for those with more emergent conditions.

In November 2008, the American College of Emergency Physicians (ACEP) and the National Association of EMS Physicians (NAEMSP) issued a joint policy statement recognizing the burden of those who activate the 9-1-1 system and do not need advanced life support (ALS) level of care or evaluation at an ED. The policy states "that in these circumstances, transportation by alternative means or to an alternative destination may be appropriate."⁵ Currently, prospective literature that assesses the ability of EMS providers to determine which patients can be transported by alternative means is limited.

Our goals were to prospectively evaluate a paramedic-administered alternative transport protocol and to provide a free nonemergent transportation option for those patients deemed not in need of emergency transport.

METHODS AND MATERIALS

This was a prospective study conducted by Norfolk Fire-Rescue (a single-tiered combined fire/EMS agency that has 18,450 annual transports) in Norfolk, Virginia (population 234,403), from June 2005 through December 2006. The study was approved by the Institutional Review Board (IRB) of Eastern Virginia Medical School and supported by a grant from the Tidewater Emergency Medical Services Council (TEMS).

Paramedics employed by Norfolk Fire-Rescue with at least one year of experience were invited to participate in this study. Participation by EMS providers was voluntary. Twenty-eight paramedics attended the two-hour orientation session directed by the principal investigator and study personnel. This represents 21% (28/133) of the total number of paramedics in our

- Age <18 or >65 years
- Abnormal vital signs
 - Pulse rate >110 or <50 beats/min
 - Systolic blood pressure <90 or >190 mmHg
 - Diastolic blood pressure >115 mmHg
 - Pulse oximetry <94%
 - Respiratory rate <12 or >24 breaths/min
 - Temperature (fever) >101°F by history
- Allergic reaction
- Chest discomfort (all types, including pleuritic, burning, and “indigestion”)
- Dyspnea or shortness of breath
- Neurologic complaints (to include focal weakness, double vision, numbness)
- Abdominal or pelvic pain
- Pregnancy-related complaints
- Significant multisystem trauma
- Uncontrolled hemorrhage (to include minor bleeding in a hemophiliac)
- Gastrointestinal complaints (vomiting, diarrhea, abdominal pain)
- Altered mental status
 - Glasgow Coma Scale score <15
 - Alcohol or drug intoxication
 - Dementia
 - Postictal
- Seizure
- Syncope
- Overdose
- Psychiatric patients (including suicidal/homicidal, psychosis)
- Headache
- Suicide attempt
- Abuse or neglect of an adult
- Any patient scenario where the crew’s best judgment dictates transport
 - Examples: language barrier, nonambulatory, risk of physical harm, severe pain, paramedic intuition

FIGURE 1. The study exclusion criteria.

EMS system. This required session included a study overview, objectives, research requirements, and subject inclusion/exclusion criteria. Paramedics were required to complete an online training course for the protection of human research subjects and to certify their knowledge and compliance with the Health Insurance Portability and Accountability Act (HIPAA).

Study protocols for subject inclusion and exclusion were created by merging published literature, established alternative transport policies by other EMS agencies, and the authors’ preferences (Figs. 1 and 2). Emphasis was placed on recommendations from the Neely Conference, which helped to establish a framework for determination of ambulance necessity.⁶ Ef-

- Ear pain with or without foreign body
- Ambulatory patients with minor extremity trauma with a low suspicion of fracture
- Minor extremity laceration without loss of function or significant bleeding
- Pain or burning on urination
- Nontraumatic musculoskeletal pain
- Penile discharge
- Vaginal discharge without suspicion of pregnancy
- Toothache without significant swelling
- Sore throats and upper respiratory infections without wheezing and without significant throat swelling
- Prescription refills
- Scheduled visits to the hospital
- Catheter replacements
- Minor insect or animal bites (without skin puncture)
- Common dermatologic problems (such as scabies, ringworm, pinworm)

FIGURE 2. The study inclusion criteria.

orts were made to exclude complicated and high-risk patient presentations and include only those conditions/complaints that were minor and did not require emergent physician evaluation.

Prior to study commencement, the research team contracted with a local taxi company to transport enrolled study participants to the nearest ED for a fee paid by the investigators. For each patient transport, the taxi company was reimbursed \$25 by means of the voucher system described below. The taxi company agreed to transport study participants to the ED within one hour after initial contact.

During the research period, ambulances responded in the usual manner to 9-1-1 calls. Use of lights and sirens was at the discretion of the responding ambulance based on the nature of the call. After initial on-scene evaluation by study-approved paramedics, patients were eligible for study participation if they were deemed to have a minor medical problem or complaint and did not meet any of the exclusion criteria. Eligible subjects were presented with both a verbal and a written description of the study. Subjects who declined participation were transported to the nearest ED via ambulance in the usual fashion. Subjects who agreed to participate provided consent and were issued a transportation voucher valid for taxi transport to the nearest ED only on the day that it was issued. After the taxi company was contacted (by EMS or the enrolled subject), the ambulance crew cleared the scene and was available to respond to other 9-1-1 calls. Enrolled subjects were instructed to call 9-1-1 if their condition changed while awaiting taxi arrival; if this occurred, an ambulance would return to the scene, terminate study participation, and transport the patient to the ED.

The research team collected transportation vouchers and consent forms from the ambulance crews weekly. The taxi company sent its voucher copies to the research team twice each month for verification and reimbursement.

The taxi vouchers were used by the research team to identify study participants. Hospital and emergency dispatch records were reviewed by the researchers to collect predetermined outcome criteria. Collected data included hospital triage time, diagnosis, admission to hospital, and the need for emergent procedures or blood products. Data were analyzed using Microsoft Excel (Microsoft Corp., Redmond, WA, 2007).

RESULTS

During the study period, there were a total of 34,080 patient transports by Norfolk Fire-Rescue. Eligible paramedics approached 104 patients who met study enrollment criteria. This represents 0.3% of the total number of transported patients during the study time frame. Eleven patients declined to participate and received ambulance transport to the nearest ED in the usual manner. All subjects who consented to the study were transported by taxi to the ED. Of the 93 patients who consented and were transported by taxi, 10 (11%) did not receive disposition from the ED because they did not register with triage or were triaged but left the ED before physician evaluation. The average time from taxi dispatch to ED triage was 43 minutes (95% confidence interval [CI] = 38 to 48). No enrolled subjects had study participation terminated because of the need to recontact 9-1-1 during the waiting period for taxi transport.

Nine of 93 (10%) enrolled subjects were admitted to the hospital from the ED. Three of these nine subjects were ultimately determined to be improperly enrolled by EMS because they met the exclusion criteria, with gastrointestinal and/or psychiatric complaints.

None of the study participants required blood transfusions or emergent procedures or suffered an adverse event definitely attributable to transport to the ED by taxi.

DISCUSSION

The majority of EMS agencies provide transport to all patients who activate the 9-1-1 system, regardless of complaint. Upon ED arrival, it is common for both ED nursing staff and EMS providers to direct stable-appearing ambulance patients with low-acuity complaints to the waiting room. Depending on the availability of ED resources, it may be hours before these patients are evaluated by a physician. This common ED scenario highlights the overuse of EMS by patients with nonemergent complaints who may not require

rapid transport to the ED. As EMS systems continue to serve increasing volumes of patients, agencies are having difficulty simultaneously managing a large volume of low-acuity responses while maintaining availability and rapid-response capabilities to patients with critical medical or trauma needs. This study documents our attempt to formulate a solution to this challenging problem.

Most published literature assessing the ability of EMS providers in determining the need for ambulance transport is retrospective in nature. It was our presumption that retrospective evaluation of medic performance in hypothetical transport scenarios overestimated undertriage rates. We were surprised to find that 10% of our prospectively enrolled subjects were admitted to the hospital. Despite our efforts to limit enrollment to patients with simple, low-acuity medical problems or complaints, this was not consistently achieved. Several patients with complex medical issues were enrolled. One patient was admitted to the intensive care unit (ICU) with findings of hepatic and renal failure, elevated troponin I level, and polysubstance abuse; his chief complaint to EMS was "ill feeling" and chills without fever. One patient was taken to the operating room eight hours after ED presentation for suspected jejunal intussusception. Ultimately the patient was found not to have surgical pathology. Three of the remaining patients were admitted to the hospital for management of symptoms related to chronic disease (two patients with human immunodeficiency virus/acquired immunodeficiency syndrome [HIV/AIDS] and one patient with end-stage renal disease [ESRD]) and, finally, one patient was admitted to the podiatry service for management of a foot ulcer (Table 1).

Patients who present with vague or nonspecific complaints (i.e., weakness and malaise) remain a challenge as far as field triage is concerned. The ability of clinicians to risk-stratify the seriousness of a patient's illness is based on a comprehensive knowledge of disease processes taken in the context of preexisting medical problems. One could argue that making an accurate assessment is beyond paramedic level of training and that a "safe" level of prehospital triage could never be achieved without significant changes in the paramedic curriculum.

The disconnect from a trained medical provider during taxi activation and transport poses the greatest risk for patients. In our study, taxi arrival and transport were relatively rapid. The average time from taxi dispatch to ED triage was 43 minutes. Despite the hospital admission rate, it is somewhat comforting that the patients transported by taxi did not require any emergent procedures or blood products. It is impossible to predict whether larger numbers of enrolled patients would have eventually resulted in a bad outcome. The authors suspect that the high admission rate

TABLE 1. Summary of Patients Admitted to the Hospital

Patient Age (yr), Gender	EMS Chief Complaint	Triage Chief Complaint	Physician Chief Complaint	Admission Reason
36, F	Headache, vomiting	Nausea, vomiting, diarrhea	Nausea, vomiting	1. Acute psychosis 2. Evaluation of vomiting
43, M	No EMS run sheet	Suicidal ideation, Homicidal ideation	Psychiatric screening examination	1. Depression 2. Suicidal ideation 3. Homicidal ideation
34, M	Joint stiffness	Bilateral lower limb pain/swelling ×3 weeks	Leg pain and swelling (chronic)	1. Bilateral leg swelling 2. HIV 3. Urinary tract infection
50, M	Foot pain	Foot pain and swelling	Foot pain and swelling	1. Left foot cellulitis
61, M	Right foot infection	Right foot infection	Right toe pain and swelling	1. Diabetic ulcer 2. End-stage renal disease
26, F	Weakness	Abdominal pain	Abdominal pain	1. Suspected jejunal intussusception; to OR
32, M	Weakness	Dehydration	Weakness	1. Failure to thrive 2. AIDS 3. Renal insufficiency
58, M	Chills, ill feeling	Chills, aches, cough	Weakness, vomiting	Admit to ICU: 1. Hepatic failure 2. Acute renal failure 3. Polysubstance abuse
61, F	Vomiting, diarrhea	Vomiting, diarrhea	Diarrhea	1. Peritonitis 2. Hypokalemia

AIDS = acquired immunodeficiency syndrome; EMS = emergency medical services; F = female; HIV = human immunodeficiency virus; ICU = intensive care unit; M = male; OR = operating room.

might be an early indirect indicator of undertriage. Unfortunately (or fortunately), the sample size was not large enough to detect significant morbidity/mortality associated with taxi transport.

Existing data on the accuracy of paramedic field triage are limited. Schmidt et al. published the first study that attempted to validate EMS transport protocols that were developed and gave EMS providers a choice of patient transport options.⁷ The triage protocols were developed by an "expert" panel and included eight cardinal conditions mandating transport. EMS personnel then assigned a convenience sample of 1,300 transport patients to one of four transport categories: EMS transport, transport by alternative means, referral to primary care provider within 24 hours, or treatment at the scene only. Thirteen of 140 patients (9%) judged by EMS not to need ambulance transport had events requiring hospital admission. Six of the 13 (46%) undertriaged patients had dementia or a psychiatric disorder.

Pointer et al. published a similar study with the addition of stroke and trauma activation to Schmidt and colleagues' cardinal conditions requiring transport.⁸ A blinded panel of emergency medicine (EM) physicians reviewed EMS triage decisions and the treatment patients received in the ED. Of 1,180 patients enrolled, EM physicians considered 113 cases (9.6%) undertriaged by EMS. The authors concluded that improvement in the transport guidelines would improve the performance of their prehospital personnel. They noted that in 32 cases the triage protocols were inadequate. Despite this, they concluded that "... even with the use of guidelines, paramedics were unable

to achieve an acceptable level of accuracy to correctly triage patients in the field compared with the emergency physicians."

Several studies have looked at the ability of paramedics to identify patients not requiring ED care. Silvestri et al. surveyed paramedics after transport to assess their patients' need for ED evaluation.⁹ Medics were asked to assign 313 enrolled patients into one of four categories: needs ED care, needs medical care within 24 hours, needs medical care in greater than 24 hours, or medical care not needed. Of the patients determined by paramedics not to need an ED evaluation, 32% (27) met outcome criteria indicating they would have been undertriaged by EMS. The authors commented that the EMS curriculum does not teach EMS providers to differentiate between patients requiring ED evaluation and those who do not.

It could be argued that hospital admission is not a reliable indicator of the need for emergent transport to the hospital. Patients with chronic medical conditions such as ESRD or HIV infection may require hospital admission simply because of the complexity of their underlying problems. While this may be true, it was indicative of the lack of knowledge the providers had regarding at least these medical conditions. Most EMS medical directors would consider the high admission rate a "red flag" and deem this unacceptable when considering a prehospital alternative transport option.

At present, it would be difficult to recommend the implementation of a prehospital alternative transport policy as designed in our study. Future studies might be able to improve the inclusion/exclusion criteria. The exclusion of ESRD and HIV/AIDS patients would

have significantly lowered our admission rates. One has to consider that as the list of exclusion criteria gets larger, it becomes more difficult to implement. A system could be designed that eliminates the taxi voucher system in favor of an EMS-staffed nonemergent transport vehicle. In order to eliminate the time during which the patient is "disconnected" from health care providers, the initial responding medic unit would need to stay with the patient until the secondary transport vehicle arrived. This might limit the effectiveness of such a program.

Limitations

Our study has several limitations. We were surprised at the low number of enrolled patients within the study time frame. This represented only a small fraction of patients transported by EMS during the time period. As paramedic participation was voluntary and only 21% of paramedics were eligible to enroll patients, there were likely many more patients transported during the study period who met the study inclusion criteria. The number enrolled may also reflect the caution that the investigators instilled in the medics during the orientation session. It also may reflect the limited number of paramedics screening subjects and/or the bulky patient consent process. IRB restrictions did not allow us to review or report hospital data for those subjects who were deemed eligible for the study by EMS though did not consent. The small number of enrolled subjects limits the ability to draw definitive conclusions regarding the future success of such initiatives.

Our exclusion criteria were also not validated and were drawn from a limited amount of literature and consensus opinions. Individual patient data at times were incomplete or unavailable. Several study providers enrolled only a few patients, while others enrolled larger numbers. Reported times by EMS, taxi dispatch, and 9-1-1 dispatch were not synchronized. We also failed to initially define a time frame for "emergent procedures" when evaluating outcome criteria.

CONCLUSIONS

This the first study that has attempted to prospectively validate an EMS-administered alternative transport policy. The ability of EMS to safely triage patients who activate the 9-1-1 system to an alternative transport mechanism remains an unproven concept. Our study adds to the concerns voiced in other published literature that EMS providers underestimate the potential severity of illness. Future attempts to implement such a program should proceed with caution.

We would like to thank Francis Counselman, MD, reviewer; Sue Morgan, administrative support; the Norfolk Fire-Rescue; and Sentara Hospitals-Norfolk for their helpful contributions.

References

1. Hjalte L, Suserud BO, Herlitz J, Karlberg I. Why are people without medical needs transported by ambulance? A study of indications for pre-hospital care. *Eur J Emerg Med.* 2007;4(3):151-6.
2. Rademaker AW, Powell G, Read JH. Inappropriate use and unmet need in paramedic and nonparamedic ambulance systems. *Ann Emerg Med.* 1987;16:553-6.
3. Chen JC, Bullard MJ, Liaw SJ. Ambulance use, misuse, and unmet needs in a developing emergency medical services system. *Eur J Emerg Med* 1996;3(2):73-8.
4. Knapp BJ, Kerns BL, Riley I, Powers JE. EMS-initiated refusal of transport: the current state of affairs. *Acad Emerg Med.* 2005;12:164-5.
5. American College of Emergency Physicians/National Association of EMS Physicians Joint Policy Statement: Alternative ambulance transportation and destination. *Ann Emerg Med.* 2008;52:594.
6. Mann NC. Defining research criteria to characterize medical necessity in emergency services: a consensus among experts at the Neely Conference. *Prehosp Emerg Care.* 2004;8:138-53.
7. Schmidt T, Atcheson R, Federiuk C, et al. Evaluation of protocols allowing emergency medical technicians to determine need for treatment and transport. *Acad Emerg Med.* 2000;7:663-9.
8. Pointer JE, Levitt MA, Young JC, Promes SB, Messana BJ, Ader ME. Can paramedics using guidelines accurately triage patients? *Ann Emerg Med.* 2001;38:268-77.
9. Silvestri S, Rothrock SG, Kennedy D, Ladde J, Bryant M, Pagan J. Can paramedics accurately identify patients who do not require emergency department care? *Prehosp Emerg Care.* 2002;6:387-90.