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# Ambulance Personnel Perceptions of Near Misses and Adverse Events in Pediatric Patients

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## Abstract

**Objective—**To identify Emergency Medical Services (EMS) provider perceptions of factors that may affect the occurrence, identification, reporting, and reduction of near misses and adverse events in the pediatric EMS patient.

**Methods—**This was a subgroup analysis of a qualitative study examining the nature of near misses and adverse events in EMS as it relates to pediatric prehospital care. Complimentary qualitative methods of focus groups, interviews, and anonymous event reporting were used to collect results and emerging themes were identified and assigned to specific analytic domains.

**Results—**Eleven anonymous event reports, 17 semi-structured interviews, and 2 focus groups identified 61 total events, of which 12 (20%) were child-related. Eight (66%) of those were characterized by participants as having resulted in no injury, 2 (16%) resulted in potential injury, and 2 (16%) involved an ultimate fatality. Three analytic domains were identified which included the following five themes: reporting is uncommon, blaming errors on others, provider stress/discomfort, errors of omission, and limited training. Among perceived causes of events, participants noted factors relating to management problems specific to pediatrics, problems with procedural skill performance, medication problems/calculation errors, improper equipment size, parental interference, and omission of treatment related to providers' discomfort with the patient's age. Few participants spoke about errors they had themselves committed; most discussions centered on errors participants observed being made by others.

**Conclusions—**It appears that adverse events and near misses in the pediatric EMS environment may go unreported in a large proportion of cases. Participants attributed the occurrence of errors to the stress and anxiety produced by a lack of familiarity with pediatric patients and to a reluctance to cause pain or potential harm, as well as to inadequate practical training and experience in caring for the pediatric population. Errors of omission, rather than those of commission, were perceived to predominate. This study provides a foundation on which to base additional studies of both qualitative

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and quantitative nature that will shed further light on the factors contributing to the occurrence, reporting, and mitigation of adverse events and near misses in the pediatric EMS setting.

### Keywords

Medical Error; Pediatrics; Emergency Medical Services; Ambulance

## INTRODUCTION

Since the release of Institute of Medicine reports on patient safety,[1,2] attention has been concentrated on error in the hospital setting.[3,4,5] Some attention, although less so, has been focused on the inpatient pediatric population.[6,7] Although approximately 2 million children are transported by emergency medical services (EMS) to United States emergency departments annually,[8] and although a review of EMS legal claims found that 6% of all claims related to pediatric care,9 little data describe the nature and causes of error in this patient population.

Some studies have examined errors in EMS. These studies have focused on specific problem areas such as recognizing clinical presentations of disease,[10] calculating medication dosages, [11] or performing procedures.[12,13] However, the methodology used in these studies may miss themes of error unique to specific subpopulations such as children. A previous qualitative study performed by this research group examined EMS provider perceptions of the nature of error in adults and found that adverse events and near-misses were common among EMS providers, that the EMS culture discouraged the sharing of that information, and errors were often attributed to system issues and inadequacies of other provider groups.[14]

Little is therefore known about how EMS providers perceive how adverse events and near misses affect the care of pediatric patients. A clearer understanding of the hazards of care within this population would be of benefit in identifying ways we might minimize them, particularly given the high published proportion of EMS providers who report having been involved in a medical error of some kind.[15] EMS providers are known to have diminished levels of comfort in managing pediatric cases, an effect that may be related to low levels of actual experience and specialized training in pediatric care.[16,17,18] It is unknown whether and to what degree provider discomfort, lack of exposure, and lack of training may contribute to medical error in the care of pediatric patients in the EMS setting.

In this study we sought to identify, using qualitative methods, EMS provider perceptions of what specific factors may affect the occurrence, identification, reporting, and reduction of near misses and adverse events in the pediatric EMS patient.

## METHODS

### Study Design

This study was a pre-planned subgroup analysis of a qualitative study examining the nature of medical error in EMS.[14] The details of the study's data collection methods are described in complete detail in a previous publication.[14] For this study, we specifically analyzed factors related to pediatric prehospital care. The University of Rochester Research Subjects Review Board approved this study.

### Study Setting and Population

We recruited study participants that were EMS providers from one of 40 volunteer and career EMS agencies in a two-county region in Western New York. Since this study focused on the perception of EMS providers themselves, we did not sample other providers such as emergency department staff or medical directors. The region includes a population of 795,000 dispersed

over urban, suburban, and rural areas and receives 120,000 requests for service annually, approximately 12% (14,400) involving children. Pediatric patients from the urban and suburban areas are usually transported to one of two hospital emergency departments with specific pediatric capabilities. Pediatric patients from the rural regions are sometimes taken to the community hospitals.

## Study Protocol

Complementary qualitative data collection methods of an Event Reporting System, Semi-Structured Interviews, and Focus Groups were used to ensure capture of important themes that may be missed using traditional quantitative techniques.[19,20] Triangulation of data sources in this way contributes to the internal validity of the data set as we compare findings from each source and investigate any discrepant information.[21,22] By including these different qualitative data collection methods, they would complement each other to capture the important themes and broadly sample the EMS providers' experiences which would move beyond the typical quantitative techniques in which the investigators define the question or theme requiring study.

A research team trained in qualitative techniques (composed of a qualitative research expert, three EMS physicians, two graduate students, and an undergraduate student) designed and piloted the interview and focus group guides. As the pediatric-specific subanalysis was pre-planned, specific pediatric care related questions were included. Participants of both Semi-Structured Interviews and Focus Groups received incentives for participation. The events described from each data collection method were reviewed prior to analysis to ensure all identifying information had been redacted.

We used the following standard definitions when analyzing responses: [23,24]

-*Adverse events* were defined as injuries caused by medical management rather than by the underlying condition of the patient.

-*Near-misses* were defined as incidents that did not result in harm to the patient, but that had the potential to do so.

-*Errors* were defined as failures of a planned action to be completed as intended or as the use of a wrong plan to achieve an aim.

## Event Reporting System

The first qualitative data collection method consisted of an anonymous event reporting system. EMS providers could access this system on-line through a link on a local EMS web-based discussion group over a 6-month period. We advertised this link aggressively, including posting fliers at local EMS agencies, discussion boards, and hospitals. The advertising indicated that anonymous reports were being requested "for a research study examining adverse events in EMS." Study personnel received electronic reports which were collated and combined in the final analysis. These reports included the following information: event classification (near-miss or adverse event), reporter level of EMT certification, setting of incident (career or volunteer agency), impact on patient, description of the event, and response and repercussions.

## Semi-Structured Interviews

Semi-structured individual interviews provided the second data collection method. EMS providers were recruited by posting fliers at local EMS agencies. We used a purposive sampling method whereby the study team guided the sampling to identify a broad range of individuals, specifically EMS providers at all levels, who could report on a variety of experiences. Interviews were conducted until redundancy of themes was reached. The EMS professionals interviewed included males and females, volunteer and paid services, had certifications ranging

from EMT Basic Life Support to Paramedic, and had a varied background ranging from recently trained EMS provider to experienced paramedics.

Interviews were performed by research assistants with no EMS affiliation or medical training to enhance subject comfort. This approach was chosen for two reasons. First, since this is an assessment of EMS provider perceptions, we wanted to eliminate the possibility of any bias that might be associated with an interviewer who has professional knowledge of experience with EMS providers. Second, many of the investigators were EMS medical directors, and we were concerned that this role might create inhibitions to sharing sensitive information. The research assistants followed a semi-structured guide (Appendix A) to ensure consistency in interviews.[19] Probing questions were used to gather detail and to further explore responses related to child health emergencies.

### Focus Groups

We conducted two focus groups with a total of 23 participants recruited from a new paramedic training class and a paramedic refresher class. The former were required to have at least one year experience as a basic EMT, and the latter implies at least three years experience as a paramedic. The sessions were moderated by a research assistant with no EMS affiliation or medical training to enhance subject comfort. The research assistant followed a standardized interview question guide (Appendix B).[19] A second research assistant, also trained in qualitative methods, took field notes which were later transcribed. Specific adverse event reports were not solicited due to the non-confidential nature of the focus group however probing and follow-up questions were used to gather detail and to explore responses.

### Data Analysis

For the purposes of this study, qualitative data involving patients 18 years of age and younger were extracted and prepared for an independent qualitative analysis. The resulting pediatric-related data were electronically coded into major and minor themes identified through iterative review by the research team, using a grounded theory approach. Disagreements were resolved by consensus. Major themes were those involving classification of the event as near miss, adverse event, or medical error. Minor themes were those that characterized events as general statements, specific examples, responses or solutions to events, or interactions between providers. These themes were then sorted into analytic domains.

## RESULTS

Data collection for the master study included 11 anonymous web-based reports, 17 semi-structured interviews, and 2 focus groups with a total of 23 participants. This purposive sample of interviews resulted in 73% with Advanced Life Support training, 40% with their primary EMS affiliation described as volunteer, and 87% male. A total of 61 specific events were described through all three methods and of these, 12 (20%) were child specific.

Of the 12 events identified by our participants as child-related, 8 were characterized by participants as having resulted in no injury, 2 in potential injury, and 2 in death. Among identified causes of events, participants noted factors relating to management problems specific to pediatrics (5), problems with procedural skill performance (2), medication problems/ calculation errors (2), improper equipment size (1), parental interference (1), and omission of treatment related to providers' discomfort with the patient's age (1).

General themes and themes unique to the care of pediatric patients emerged from both observations about specific events as well as from general comments made about children (Table). Participants expressed a great deal of discomfort with pediatric patients in general,

and specifically with what they reported as inadequate training and clinical experience in pediatrics. Some participants also desired more training and experience with clinical procedures in children. Participants identified both their discomfort with pediatric patients, and their lack of training and experience, as significant factors contributing to errors. In the words of one participant "*Pediatrics is a problem.*"

### Analytic Domain 1: Event Reporting

**Reporting is Uncommon—**Reporting of specific events in the entire study group as described by our participants was uncommon. None of the events described by our participants that resulted in potential injury or a fatality had been previously reported; of the 3 events that participants recalled reporting, none resulted in potential injury or involved a fatality. Additionally, none of the events were reported to patients or families. One participant stated "*the errors you see in pediatrics are not as obvious and don't get reported anywhere*." The only explanations given for a lack of reporting was a feeling that the outcome was not affected even though an error had occurred, and a general concern for job security. One of the participants summarized a typical approach to error management by saying: "*What happens in the back [of the ambulance] stays in the back.*"

**Blaming Errors on Others—**Another important general theme was the focus on errors committed by others. Most events described by our participants were described in terms of actions or omissions by others. Rarely were errors by EMS providers disclosed, and to the contrary, errors by non-EMS providers (physicians and nurses primarily) were often reported. One investigator noted during an interview that "*the participant talked a lot about how good his agency is and how they never make mistakes.*"

### Analytic Domain 2: Children are Different

**Provider Stress / Discomfort—**Participants reported that caring for an ill or injured child evokes powerful emotional responses among EMS providers. Statements such as "*Nobody likes to see a child that is seriously injured,*" "*A lot of people get nervous with pediatrics,*" or "*A pediatric patient is so much different than an adult*" were common. These emotional reactions produced substantial discomfort, anxiety, and stress in our participants' reports.

**Errors of Omission—**Errors of omission were especially prominent among comments from participants. They reported that, when working with children, they were more inclined to omit procedures that might be considered standard in adult patients. For example, one participant reported "*a lot of times I find paramedics are almost too hesitant to do anything in pediatrics, which I think is a lack of comfort or a lack of experience*." Participants also noted their desire to avoid pain in children as an explanation for errors of omission. The frequency of close parental presence during evaluation and treatment, and the parents' wishes regarding their children created stress and also led to errors of omission. The baseline provider stress and discomfort when caring for children, the anatomical and physiological differences between adults and children, and the parental presence all were felt to contribute to omission of interventions.

### Analytic Domain 3: Lack of Pediatric-Specific Training

**Limited Training—**Participants attributed their discomfort and lack of familiarity with biological differences in children to being less directly involved during their training in the care of pediatric patients. This was reported even during specific pediatric rotations, during which participants perceived that other trainees such as medical and nursing students and residents were given priority in their involvement in direct patient care, procedures, and decision-making. Participants related the resulting sense of insecurity regarding pediatric

patients to the tendency to omit diagnostic and therapeutic interventions, resulting in the preponderance of errors of omission over those of commission in their experiences. Several participants suggested that increasing the exposure to pediatric clinical environments (and actual involvement when present) would lead to increased comfort and potentially reduced errors.

## DISCUSSION

Despite the fact that children comprise up to one-third of patients who visit Emergency Departments,[8] there have been few previous studies characterizing the nature and potential causes of errors in the prehospital care of children by EMS providers. EMS errors are recognized as an important part of the overall burden of error in emergency care, and the study of error in EMS in general has begun to produce intriguing and important results.[25,26,27] Our study extends those results with a particular focus on the special nature of errors as they arise during the care of the pediatric patient.

Consistent with previous reports, our participants indicated that the overwhelming majority of adverse events and near misses remain unreported,[15] as most of the events identified in our study had not been previously reported. It seems likely that our data collection strategy, including the anonymous reporting system and the provision of explicit definitions and classification of errors, contributed to increased recognition and a relative willingness to discuss errors in a confidential and "blame free" setting. Future study that might address these barriers include educational programs to address the importance of recognizing and characterizing errors, adverse events, and near misses, and adapting reporting systems that EMS providers perceive as easy to use and useful to their practice.

In the EMS system in which we conducted this study, approximately 12% of annual encounters involve children. We were therefore struck by the relatively larger proportion (20%) of child-related events recounted by participants in this study. While this apparent disproportion may be the result of recall bias, this finding is likely to indicate the relative importance placed on the events by the participants. Our participants' own observations about their general discomfort with the care of children as patients tend to support this interpretation, and provider discomfort has been identified as a source of medical error in pediatric emergency care in hospitals.[6]

Our participants' focus on their perceptions of ways in which pediatric populations differ from adults was also striking. A positive interpretation of this finding is that the message that "children are not just little adults" has been successfully incorporated by our participant group. Perhaps as an unintended consequence, however, this exaggerated sense of difference may have contributed to the predominance of errors of omission, in which participants reported a hesitancy to perform procedures that would be standard in adults, attributing their reluctance to their discomfort with the "foreign" world of pediatrics.

An additional area in which our participants described substantial differences from their experiences with adults was the close proximity of parents or other family members, something they encountered much less frequently in the adult population. Participants who felt "hovered over," or under perceived scrutiny were potentially likely to omit procedures that might be painful or those which may not have first attempt success.

Our participants also clearly identified inadequate training and practical experience with pediatric patients as substantial factors in creating and maintaining their lack of confidence in caring for children. Insufficient training and experience was one of the many foci of the American Academy of Pediatrics report on patient safety in Emergency Departments.[28] It seems probable that the appropriate additional sensitivity demonstrated in EDs by staff caring

for children may have the unintended consequence of restricting training opportunities for EMS providers, who are frequently present only for short periods in most hospital settings.

The prominence of participant focus on errors of omission in our study is congruent with previous quantitative and qualitative reports,[29,30,31,32,33,34,35] though most of the previous literature focuses on medication errors and on the inpatient population. It seems probable that the high rate of actual occurrence of omission errors and their low rate of reporting can be attributed to the fact errors of omission are less obvious than those of commission, especially in "near miss" situations in which there is no adverse outcome.

## LIMITATIONS

Results reported here represent a portion of a larger qualitative study of error in the general EMS population, and as such are subject to certain limitations. While we did attain redundancy of themes, the relatively small number of participants leaves open the possibility that other important themes might have emerged had we expanded our sampling. Similarly, a study in which the subject of error in pediatric EMS care was the primary objective might have elicited more, or potentially different, themes. As with any qualitative study, no conclusions should be drawn about actual incidence of events in the population, as methods are intended to be hypothesis generating, not to produce generalizable data. Finally, the prominence of discussion of events committed by others rather than by participants themselves suggests the possibility that participants did not feel completely comfortable in disclosing errors in this study, despite assurances of confidentiality and the lack of provider-identifying data.

### FUTURE DIRECTIONS

This study has brought forth a number of concepts that relate to the care of pediatric patients in the prehospital environment. The next step should be using mixed methods to better clarify, quantify, and delineate these issues to allow the development of systems-level initiatives to address the concerns raised regarding error in the pediatric EMS population.

## CONCLUSIONS

Adverse events and near misses in the pediatric EMS environment may go unreported in a large proportion of cases. Participants in this qualitative study attributed the occurrence of errors to the stress and anxiety produced by a lack of familiarity with children as patients and to a reluctance to cause pain or potential harm, as well as to inadequate practical training and experience in caring for the pediatric population, however the study was not designed to validate these perceptions. Errors of omission, rather than those of commission, were perceived to be the most likely outcome of the interaction of these factors. Participants expressed a strong desire for increased training in both the biomedical and the psychosocial approaches to caring for children, and for increased opportunities for practical involvement during training in order to reduce future error.

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## Table

Domains, Themes and Representative Quotations

| Domain | Theme | Illustrative Quotation |
|---|---|---|
| Error Reporting | Reporting is uncommon | "What happens in the back [of the ambulance] stays in the back." |
| | | "You don't want to rat on friends and you want to save your own ass as well." |
| | | "Some ambulance corps are so small that no one gets fired, so reporting errors doesn't matter." |
| | Blaming errors on others | "Hypoglycemic child, medical control ordered adult dose, EMS corrected medical control about pediatric dose." |
| | | "Nurse did not listen to EMS provider and pulled out the [pacing] plug and placed it into theirs [which was not compatible] and the patient died." |
| | | "Missing drug box because the previous crew forgot. It was not noticed because there were no calls where the box was needed." |
| Children are Different | Provider Stress/Discomfort | "A lot of people get nervous with pediatrics" |
| | | "A pediatric patient is so much different than an adult" |
| | | "EMS often see doctors and nurses arguing about Peds patients in the hospital, so they are obviously not comfortable or there are different ways to treat, and those are the people who are suppose to specialize in these things." |
| | | "Providers are scared of kids, don't like to see them. They often kick it up a notch – adrenaline rushes. Plus they don't have any experience on peds calls – maybe like 1 out of 15 cases are kids?" |
| | | "Nobody likes to see a child that is seriously injured" |
| | | "It is absolutely more emotional situation no matter whether it is an arrest call or trouble breathing. Any kind of pediatric call compared to the same call for an adult." |
| | | "Pediatric patient at MVA, pressure by fire chief to work up child. Would have called it on scene. Patient not salvageable." |
| | Errors of Omission | "A lot of times I find paramedics are almost too hesitant to do anything in pediatrics, which I think is a lack of comfort or a lack of experience." |
| | | "Pediatric patient (3 y.o. male) call dispatched as general illness/patient would not stop crying. BLS dispatched, transported patient to hospital with little actual care. Patient was found to have bilateral femur and humerus fractures consistent with abuse, and was transported to another hospital for treatment. EMS providers did not do a complete physical exam or splint any of the limbs during transport." |
| | | "The ALS medic was scared of kids (this one was 15 month old) and did not want to put in IV." |
| | | "A 5-year old was hit by a car at 30 MPH, thrown 20 feet, landed on her head. They were on their way in and not going to start an IV because her dad didn't want them too." |
| | | "Policy is parents ride along. This is not the best thing, it can interfere with treatment, parent often hysterical." |
| Lack of Pediatric Training | Limited training | "The paramedic [students] here, they come into our ED and the nurses don't have them in there doing IV's" |
| | | "My Pediatric ED time was, I wouldn't say limited, but I didn't get a chance to do a lot." |
| | | "It is hard to know what is normal in pediatric patients if you don't have kids of your own, and if you don't know what normal looks like it is hard to tell what is abnormal." |
| | | "People are hesitant to treat kids aggressively if they have to because, while we do get PALS and stuff like that, our pediatric airway, and especially our pediatric phlebotomy is very limited." |
| | | "We have adult phlebotomy rotations in the paramedic class where that's what you do, you just go around and do IV's and blood draws and stuff like that. But they don't have one like that for pediatrics." |