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Brief Report

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Abstract

Objective: A well-organized emergency medical system with adequate prehospital care can save lives and prevent disability. In Yemen, there are no data available about its prehospital care system. This qualitative, cross-sectional study aims to assess the status of prehospital care or emergency medical services in Yemen.

Methods: Data were collected from January to February 2019 through interviews and a questionnaire obtained from the Prehospital Trauma Care Systems Guideline published by the World Health Organization (WHO). Respondents were key representatives of the Ministry of Public Health and Population (MoPHP), Civil Defense/Police departments, and Yemeni Red Crescent Association (YRCA).

Results: Overall, based on 153 responses, it was found that, despite the availability of some formal services, the prehospital care system in Yemen is uncoordinated, fragmented, and insufficient.

Conclusions: Given the importance of regulation, legislation, and funding support in the establishment of an effective prehospital care system, these areas merit the greatest attention and efforts. Future policies and strategies should also strive to improve communication and coordination between existing prehospital care providers, to establish a lead agency, and to increase accessibility to training.

Worldwide, injury is the leading cause of death. Every year more than a million persons die from road traffic injuries. Ninety percent of these fatalities are seen in low- and middle-income countries (LMICs).¹ Strengthening trauma and emergency care can prevent many deaths and long-term disabilities.² Most postinjury fatalities occur before arrival to a hospital; moreover, 50% of these were preventable if early first aid interventions had been administered at the scene or during transport to hospitals.³ Therefore, a well-organized emergency medical system with adequate prehospital care and short transport time to definitive care can save lives.

The World Health Organization (WHO)⁴ set out to determine the essential elements for designing and establishing a cost-effective prehospital emergency system for trauma care. In 2005, the WHO published guidelines to assist health-system planners in the implementation of highly economical and effective hospital and prehospital care systems in countries with limited resources.⁴

Before establishing and strengthening any given prehospital emergency system, it is essential to understand the available resources, capability, and challenges facing the development of this system. Unfortunately, in Yemen, no such data about the prehospital care system are available. Therefore, the aim of this study was to assess the current status of prehospital care or emergency medical services (EMS) in Yemen.

Methods

A qualitative, cross-sectional study was conducted in Yemen from January to February 2019 involving a self-reporting questionnaire and an interview. The questionnaire was derived from the Prehospital Trauma Care System Guideline created by WHO for the developing countries.⁴ Additionally, other relevant key contents were extrapolated from a literature review of the EMS systems of 48 LMICs.⁵ The study questionnaire consisted of 36 questions designed into 7 sections: (1) background of respondents, (2) organization, (3) prehospital care and transport, (4) training of prehospital care providers, (5) funding, (6) quality and regulations, and (7) barriers to implement or develop the service. We followed a qualitative research approach and implemented a purposeful sampling technique to capture the range of approaches to prehospital care in the country. The sampling targeted the key representatives of the respective agencies that may oversee or run the service. These agencies were the Ministry of Public Health and Population (MoPHP), Civil Defense/Police departments (MOI), and the Yemeni Red

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Table 1. The available resources related to the prehospital care, on day-to-day bases

Organization	Authority	MoPHP*	CD**	Police
	Type of service	Inter-hospitals transportation	Fire response	Roadways ambulance service
	Dispatch center	No	No	Yes
	UTFN [‡]	Landlines	191 + landlines	195 (194 for illegal issues)
	Access	Most (hospitals/PHCs)	Whole country -main cities	Whole Country (main roads)
	Tier system	Tier system (BLS & ALS) None-BLS & ALS [§]	NO	None-BLS & ALS [§]
	Deployment	Population/Hospitals/PHCs Ambulance/100,000 people	Main cities	Main road networks Main police checkpoints
	Communications	No	-	No
Care and Transport	Transportation	Referral	No	RTCs [¶] people
	Care provided	Sometimes BLS & ALS	Evacuations Basic first aids	Scoop-and-Run No interventions
Human Resources	Providers	Medical staff (nurses)	Fire brigades	Police officers
	Type	Paid-employees	Paid-employees	Paid-employees
	Certified (EMS)	Not applied (medical profession)	-	-
	Training course	BLS, ALS	First Aids	No
Finance	Payment	Non-out of pocket	Non-out of pocket	Non-out of pocket
	Funder	MoPHP	Mol [†]	Mol
	Budget	Hospitals	CD	Police department
	Taxes	-	-	-
	Cost/run	Less than 100\$/mission	-	-
Regulations	Legislation	Yes	-	Yes
	Standard	No	-	No
	Quality measures	No	-	No

*Ministry of public health and population. **Civil defense. [‡]Universal toll free number. [§]Ambulances with stretchers +/- oxygen only. [¶]Road traffic collisions. [†]Ministry of Interior

Crescent Association (YRCA). We realized that access to data from governmental authorities would not be easily feasible. Therefore, we also interviewed providers from these agencies. This type of sampling is appropriate when developing an understanding of general approaches to a problem.⁶

Unfortunately, during the data-gathering phase of this study, the country was still suffering from the ongoing war; consequently, some provinces were inaccessible, and others were non-functioning. Moreover, most of the related resources were allocated to the then-current needs. Therefore, we collected data with the use of both on-site interviews and electronic means (ie, telephone, email). The data were analyzed qualitatively on 2 premises: on a day-to-day basis and in times of emergencies. Military, private resources, and other non-governmental organizations (NGOs) were excluded from this study.

Results

Table 1 summarizes the key components of prehospital care in Yemen on a day-to-day basis.

Respondents' Background

The data were obtained from the prehospital care representatives in the headquarters of MoPHP, MOI, and YRCA located in Sana'a and Aden ranging from clinicians and technicians to fire brigades and law enforcement.

Organization

There are several formal prehospital services in the country; however, these services are still underdeveloped—insufficient to cover an entire country and run by unqualified providers.

Roadways Ambulance Service (RAS) is an ambulance service to transport critically injured victims of traffic collisions. The MoPHP provided none-equipped ambulances at select rescue points throughout some highways of the country to be operated by traffic police officers. This service had a dispatch center with a toll-free number (195) for emergency calls; however, this dispatch center was nonfunctioning.

Transport and Care

Most patients were self-driven to hospitals or by commercial vehicles. There was no specific tier system followed by the MoPHP in providing prehospital care; thus, the majority of ambulances were not equipped with life support supplies. Most providers used the scoop-and-run approach—patient transportation without applying any rescue interventions such as airway management, positioning, bleeding control, or immobilization. It was found that only 45% of them could provide first aid, basic life support (BLS), and/or advanced life support (ALS) care.

Human Resources and Training

A total of 190 providers were recruited by the MoPHP to carry out ambulance services across the country. The vast majority of the staff rendering ambulance services were non-EMS/EMT certified; they were either general nurses or nontrained nonmedical professionals (eg, police officers, drivers). There were in-service training programs in emergency medicine, but no specialty degree or fellowship programs in EMS and disaster medicine. There were no formal courses in first aid, Prehospital Trauma Life Support (PHTLS), or Advanced Trauma Life Support (ATLS) being provided in Yemen.

Table 2. The available resources related to the prehospital care, on emergencies and disasters

Organization	Authority	MoPHP*	YRCA ^a	CD/Police**
	Formal plan	Yes	-	Yes
	Activation	MCI	On need	Natural disasters
	Type of service	Prehospital care	Humanitarian aids	Search, rescue, evac&reliefs
	Dispatch center	Yes	No	No
	UTFN [‡]	(195)	-	191, 199
	Access	Capital Sana'a & Aden city	Regional/local (On need)	Whole country
	Tier system	Tier 1 system (BLS & ALS) None BLS & ALS [§]	Tier 1 system (BLS & ALS) None BLS & ALS [§]	No
	Communications	No, sometimes landlines/mobile	No, sometimes mobile phone	-
Care and Transport	Field In Charge	Yes	No	Yes
	Transportation	Yes	Yes	No
	Care provided	Scoop & run (no intervention)	Scoop-and-Run +/- First Aids	No
Human Resources	Providers	Medical staff (RNs)	Medical staff (DRs & RNs) Non-medical (Publics)	Security force + Fire brigades
	Type	Paid-employees	Paid-employees & Volunteers	Paid-employees
	EMS Certified	Not applied (medical profession)	No	No
	Training course	BLS, ALS	First Aids +/- BLS & ALS	No
Finance	Payment	Out of pocket	Out of pocket	Out of pocket
	Funding source	MoPHP & WHO	NGOs	Mo†
	Budget	MoPHP (not fixed/specified)	-	Police/CD departments
	Taxes	-	-	-
	Cost /run	Less than 100\$/mission	Less than 100\$/mission	-
Regulations	Legislation base	Yes	-	-
	Standard	No	IRC	No
	Quality measures	No	Customer satisfactions	-

*Ministry of public health and population. ^aYemen Red Crescent Association. **Civil defense. [‡]Universal toll free number. [§]Ambulances with stretchers +/- oxygen only. [†]Ministry of Interior.

Regulation, Quality, and Funding

Data showed that some resolutions and decrees were enacted regarding prehospital service; however, these legislations were insufficient and inactive, with a need for more supportive laws that can help in advocacy for the development of this service, especially with regard to financial support. There were no national standard or quality development measures used to regulate the improvement of service. RAS provided services free-of-charge and was funded by the government from the MoPHP budget; inter-hospital transportation was an indirectly paid-service, added to the cost-sharing payments fees of service delivery and drugs supplement to the customers.

Obstacles

A major obstacle to the provision of the prehospital care or EMS development in Yemen was the scarcity of governmental, political, and financial support. Other obstacles are technological and geographical factors, such as the large surface area of the country, road infrastructure and designs, traffic congestion, and lack of telecommunication and Internet to large areas of country.

Disaster

Table 2 summarizes the key components of prehospital care in Yemen in emergencies and disasters.

Discussion

The present study assessed the status of prehospital care in Yemen with a focus on the overall service organization. The overall data

showed that some formal prehospital services are being delivered; however, they are uncoordinated, fragmented, and insufficient. The areas lacking most considerably are in legislation, regulation, and funding support.

We found that communication suffered significant shortcomings in the status of prehospital care: although a toll-free number existed for emergency calls, the dispatch center was non-functioning, resulting in no means of communication between rescue points, ambulances, and hospitals. A systematic review of barriers in prehospital care in LMICs found that 39% had a centralized emergency number, which allows for more efficient activation of the EMS system; however, coordination of care between various service providers still poses a great challenge.⁷ Better coordination between providers can improve patient outcomes and allow for less reliance on technology as in the more costly models seen in high-income countries.⁷

Unfortunately, due to the extreme difficulty of the situation in Yemen, we were not able to gather information on EMS documentation and incident records. Such administrative elements allow not only for sustainable and effective allocation of resources, but for insights into the location and types of community hazards.⁴ Consequently, the systematic collection of such data can inform the development of prevention programs that target high-risk settings, products, behaviors, and groups.⁴ Furthermore, documentation of information such as distribution of coverage or response times can guide future development of interventions and policy.

We found that most patients were self-driven to the hospital or in commercial vehicles. A study conducted in Sana'a reported similar results: 71% of casualties were transported to hospitals

by a taxi, compared with the 13% transported by ambulance.⁸ This may be due to lack of accessibility to ambulances. Our study also found that the majority of ambulances in Yemen were not equipped with supplies to provide first aid, BLS, and/or ALS care, resulting in widespread use of the scoop-and-run approach. This is a common barrier in LMICs: a study conducted in Mexico found that many patients in respiratory distress were not able to receive the necessary care due to lack of equipment.⁹ By contrast, Ukraine is an example of a LMIC that operates well-equipped ambulances.⁵ In all, lack of equipment precludes the delivery of appropriate care to patients. This is a disservice to patients as most deaths within the initial hours following injury are a consequence of uncontrolled bleeding, airway compromise, or respiratory failure—all of which can be addressed with the appropriate interventions.⁴ Moreover, the number of delayed deaths and the likelihood of complications can also be reduced through interventions such as oxygenation and blood pressure support or fracture immobilization.⁴ However, successful implementation of such interventions requires that ambulances not only be equipped with the necessary supplies, but also with adequately trained personnel.

The majority of providers recruited to provide ambulance services were non-EMS/EMT certified. Multiple studies have shown improved outcomes after health-care providers and bystanders alike had been provided training in the fundamental components of trauma care.^{4,5} Furthermore, no formal courses in first aid, PHTS, or ATLS were offered in Yemen. However, a case study in Ghana demonstrated that first-aid training need not be formal to be effective; training can be tailored to be provided at an appropriate educational level with an increased emphasis on active learning, demonstrations, and practice sessions.¹⁰

In terms of regulation, there currently exists no national standard or quality development measures. With regard to funding allocated to prehospital care in Yemen, we were unable to obtain exact numbers due to the sensitive nature of this information. For years, Yemen has been dealing with economic decline; coupled with the recent pooling of financial resources toward the COVID-19 response, it is unlikely that there is adequate funding dedicated to the development of the prehospital care system. In all, the areas of regulation, funding, and legislation appear to be most considerably lacking in our assessment of the status of prehospital care in Yemen. This is consistent with a prior systematic review that identified inadequate funding and legislation setting standards as the most commonly cited barriers to EMS development in LMICs.⁵ Per WHO⁴ recommendations, legislation enactment may be necessary to ensure the success of a prehospital care system; despite this, the lack of legislation remains one of the most frequently cited barriers to EMS development.⁵ EMS legislation has been demonstrated to improve the care received by victims of medical emergencies in 2 promising case studies in Columbia and Romania.⁵ Furthermore, many of the aforementioned issues related to communications, equipment, regulation, and funding can be addressed by EMS and prehospital care legislation.⁷

Limitations

One limitation of the present study may stem from our small sample size. This was in part due to the detailed and sensitive nature of the information necessitated by this study. Coupled with the ongoing conflict and humanitarian crisis, our sampling was limited to respondents located in Sana'a and Aden. As the largest 2 cities in Yemen, the status of prehospital care systems assessed

from our sampling may not be representative of Yemen as a whole, especially given the differences in infrastructure and local expertise between urban and rural settings. Furthermore, the selection of these 2 locations—Sana'a and Aden—represent the health-care systems at the national and regional levels, respectively. As such, this means of sampling is appropriate given the roles and involvement of both levels of government in the establishment of a prehospital care system.

Conclusions

Overall, despite the availability of some formal services, the prehospital care system in Yemen is uncoordinated, fragmented, and insufficient. The areas most lacking are in regulation, legislation, and funding support. Future policies and strategies should strive to improve communication and coordination between existing prehospital care providers, to establish a lead agency, and to increase accessibility to training. Combined with appropriate legislation and allocation of resources, the existing prehospital care system in Yemen can be rendered more effective and sustainable.

Author Contributions. W.N. is the first author proposed the project, contributed to the conception, formulation and drafting of the article. M.A. is the corresponding author contributed to the drafting of the paper and supervised the elaboration at every step of the paper writing process and was responsible for coordination of the study and communication with all coauthors. W.S., R.Y., and H.B. contributed equally to the conception, drafting and reviewing of the paper. W.N. and M.A. revises the whole manuscript. All authors read and approved the final manuscript.

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