BRIEF REPORT

Emergency Medical Service in the US National Park Service: A Characterization and Two-Year Review, 2012–2013

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Objective.—Visitors to US National Park Service (NPS) units have a unique set of needs in terms of emergency medical care. The purpose of this review is to quantify and characterize emergency medical services (EMS) activities in the NPS to elaborate on its unique aspects, establish trends, and benchmark these data against a sample of national EMS data.

Methods.—The EMS data for calendar years 2012 and 2013 were queried from national NPS reports.

Results.—The EMS responses totaled 40 calls per million visitors in 2012 and 34 calls per million visitors in 2013. Of those, 75% required a basic life support level of care. There were comparable incidences of transported EMS trauma calls (49%) and medical calls (51%). Of a total of 137 sudden cardiac arrest events, 65% of patients received defibrillation and 26% survived to hospital release. There were 262 total fatalities in 2012 and 238 in 2013, with traumatic fatalities occurring approximately twice as often as nontraumatic fatalities.

Conclusions.—Across the country, the NPS responded to a large number of EMS calls each year, but with a relatively low frequency, considering the large number of visitors. This is a challenging setting in which to provide consistent EMS care throughout various NPS administered areas. The typical NPS EMS response provided basic life support level care to visitors with traumatic injuries. The NPS caregivers must be prepared, however, to respond to a varied and diverse range of EMS calls.

Key words: emergency medical services, National Park Service, automated external defibrillator, wilderness, rescue, sudden cardiac arrest

Introduction

The US National Park Service (NPS) oversees 401 land areas encompassing more than 84 million acres. These areas, or units, received more than 430 million visitors each year in 2012 and 2013.¹ National parks comprise 59 of the 401 units, with recreation areas, preserves, seashores, battlefields, monuments, and historic sites making up the rest. Units are further divided into 7 geographic regions. Individual units cover a spectrum from urban, populated sites to remote, rugged wilderness.¹ This presents a challenging environment in which to provide emergency medical services (EMS) care and necessitates a uniquely adapted EMS infrastructure.

The NPS must be capable of responding to traditional, frontcountry EMS needs as well as nontraditional

wilderness medical emergencies in backcountry terrain.^{2,3} Compared with a traditional environment, backcountry emergency care poses additional challenges, including difficulty accessing or evacuating a patient, extreme environmental conditions, and inability to have real-time physician medical oversight.⁴

The EMS operations are overseen at the national level by the NPS Washington Support Office, which provides protocol standards to the overall NPS EMS system. At the level of the individual NPS unit, there is generally an EMS coordinator and a local physician medical director. Coordination of EMS is often a collateral duty, meaning that duties are not meant to exceed 25% of the total individual workload. Activity of EMS depends on the individual unit and has been shown to vary geographically. Smaller or less-visited units, for example, might rely on outside EMS agencies, such as a county ambulance service.⁵

The unique aspects of EMS care within NPS units have been previously established.⁵ The purpose of this

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review is to update those previous data and to provide additional insight by considering previously unreported aspects of EMS care. These characteristics include personnel, resources, funding, and response times. Also included are NPS search and rescue (SAR) activities because these often involve backcountry patient care. These NPS data will be benchmarked against data from the National EMS Information System (NEMSIS), an online national EMS database, and previous NPS data in an attempt to establish trends.

Methods

This is a retrospective review of internally generated NPS data for the calendar years 2012 and 2013. Data pertaining to NPS, EMS, and SAR activities, funding, and personnel were obtained from NPS annual reports.¹ Dispatch, on-scene, and transport times were taken from the electronic patient care record (ePCR) database. Important limitations of the database include an inability to provide a measure of spread and to account for data entry errors, leading to extraneously long maximum reported values. Visitation data were obtained from the NPS website available to the public.¹ These NPS data were benchmarked against data for the same period from NEMSIS (version 2; available at: nemsis.org) and previously published NPS data.⁵ Institutional Review Board approval was granted through the University of Utah.

Each individual NPS unit records internal EMS and SAR activities and forwards annual results to the Visitor and Resource Protection Division of the Intermountain Regional Office. The data are then compiled and added to the NPS annual report form. The NPS provided the data included in this review from these reports. National-level EMS data were obtained for the 2 calendar years included in the review from NEMSIS and are included as a qualitative comparison rather than as a comprehensive quantitative statistic.

Data reported here include care provided by NPS personnel only, excluding care provided by third parties. Therefore, this review is limited to care provided by the NPS and is not a comprehensive tally of all care provided within NPS administered units. Care initiated by NPS personnel and subsequently transferred to other agencies for transport and continuation of care is included here.

Incidence statistics listed as “per million visitors” were generated using a recreational visitor count. Incidence was calculated by dividing the total number of events by the number of recreational visitors in millions, using Microsoft Excel 2013 (Redmond, WA). Recreational visitor counts are generally gatehouse tallies. Visitor center counts are used if the park does not have a gate.

Persons entering a nongated park after hours, NPS or third-party employees, and park residents are among those not represented in this count.¹ Recreational visitation, rather than total visitation, is used to allow for comparisons with previously published incident rates.⁵ However, NPS annual reports do not subdivide EMS responses by visitor type. Therefore, true event rates that include total visitors, rather than solely recreational visitors, are likely lower than event rates included in this review. Therefore, such rates are not meant to be an epidemiologic assessment of injuries within NPS units, but rather simply a comparison to those previously published rates.

Results

Recreational visitors totaled 282,765,682 in 2012 and 273,639,895 in 2013. Overall visitation, including both recreational and nonrecreational visitors, totaled 432,206,862 in 2012 and 430,410,197 in 2013.

PERSONNEL

Individual care providers included a range of training levels (Table 1). Most EMS operations are carried out by park rangers. A small number of dedicated EMS providers focus on EMS calls only. Paramedics and parkmedics provide advanced life support (ALS) level care. The parkmedic, a level of care unique to the NPS, is similar to an advanced emergency medical technician, with additional skills predominantly related to prolonged care in remote settings (ie, antibiotics, joint reductions). These skills are taught during a biennial course at the University of California, San Francisco–Fresno. Basic life support (BLS) level care is provided by emergency medical responders (EMR) and emergency medical technicians (EMT).

RESOURCES AND FUNDING

The NPS operated 144 ambulances in 2012 and 157 in 2013, accounting for 90% of NPS patient transports. Other modes of transport included water craft (5%), nonambulance vehicles such as a patrol car (3%), and aircraft (2%).

Table 1. Care providers employed by the National Park Service

Year	EMR	EMT	Parkmedic	Paramedic	Physician
2012	469	1532	148	89	144
2013	452	1464	153	89	157

Emergency medical responder (EMR) includes both first responders and wilderness first responders (WFR); emergency medical technician (EMT) includes both EMT-basic and wilderness EMT (WEMT). Physicians serve as medical directors for individual park units.

The EMS operations used \$2,354,000 in annual funding in 2012 and \$1,984,000 in 2013. These totals do not include training costs. Cost per EMS run averaged \$210 in both 2012 and 2013. Annual EMS funding totaled \$8325 per million recreational visitors in 2012 and \$7252 in 2013.

EMS STATISTICS

National Park Service personnel responded to 40 calls per million recreational visitors in 2012 and 35 calls per million in 2013, or 11,244 and 9480 total calls each year, respectively. These calls were classified as first aid if transport was not required. Total responses are given in Table 2. Calls requiring transport were subdivided by level of care, shown in Table 3, or by mechanism, as shown in Table 4. There were 262 fatalities in NPS units during 2012, and 238 fatalities during 2013 (Table 5). Traumatic fatalities (65%) occurred approximately twice as frequently as nontraumatic fatalities (35%). Dispatch, on-scene, and transport times are given in Table 6. The 0- to 15-minute averages would be considered analogous to a traditional frontcountry response with ready ambulance access, whereas the longer times represent extended-care scenarios.

The NPS and concessionaires operating within park boundaries had 1699 automated external defibrillators in place in 2012 and 1746 in 2013. The NPS caregivers responded to 75 sudden cardiac arrest (SCA) events in 2012 and to 62 in 2013. Of these 137 total SCA events, 65% received defibrillation with an automated external defibrillator, and 26% survived to be released from the hospital.

BACKCOUNTRY CARE AND SEARCH AND RESCUE

The NPS carried out 2876 SAR operations in 2012 and 2348 in 2013, or roughly 9 operations per million recreational visitors. Patient care was involved in 47% of those operations.

Table 2. National Park Service emergency medical services responses for 2012 and 2013 by transport

Year	On-scene first aid	Total transports	Total responses
2012	3795 (34%)	7449 (66%)	11,244
2013	3175 (33%)	6305 (67%)	9,480

Responses that were not transported were not further broken down by level of care or mechanism of call; responses that were transported were further broken down.

Table 3. Transported National Park Service emergency medical services responses by level of care provided for 2012 and 2013

Year	BLS transports	ALS transports
2012	4611 (62%)	2838 (38%)
2013	3914 (62%)	2391 (38%)

Transports totaled 7449 for 2012 and 6305 for 2013.

BLS, basic life support; ALS, advanced life support.

COMPARISON WITH PREVIOUS NPS DATA

Table 7 summarizes data covering the years 2007 to 2011 that are pertinent to the findings included in this review. There was a decline in all reported categories of both EMS responses and fatalities.

Discussion

National Park Service personnel participated in a large number of EMS responses but relatively infrequently, given total visitation. Caregivers represent a range of training levels from EMR to medical professionals. Overall, ALS providers represent 11% of NPS caregivers (not including physician medical directors or volunteer professionals). However, 26% of the calls received ALS level care, indicating that ALS providers respond at a proportionally higher rate than their BLS counterparts. This finding can partially be explained by some ALS providers who are more directed toward providing EMS services. In other cases, remote environment and technical evacuations may only allow BLS care.

Patient transport methods reflect the varied terrain in which NPS personnel operate. Ninety percent of patient care involved an ambulance, and the remaining portion represents backcountry responses in which road access with an ambulance was not possible. Ambulance transports also include multimodal transports, such as those initiated in the backcountry and terminating with a frontcountry ambulance. Funding for EMS operations depends on the needs of the individual unit. The EMS budget represents a combination of base funding from the national level and funding from local NPS service

Table 4. Transported National Park Service emergency medical services responses by mechanism of injury for 2012 and 2013

Year	Trauma transports	Cardiac medical transports	Noncardiac medical transports
2012	3567 (48%)	458 (6%)	3424 (46%)
2013	3138 (50%)	343 (5%)	2824 (45%)

Transports totaled 7449 for 2012 and 6305 for 2013.

Table 5. National Park Service fatalities

<i>Year</i>	<i>Traumatic fatalities</i>	<i>Nontraumatic fatalities</i>	<i>Total fatalities</i>
2012	178	84	262
2013	145	93	238
Per million visitors	0.58	0.32	0.90

charges for ambulance transport. Units without transport capabilities are supported by base funding alone.

Various NPS units began switching to an electronic patient care report (ePCR) system in 2009, with most units switching in 2010. The ePCR system allows for efficient data retrieval and analysis of EMS response times, but it is subject to notable limitations. In a wilderness area lacking network access, information is often manually recorded and input into the electronic system at a later time. This is potentially a source of inaccuracies and can lead to erroneous maximum reported values (ie, a 25-day maximum dispatch and a 64-day on-scene time.) Owing to a large database on ePCRs, these limitations cannot be specifically accounted for at this time. Dispatch to on-scene times may further be influenced by instances in which responders must travel to the ambulance from another location before responding. During 2012 and 2013, NPS dispatch to on-scene time averaged 33:38 minutes. National response times averaged 11:38 for wilderness responses and 7:39 for urban responses. Just 3% of national responses qualified as wilderness based on population density. Although the NPS does not make such a distinction, the remote nature of NPS units would presumably qualify most EMS responses as wilderness.

The types of EMS responses in NPS units differed from national averages. The NPS responses were largely of BLS level (75%). Roughly half (49%) of transported cases had a traumatic mechanism. Nationwide, a survey

Table 7. Reported trends comparing 2007–2011 and 2012–2013

<i>Category</i>	<i>2007–2011</i>	<i>2012–2013</i>	<i>Change, %</i>
First aid	20	13	–35
Noncardiac medical	13	13	0
Trauma	13	12	–8
Fatalities, total	296	250	–16
Traumatic	182	162	–11
Nontraumatic	114	89	–22

Emergency medical services data are given as annual averages per million visitors; fatalities are given as annual totals. Annual recreational visitors averaged 279,000,000 in 2007–2011 and 278,000,000 in 2012–2013.

of EMS organizations over the same 2012 to 2013 period reported a roughly even split of ALS (51%) and BLS (48%) level care, with trauma in just 4% of the sampled 47,908,148 records.

Survival of out-of-hospital SCA events was 26% in the NPS during the 2 years covered in this study. This survival rate was higher than a national survival rate of 11.4% in 2012 and 9.5% in 2013.⁶ Reasons for this difference could include differences in the underlying cause of the cardiac event (ie, improved survival of SCA due to lightning strike of an otherwise healthy person in the NPS as opposed to myocardial infarction in an urban area). A longer time-to-scene could also lead to more deaths occurring before EMS arrival, so that care is initiated only on patients with a higher chance of survival. Further study is needed to evaluate this difference.

A comparison of data included in this study with comparable published data from 2007 to 2011 showed a decline in EMS call volume and fatalities. This decline persisted even when corrected for a slight decline in visitation.⁵ The 35% decline in first aid responses can likely be attributed to a shift from an automatically

Table 6. Dispatch, on-scene, and transport times

<i>Times</i>	<i>Average time (all records)</i>	<i>Average Time (records between 0-15 minutes)</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Total (n)</i>
Dispatch	33		1	36,047	6703
On scene	71	10	1	92,160	3317
Transport, hospital	48	9	1	7253	1847
Transport, transfer	78	9	1	43,207	1488

Times are in minutes. The average time inclusive of all records includes extended care scenarios and data entry artifacts. The average time limited to those records between 0 and 15 minutes are included as a comparison to a traditional front-country response.

generated report to a user-generated report. Reasons for the remainder of the observed decline were not determined but could include normal statistical variation, improved visitor education, or a shift in visitation to NPS units that rely more on external EMS coverage.

Conclusion

The objective of this review was to update and elaborate on EMS care provided by the NPS during 2012 and 2013. The data show that the typical NPS response will involve BLS care of traumatic injuries. Compared with similar data covering the years 2007 to 2011, there was a decline in EMS activities during 2012 and 2013 that included first aid level calls, total medical and trauma incidents, and all types of fatalities. Reasons for these declines are not apparent and present a topic for further analysis.

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