

## ORIGINAL RESEARCH

# Pediatric emergency care capabilities of Indian Health Service emergency medical service agencies serving American Indians/Alaska Natives in rural and frontier areas

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## ABSTRACT

**Introduction:** In the USA, the emergency medical services (EMS) system is vital for American Indians and Alaska Natives, who are disproportionately burdened by injuries and diseases and often live in rural areas geographically far from hospitals. In rural areas, where significant health disparities exist, EMS is often a primary source of healthcare providing a safety net for uninsured individuals or families who otherwise lack access to health-related services. EMS is frequently the first entry point for children and their families into the healthcare system. The Indian Health Service (IHS) supports the federally funded, tribally operated EMS agencies to help meet the affiliated American Indian and Alaska Natives' pre-hospital needs. While periodic assessments of state EMS agencies capabilities to care for children occur, it appears a systematic assessment of IHS EMS agencies in regards to children had not been previously conducted.

**Methods:** A consensus process, involving stakeholders, was used to identify topic areas for a survey for assessing the pediatric capabilities of IHS EMS. The survey was sent to 75 of 88 IHS EMS agency contacts.

**Results:** Sixty-one agencies (81%) responded. Nine agencies (15%) did not have a medical director. Agencies without a medical director were less likely to report the availability of online ( $p=0.1$ ) or offline ( $p<0.01$ ) pediatric medical direction. Half (51%) of the agencies had a mass casualties plan; however, 29% reported responding to a mass casualty incident, involving a large number of



pediatric patients, that overwhelmed their service. Most agencies were well integrated with their state EMS system with almost all (95%) collecting EMS patient care data and 47% using national standard data elements.

**Conclusions:** In some areas, IHS EMS agencies did not have the infrastructure to treat pediatric patients during day-to-day operations as well as disasters. Similar to operational challenges faced by rural EMS agencies, the IHS agencies lacked a medical director, were unable to provide pediatric continuing education, and were overwhelmed during mass casualty incidents. Moreover, the overall ratio of IHS EMS to service population is almost double that for other EMS agencies. In other areas, agencies were well integrated with their state EMS system. One possible solution to increase capabilities to care for pediatric patients is combining and sharing of common resources including medical directors with their state EMS systems and authorities.

**Key words:** EMS agencies, Indian Health Service, pediatric, rural children, survey.

## Introduction

In the USA, the emergency medical services (EMS) system is an important part of the overall healthcare system<sup>1,2</sup>. EMS responds to more than 15 million emergency events annually with approximately 10% of those for children under 18 years<sup>3</sup>. EMS comprises a combination of state, local, and private-public EMS agencies<sup>1,4</sup>. While the primary focus of EMS is the timely pre-hospital treatment and transport of individuals with acute medical and trauma needs, EMS frequently includes prevention, routine medical treatment for chronic illnesses, patient rehabilitation, and initial health care regardless of ability to pay<sup>1,5</sup>. In rural areas, where significant health disparities exist, EMS is often a primary source of health care for children and their families. The rural health disparity is further magnified for children who are a vulnerable population. Often, EMS serves as a safety net for families that lack insurance or access to other health-related services<sup>1</sup>. The importance of rural EMS as a primary healthcare service has further increased due to dwindling resources and closure of many rural hospitals<sup>1</sup>.

EMS, like other healthcare services, is vital for American Indians and Alaska Natives, who are disproportionately burdened by injuries and diseases and often live in rural areas geographically far from hospitals<sup>6-10</sup>. EMS is frequently the first entry point for American Indian and Alaskan Native children and their families into the healthcare system.

However, more than 6 million people in the USA who are American Indian and Alaska Natives (tribal and non-tribal affiliations)<sup>11</sup> are often not represented in EMS and other healthcare systems.

Pre-hospital emergency care for the federally recognized tribal population represents a complex system of federal, tribal, state (non-tribal), and private (non-tribal) EMS agencies. The Indian Health Service (IHS) supports the federally funded, tribally operated EMS agencies to help meet the affiliated American Indian and Alaska Natives' pre-hospital healthcare needs (hereafter referred to as IHS EMS agencies)<sup>9,12</sup>. The federally supported agencies serve approximately 57% (1.9 million) of the total affiliated tribal population, which are located in 25 states<sup>12,13</sup>. Approximately 500 000 (28%) of the IHS service population are American Indian and Alaska Native children under 18 years<sup>11</sup>.

Past reports show that IHS EMS agencies often report challenges to providing care similar to those of rural and frontier areas including geographic isolation, lack of qualified physicians to serve as medical directors, insufficient staffing of EMS providers, substandard road conditions, inadequate landing areas for air transport, and radio communication dead zones<sup>2,4,13</sup>. The impact of these challenges may be amplified for children and families located in rural areas<sup>10,14,15</sup>. For example children in rural areas who are transported for trauma have worse outcomes than those from urban areas, due in part to longer transport times<sup>14</sup>. In addition, children



residing in rural areas have increased exposure to dangerous work- and recreational-related machinery resulting in unique pediatric emergency medical needs<sup>10</sup>. However, information regarding the IHS agencies' capabilities to care for children is lacking.

The first steps to improve capability are to assess the gaps within a system. While periodic assessments of state EMS agencies capabilities to care for children occur<sup>16-18</sup>, a systematic assessment of IHS EMS agencies in regards to children does not appear to have been previously conducted. The purpose of this study was to understand the infrastructure of the IHS EMS agencies to care for children.

## Methods

### *Survey development*

During 2006, a consensus process, involving stakeholders, was used to identify topic areas that were considered essential for assessing pediatric capability in both day-to-day and disaster situations and to develop a survey to assess IHS EMS. The stakeholders were experts in the fields of pediatric emergency medicine, EMS, nursing, trauma, maternal and child health, and emergency preparedness. The survey comprised 42 open- and 47 closed-ended questions designed to assess the areas of availability of pediatric medical direction, staffing and pediatric training needs, availability of pediatric equipment, disaster preparedness and response, and EMS system data collection and integration.

When available, the stakeholder group used national guidelines or federal measures to assess the topic areas. For example, the federal EMS for Children Program developed 10 performance measures to help states assess their capability to care for children in the pre-hospital setting<sup>19</sup>. Definitions for the EMS for Children performance measures regarding online and offline pediatric medical direction and availability of pediatric equipment on ambulances were used based on the national guidelines<sup>19,20</sup>. The American Academy of Pediatrics (AAP) guidelines for preparedness were used for

the preparedness section<sup>21</sup>. The survey also included questions regarding compliance to both the National Incident Management System (NIMS) or the National EMS Information System (NEMSIS) to further assess disaster preparedness, patient care data collection, and level of integration with the state in which the agency operates.

Respondent agencies were classified as basic life support (BLS) or advanced life support (ALS) based on the highest level of care they were reported to provide. For agencies that operate both types of ambulances, their BLS ambulances' equipment was reported separately from that of their ALS ambulances. When completing the survey, respondents used their own definition of the ages constituting a pediatric patient. Unless specified, respondents were asked to report for the previous year.

The survey was available to potential respondents in web-based and paper formats. The web-based format was tested prior to launching to ensure that all question conditions and branches functioned correctly.

### *Study population*

Most of the IHS EMS agencies are located on or near reservations and in rural and frontier communities, primarily located in western states where their service population lives<sup>9,22</sup>. At the time of the survey, IHS was divided into 11 health service areas covering the 48 contiguous continental states. The health service areas contained 88 HIS EMS agencies located in 25 states<sup>23</sup>; non-federally funded tribal EMS agencies were not included. The number of agencies located in each health service area ranged from 1 to 14<sup>23</sup>. The survey was sent to 75 (85%) of the 88 agency contacts listed on the IHS program directory<sup>23</sup> because a contact person, station of operation, or EMS providers for the remaining 13 agencies could not be identified by IHS personnel.

### *Implementation and analysis*

A multi-contact approach was used to ensure an optimal response rate. IHS personnel telephoned all of the agency



contacts to notify them of the purpose of the survey and the launch date. Agency contacts were invited to complete the survey via an email that contained a link and a PDF attachment or by a paper survey mailed to them with return instructions. Data collection occurred from 2 August to 28 December 2007. During the data collection period, up to four email reminders were sent to non-respondents. As a final contact, IHS personnel telephoned the remaining non-respondents several weeks after the last email reminder was sent. Respondents who completed the survey were able to identify a member among their EMS providers to receive a scholarship to attend the 2008 National Native American EMS Association conference.

Data were analyzed using Excel and Statistical Analysis Software v9.2 (SAS; <http://www.sas.com>) and summarized using descriptive statistics. Fisher's exact test was used to examine the significance of associations between agencies with and without a medical director regarding the availability of pediatric medical direction, the need for pediatric continuing education, and requirements for paramedic recertification.

## *Ethics approval*

The survey was considered a departmental quality improvement initiative and considered exempt from institutional review by the IHS.

## Results

Respondents from 61 of the 75 study agencies (81%) completed the survey. Two respondent agencies were excluded from analysis as they reported having neither ambulances nor EMS providers, resulting in participation by 59 agencies. Ten of the 11 IHS healthcare service areas were represented in the final analysis; the one area not represented contained one IHS EMS agency. Nearly all of the agencies ( $n=55$ ; 93%) defined a pediatric patient as starting at 0–1 years. The end of the pediatric age range was 19 years with

over half of the agencies (56%) reporting 18 years as the cut-off age.

## *Demographics*

Respondent agencies represented 266 ambulances and 1008 part- and full-time emergency medical technicians (EMTs). Table 1 shows that most of the agencies (66%) operated as stand-alone and 10% were associated with a hospital. The highest level of care for over half (58%) of the agencies was ALS. The majority (71%) of the EMS providers were full-time.

The 59 agencies accounted for 46 761 annual emergency responses and 9,981 annual inter-facility transports. Pediatric emergency responses constituted 15% ( $n=7190$ ) of the total 46 761 emergency responses with an average of 180 pediatric responses per agency per year. Almost half ( $n=26$ ; 44%) of the agencies averaged less than one pediatric emergency response per week.

## *Pediatric capabilities*

**Medical director/direction:** Nine respondents (15%) reported their EMS agency did not have a medical director. Almost all (94%) ALS agencies had a medical director compared to 80% of BLS agencies. The medical directors were located at several different types of facilities: local hospital/clinic (36%), tribal (32%), and at IHS (26%).

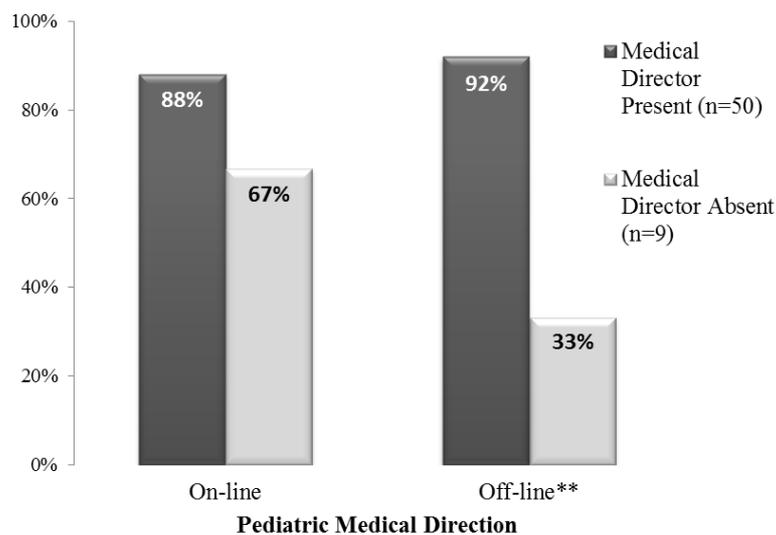
More than 80% of the agencies reported availability of online and/or offline pediatric medical direction when treating a pediatric patient. Figure 1 shows that agencies with a medical director were more likely to report availability of online pediatric medical direction ( $p=0.1$ ) and offline pediatric medical direction ( $p<0.01$ ) than agencies without one. The reasons provided by respondents for not having online pediatric medical direction available included remoteness/communication issues, lack of infrastructure, and absence of a medical director.



**Table 1: Indian Health Service Emergency Medical Service agency and provider demographic information (N=59)**

EMS agency and provider demographic	n	%†
Agency type (n=59)		
Stand-alone	39	66%
Fire-based	14	24%
Hospital-based	6	10%
Agency highest certification (n=59)		
Advanced life support (ALS)	34	58%
EMS provider type (n=1008)		
EMT-B	528	52% (66%)
EMT-I	183	18% (79%)
EMT-P	297	30% (75%)

† Percentages in brackets indicate percentage of EMS providers that are full-time.  
 EMS, emergency medical services. EMT, emergency medical technician. B, basic, I, intermediate, P, paramedic.



**Figure 1: Comparison of agencies with and without a medical director regarding availability of pediatric medical direction (N=59; \*\*p<0.01).**

**Pediatric continuing education:** The majority of respondents (83%) reported their EMS providers needed pediatric continuing education for certification and recertification. Respondents from 14 (24%) agencies reported that all (100%) of their EMS providers received pediatric continuation education training while six respondents reported none (0%) of their providers had

received pediatric training. One of the respondents, who reported that none of their EMS staff had received this training, also reported their agency required 4 hours of pediatric continuing education for recertification.

For training requirements, 68% of respondents reported their EMS providers needed pediatric education for pre-hospital



professionals (PEPP) and 64% needed emergency pediatric care (EPC), but reported their agency was unable to provide either. Figure 2 shows EMS agencies with a medical director were less likely to report needing pediatric continuing education for their providers' certification and recertification compared to agencies without a medical director. There was no statistical significance between agencies with a medical director and those without one in regards to the need for pediatric continuing education ( $p=0.3$ ).

In addition, agencies with a medical director (86%) were more likely to require pediatric-specific training for recertification of their paramedics than agencies without a medical director (75%), but this was not statistically significant ( $p=0.5$ ). Of the 40 agencies with paramedics on staff, 15% reported their agency did not require any pediatric-specific continuing education for recertification of paramedics.

**Pediatric equipment:** Respondents were asked to report the presence of equipment in reference to the national guidelines for pediatric equipment on ambulances. All of the agencies carried at least a proportion of the recommended pediatric equipment on at least some of their ambulances. More than a quarter ( $n=11$ ; 28%) of agencies with BLS ambulances carried all (100%) of the BLS-recommended pediatric equipment on all of their ambulances. For agencies with ALS ambulances, 30% ( $n=10$ ) carried all the ALS-recommended pediatric equipment on all their ambulances. Most of the least-often carried pieces of equipment on both BLS and ALS ambulances tended to be items related to the treatment of younger and smaller pediatric patients. Most of the respondents (97%) reported their agency operated in a state with specific requirements or regulations for ambulance equipment.

### *Disaster preparedness*

Half ( $n=30$ , 51%) of the agencies reported having a mass casualties plan. Of the 30 agencies with a mass casualties plan, 15 had participated in a pediatric-focused mass casualties drill within 2 years of the survey. A quarter ( $n=17$ ; 29%) of all agencies had responded to a mass casualty incident involving a large number of pediatric patients that overwhelmed their

service and 8 of the 17 agencies reported they did not have enough pediatric equipment available when they responded to the incident. There were 51 (86%) respondents who reported their agency was compliant with NIMS.

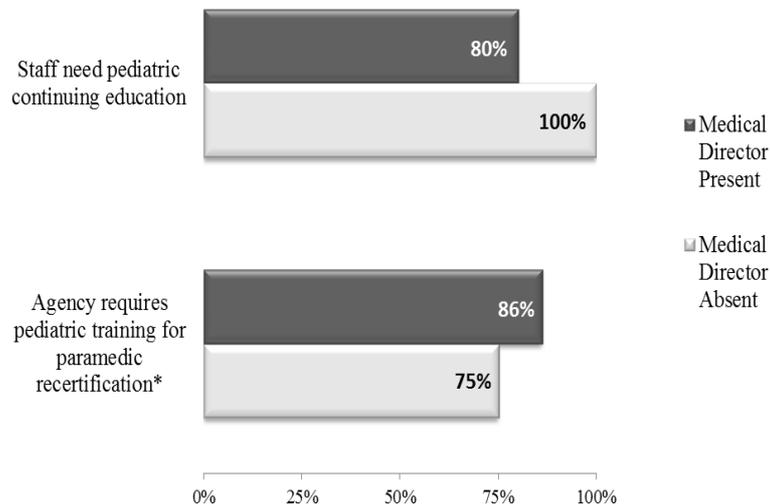
### *EMS system data collection and integration*

Almost all of the agencies ( $n=56$ , 95%) collect EMS patient care data. A little more than a third (36%) of these agencies employed a commercial or state database to store patient care data. An additional 10 agencies used spreadsheets or relational databases. Almost half (48%) of the agencies that collected patient care data used nationally recognized standard data elements (ie NEMSIS).

Almost three-quarters ( $n=43$ , 73%) of all agencies submitted patient care data to their state EMS authority. Of the agencies that submitted data, 56% ( $n=24$ ) did so electronically. Sixteen (37%) agencies submitted data to their state EMS authority by mailing paper copies; the remaining 7% of respondents were unsure of the submission format their agency utilized.

## Discussion

The focus of this study was to assess the gaps of the federally funded IHS EMS agencies' ability to care for American Indian/Alaska Native children. In the USA, American Indian and Alaska Natives represent 6.2 million people (tribal and non-tribal affiliations)<sup>11</sup>. Often, American Indian and Alaska Natives may not be represented in EMS systems of care for which they interface. The representation challenges are in part due to the sovereign nature of each tribe for which there are 566 federally recognized tribes<sup>11</sup>. As sovereign entities, each tribe has its own governance and systems, which may add complexity to accessing non-tribal care. Many tribes live in remote or frontier areas that compound their inclusion in systems of care. Compared to non-tribal communities, American Indian and Alaska Native children represent a large proportion of the tribal communities<sup>11</sup> and need care that addresses their differences of anatomy, physiology, and development from adults.



**Figure 2: Comparison of Indian Health Service Emergency Medical Service agencies with and without a medical director for pediatric continuing education needs and requirements for paramedic recertification (N=59; 19 agencies did not have paramedics).**

The study has mixed findings regarding the ability of IHS EMS agencies to care for children. Some IHS agencies lacked a medical director, were unable to provide pediatric continuing education for their EMS providers, and were overwhelmed during mass casualty incidents involving pediatric patients. In other areas, the agencies were well integrated with their state EMS system and most submitted patient care data to their state EMS authority.

Medical direction is considered a key component of a functioning EMS agency<sup>10,24,25</sup>, yet several respondents reported their agency did not have a medical director, which has repercussions for all aspects of EMS operations. For example, the results indicate that agencies without a medical director were less likely to report the availability of on- or offline pediatric medical direction and more likely to report the need for continuing education in pediatrics than agencies with a medical director. Slifkin et al<sup>24</sup> report several barriers for agencies recruiting medical directors in rural areas, including qualified individuals not wanting to devote the time

required, lack of monetary compensation for time, liability concerns, and turnover. Generally, EMS medical directors are board-certified emergency physicians<sup>24</sup>. In rural areas such as those operated by IHS agencies, board-certified emergency physicians may not be available. A recent policy statement by the AAP proposes the use of pediatricians in rural areas to supplant many of the roles a medical director traditionally fulfills for EMS agencies<sup>10</sup>.

While this study's findings are similar to the EMS for Children national indicators regarding the availability of on- and offline pediatric medical direction<sup>26</sup>, what is different is the geographic distances the IHS EMS agencies cover<sup>9</sup>. Moreover, the overall ratio of IHS EMS to service population is one agency per 21 000 affiliated tribal members and one agency per 5700 children under the age of 18 years. This overall ratio is almost double that of the one agency per 13 500 people reported for EMS agencies in the USA<sup>26,27</sup>. In addition, based on respondent descriptions, the IHS EMS agencies are small, with a limited number of EMS providers,



who are mostly trained as basic EMTs. Medical direction is crucial in service areas where the EMS providers are more likely to be certified as EMT-Basics, who require more medical oversight than paramedics<sup>24</sup>. A recent study showed that EMT-Basics employed at rural agencies with medical director involvement are more likely than those at agencies without a medical director to have the authority for interventions usually considered out of their scope of practice<sup>28</sup>.

The majority of EMS providers in the USA are located in rural areas similar to IHS EMS<sup>10,29</sup>. EMS agencies located in rural and frontier areas are different from their urban counterparts in critical ways, primarily in regards to operational challenges<sup>2,9</sup>. In the rural IHS service areas, where significant health disparities exist, EMS is often a primary source of health care<sup>10</sup>. The importance of rural EMS as a primary healthcare service has further increased due to dwindling resources and closure of many rural hospitals<sup>1</sup>. The extended response and transport times to definitive care in rural areas necessitates EMT-Basics having a broader scope of practice than their urban counterparts, for improved patient outcome<sup>28</sup>.

Another important finding was that agencies without a medical director often reported that their EMS providers needed pediatric continuing education. Continuing education in pediatrics is important for EMS providers to maintain both skills and confidence when treating children<sup>3,19,26</sup>. Approximately 15% of emergency responses among the IHS agencies were for pediatric patients. While this figure is slightly higher than the national average of 10%<sup>3</sup>, it is still low. Almost half of the agencies reported responding to less than one pediatric emergency response per week. The infrequency of pediatric-related emergency responses highlights the need for pediatric continuing education among providers in this study and in the USA. The geographically far definitive emergency care for American Indian/Alaska Natives children in rural areas further underscores the importance of continuing education for IHS EMS providers servicing this population<sup>9,10</sup>.

Children are an important focus for improving disaster planning<sup>1,30-32</sup> and are more vulnerable than adults during disasters<sup>1,15,31,33</sup>, making it vital for EMS to include pediatric patients in mass casualty drills<sup>1,10</sup>. Unfortunately, several agencies reported responding to a mass casualty incident that overwhelmed their service and not having enough pediatric equipment when they responded to the incident. Having most of the recommended pediatric equipment or a mass casualty plan does not imply an agency's providers are prepared to treat children during a disaster. The geographic isolation, lack of qualified medical directors, and insufficient staffing of EMS providers that rural EMS agencies face amplifies the situation for the pediatric population, who are already a vulnerable population<sup>2,4,10,13-15</sup>. These findings underscore the need for a medical director who is available to provide oversight, medical direction, pediatric continuing education, and quality assurance reviews<sup>10</sup>.

Integration at a state level helps agencies identify needs, make decisions, and set priorities to improve care<sup>34</sup>. Overall, IHS agencies were well integrated with their state EMS system including submitting patient care data electronically to their state EMS authority. A recent study found that hospitals located in states with regulations mandating the presence of inter-facility transfer guidelines and agreements for pediatric patients were more likely to have the guidelines and agreements than hospitals located in states that did not have regulations<sup>35</sup>. Further evidence of integration was found in the compliance of most agencies with NIMS and NEMESIS. By integrating with other state emergency response departments and collecting standardized national EMS data elements, EMS agencies are increasing unified accountability and their ability to collect compensation for the services they provide, thereby, augmenting their sustainability<sup>34,36</sup>. Compensation for EMS services is important in a rural setting where resources are often scarcer and the transport times to definitive care facilities are longer compared to urban settings. In addition, integration with a state system helps individual EMS agencies remove overlap and redundancy of programs, optimizing funding opportunities and improving patient outcomes during disasters<sup>34,36</sup>.



## *Limitations and strengths*

This study has several limitations and strengths. The results are based on self-reported data. The survey was not pilot tested with the target audience prior to launching. However, for the survey development a consensus approach was used, involving experts from the population being assessed. The 13 agencies that were not sent the survey appear to be inactive as the name of a contact person could not be obtained nor a station of operation established for these agencies. Information regarding the 14 agencies that were sent the survey, but did not respond, could not be obtained. The data are 5 years old; unfortunately, previous reports indicate that change is slow for tribal EMS. Needs assessments conducted over the past 19 years concentrating on adult populations and use of tribal EMS show continued deficiencies in medical direction, staffing and training, and equipment. The authors only have information on the IHS EMS agencies. The rest of the affiliated tribal population relies on non-tribally operated local public and private EMS agencies<sup>12</sup> who primarily serve a non-Native American population. It is not known how similar or different the non-tribally operated EMS services are to the IHS EMS agencies. While the cultural relevance of services is important, it is not known whether the American Indian/Alaska Natives served by IHS agencies prefer utilizing the services provided by IHS EMS or the services of non-federally funded tribal agencies. However, in most of the study service areas, IHS EMS is the only EMS option available. A strength of this study is that this appears to be the first systematic assessment of IHS EMS agencies capabilities to treat and care for children. Another strength is the high response rate (81%), which may have been facilitated by using stakeholders from the respondent community for survey development as well as multiple-contact system and a scholarship for completed surveys.

## Conclusions

Seemingly, this is the first assessment of IHS EMS agencies' capabilities to care for pediatric patients. The IHS agencies, with a limited number of EMS providers who are mostly

trained as EMT-Basics, face the challenge of providing pre-hospital services in rural and sparsely populated areas analogous to other EMS agencies located in rural USA. A policy statement recently released by AAP<sup>10</sup> highlights the need for medical direction, pediatric equipment, and disaster response plans that are applicable in rural settings as among the components of vital access for pre-hospital emergency care. While generally the IHS EMS agencies in the study were integrated with their state EMS system and submit patient care data to their state EMS authority, some of the agencies lacked a medical director, were unable to provide pediatric continuing education for their EMS providers, and were overwhelmed during mass casualty incidents.

Allocation of resources to support the IHS EMS agencies may be necessary. However, resources are often scarce, requiring inventive solutions. Similar to the operations challenges facing rural EMS agencies, resource scarcity is a large issue for IHS EMS where the ratio of agencies to service population is almost double that found for EMS in the USA. One possible solution is the combining and sharing of common resources. This may be a viable solution as overall agencies were well integrated with their state EMS systems and authorities. One area where sharing resources is particularly important is medical direction. Integration may help IHS EMS agencies share medical directors with other EMS agencies in their state. The recent policy statement of the AAP<sup>10</sup> recommended the use of pediatricians in rural areas to fill many of the EMS aspects where a need was identified. Furthermore, some of the identified areas of need, such as pediatric-specific drills for disaster response and pediatric continuing education, are an issue not only for IHS EMS, but for EMS systems throughout the USA<sup>1,2,9</sup>. Continued efforts are needed so that the delivery of optimum pre-hospital pediatric care occurs throughout the country.

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