


EMS at 3600 Meters: Exploring Barriers to Emergency Care and Transport in Rural Andean Perú

Alison H. Vasa, MD;¹  Karen A. Falkenstein, BSN, MPH;² Wayne A. Centrone, MD, MPH²

1. Oregon Health and Sciences University, Portland, Oregon USA; Cook County Health, Emergency Medicine, Chicago, Illinois USA
2. Health Bridges International, Portland, Oregon USA

Correspondence:

Alison H. Vasa, MD
Department of Emergency Medicine
Administrative Offices
1950 W Polk Street, 7th Floor
Chicago, Illinois 60612 USA
E-mail: alisonvasa@gmail.com

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Abbreviations:

EMS: Emergency Medical Services
LMIC: low- and middle-income countries
SERUMS: El Servicio Rural y Urbano Marginal en Salud (Rural and Marginal Urban Health Services)

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Abstract

Background: Given the demonstrated success of programs that bolster informal Emergency Medical Service (EMS) systems in other low- and middle-income countries (LMICs), this study aimed to explore formal and informal systems, practices, customs, and structures for emergency response and medical transport in Colca Valley, Perú while identifying possible opportunities for future intervention.

Methods: Twenty-two interviews with first responders and community members were conducted in three mountain villages throughout rural Andean Colca Valley of Perú. Subjects were recruited based on profession and experience with medical emergencies in the area. Transcripts were entered into Dedoose, coded, and analyzed to identify themes.

Results: Providers and community members shared similar perceptions on the most common barriers to emergency care and transport. Challenges experienced equally by both groups were identified as “structural problems,” such as lack of infrastructure, lack of structured care delivery, and unclear protocols.

Incongruities of responses between groups emerged with regard to certain barriers to care. Providers perceived baseline health education and use of home remedies as significant barriers to seeking care, which was not proportionally corroborated by community members. In contrast, 86% of community members cited lack of trust in health providers as a major barrier.

Community members often noted witnessing a high frequency of emergency events, their personal experiences of helping, and the formal utilization of lay providers. When specifically questioned on their willingness to engage in first aid training, all participants were in agreement.

Conclusion: While structural changes such as increased infrastructure would likely be the most durable improvement, future interventions focused on both empowering community members and improving the relationship between the health center and the community would be beneficial in this community. Additionally, these interview data suggest that a layperson first aid training program would be feasible and well-received.

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Introduction

It is estimated that more than five million deaths can be attributed to traumatic injuries annually.¹ Of these, 90% take place in low- and middle-income countries (LMICs) and 80% occur in the prehospital setting.¹

The emergency disease burden in LMICs is estimated to be 4.4-times higher than in high-income nations, some of which may be associated with limited or nonexistent systems for emergency medical care and transport.² While programs aimed at addressing trauma and emergency-related mortality in LMICs are diverse, many aim to strengthen existing Emergency Medical Service (EMS) systems, often through the use of layperson providers.³

While limited generalizable data in this sector are available, there are case studies. For example, in a day-long trauma response workshop in Uganda for community members and police, 90% of participants utilized their newfound skills within the first six months and were able to answer questions accurately in a post-test.⁴ In Iraq, a program that provided intensive paramedic-style training to students found that eight years following this curriculum, 72% of providers were still working in their communities in this role. Furthermore,

time to care in the field significantly dropped, and prehospital mortality from war injuries plummeted from 28.7% to 9.4%.⁵ Few studies report on similar projects in Latin America.

The Colca Valley of Perú provides a unique opportunity to explore challenges and possible solutions for better emergency response and transport. Primarily, it represents a logistical challenge due to its geography: the largest city of Chivay lies at nearly 12,000 feet above sea level and 165 kilometers from the city of Arequipa, which itself is somewhat isolated from the resources of the Peruvian capital city of Lima. The geography of the Colca Valley, situated on a high-altitude plateau between 12 and 16,000 feet above sea level with over 100 small villages isolated from main roadways, makes the area the perfect proving ground for developing medical and emergency transport models.

This study aims to qualitatively explore formal and informal systems for emergency medical transport in the Colca Valley of Perú, with a particular goal of examining the feasibility and attitudes toward a community member training program in this area.

Methods

Semi-structured interviews were utilized to elicit a range of experiences, challenges, and cultural contexts surrounding emergency response in the Colca Valley. Participants were categorized as either trained health care providers or community members. Interviews were audio recorded in Spanish and transcribed into English. Translation was done in real time throughout the interviews with a professionally trained medical interpreter.

Participants were selected using a purposeful sampling method based on their professions or personal experience with medical emergencies in the Colca Valley. All participants provided consent required by the Oregon Health and Science University (Portland, Oregon USA) Institutional Review Board, which approved this project (IRB study protocol #00019329).

Researchers determined data saturation was sufficiently achieved when further data collection and analysis of the data revealed no new information and themes to address the research question. Verification of the data and themes was done by members of the research team with skills in qualitative analysis. Data were analyzed for a conceptualization of underlying patterns and themes using inductive theme analysis to generate new insights and concepts. First, the researchers familiarized themselves with the data. This involved transcribing the interviews and creating memos. Next, an initial set of codes were developed into a codebook to represent the meaning and patterns seen in the data. The four researchers worked together to view and refine codes to ensure consistency. The codebook was collated with supporting data, and lastly, researchers grouped codes into themes, which were reviewed and revised a final time. The final analysis was facilitated by Dedoose (version 8.3.21) software (SocioCultural Research Consultants; Los Angeles, California USA).⁶

Results

Twenty-two interviews were conducted with a total of twenty-nine participants. Six participants were considered trained providers while twenty-three were community members with meaningful perspectives or experiences with emergency response. Further demographic information of participants is noted in Table 1.

Responses were sub-divided into four major categories: (1) Structural challenges; (2) Barriers and challenges for health care workers; (3) Barriers and challenges for community members; and (4) Community engagement. Major themes with representative quotes are highlighted in Table 2.

Profession	Hometown Designation ¹	Gender	Age Designation ²
Firefighter	Arequipa - Urban	M	Young Adult
Firefighter/Nurse	Arequipa - Urban	F	Young Adult
Obstetrician	Maca - Rural	F	Adult
Obstetrician	Chivay - Rural	F	Adult
Mountain Rescue Worker	Chivay - Rural	M	Adult
Physician	Lima - Urban	M	Young Adult
Municipal Officer	Chivay - Rural	M	
Municipal Officer	Chivay - Rural	M	Young Adult
Police Officer	Chivay - Rural	M	Adult
Police Officer	Chivay - Rural	F	Adult
Market Vendor	Chivay - Rural	F	Elderly
Farmer	Tuti - Rural	M	Adult
Farmer	Tuti - Rural	M	Adult
Student	Yanque - Rural	F	Young Adult
Mayor	Tuti - Rural	M	Adult
Business Owner	Tuti - Rural	F	Elderly
Business Owner	Tuti - Rural	M	Adult
Homemaker	Caylloma - Rural	F	Adult
Taxi Driver	Tuti - Rural	M	Young Adult
Construction Worker	Tuti - Rural	M	Adult
Market Vendor	Tuti - Rural	F	Adult
Market Vendor	Chivay - Rural	F	Adult
Market Vendor	Chivay - Rural	F	Adult
Homemaker	Yanque - Rural	F	Adult
Homemaker	Tuti - Rural	F	Adult
Homemaker	Maca - Rural	F	Adult
Taxi Driver	Chivay - Rural	M	Young Adult
Bus Driver	Chivay - Rural	M	Adult
Bus Driver	Chivay - Rural	M	Adult

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Table 1. Demographics of Participants

Both trained providers and community members relayed a range of frustrations surrounding structural challenges, as in, a lack of protocols, systems, supports, or policies. These barriers frequently result in a critical time delay, or a complete standstill of a transfer. From the trained providers perspective, this manifested as an inability to know who to call for reliable assistance with a patient transfer. Health workers felt that care was fragmented in the absence of streamlined protocols or supportive policies. This not only affected their ability to perform the job, but also amounted to perceived negative outcomes for patients.

For community members, structural challenges manifested similarly in that many did not know who to call or how to respond in an emergency. Participants described a cycle of calling the police, the municipality, the health center, and the insurance company, all without ever receiving clear instructions or formation of a plan. Often after pursuing all these avenues, one must still arrange private transportation independently. Negative experiences seeking help during an emergency had led to mistrust in the government to improve these systems, which was expressed by both groups.

Theme	Major Finding	Quote
Structural Challenges	Both health workers and community members mentioned lack of structured care delivery and lack of clear protocols for non-professional EMS as major barriers, as well as expressed a distrust in government to address these deficiencies.	<p>"We need to unify our system for emergency response. We need to unify efforts of police, red cross, hospitals, and ministry of health. We have nothing like 911 where everything is connected."</p> <p>"The truth is many times when we have emergencies, no one knows where to go."</p>
Barriers and Challenges for Health Care Workers	Health care workers spoke most often of lack of resources and equipment (n = 42) and (subsequent) time delays (n = 31). While many desired resources were mentioned, ambulances in particular were most often cited as scarce (25 times).	"Ambulances are not well-equipped. My health center is two hours from Arequipa and to get an ambulance we have to wait at least an hour. Then the one that comes... it doesn't have many medications. No mannitol, no defibrillator, just oxygen."
Barriers and Challenges for Community Members	Community members spoke of many challenges, among the most frequent were cost of transport (n = 43), distance (n = 30), and lack of trust in health centers or health care providers (n = 38).	<p>"Unfortunately, money is what moves things. If you don't have the money, you can't get a [private] car. It's a sad situation."</p> <p>"We go there, and they say go to Arequipa. They say, well, I don't know what your problem is. Maybe it's because they don't have the equipment they need. So, we are doubtful. We say, well it's better to just not go."</p> <p>"Those people [health center staff] are from the big city, they do not understand us."</p>
Community Engagement	Community members shared ideas for improvement, previous experiences helping with emergencies, and expressed willingness to receive first aid training to better assist with witnessed emergencies in the future.	<p>"Because I have seen a lot of accidents, I know the main thing is not to be afraid, just help."</p> <p>"I do not have first aid training but I want to. Because if there is an accident I can know how to react better."</p>

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Table 2. Major Themes with Representative Quotes

Barriers experienced specifically by trained providers most commonly involved deficient resources or equipment and significant time delays during emergency transfers. Very frequently, providers mentioned a lack of ambulances, equipment in ambulances, staff to accompany patients during critical transfers, and basic equipment in their home health centers.

While time delays seemed to originate from many sources along the chain of a transfer, according to providers, resource scarcity was a significant contributor to delays. The most common example being acquiring an ambulance. Small health centers must wait for an ambulance to arrive, to be stocked with supplies, to be fueled, or to find a driver.

As for challenges specific to community members, participants most frequently described cost of care and transport as major barriers. Once again, these barriers resulted in significant cumulative time delays to care. Expenses come from many sources in the event of an emergency. Community members struggle to afford the cost of transportation to a health post, which due to the lack of ambulance services available, usually necessitated a private taxi or bus. In the event that an ambulance was available, some participants described the need to pay for ambulance services up front with hopes of a later reimbursement through their public health insurance.

The challenge of distance was intimately linked to both cost and trust. There was a frustration that one must travel to Arequipa to get what is perceived as very basic health care as a result of the resource deficiencies among the health centers in villages in the Colca Valley. Consequently, this eroded the relationship between the community and health post providers.

Further complicating this relationship, many providers in these health posts in Colca Valley were completing their "SERUMS." For its initials in Spanish (El Servicio Rural y Urbano Marginal

en Salud), SERUM is a service year or internship carried out only by health professionals for the Peruvian State. Since SERUM service has a mandatory requirement to opt for specialty training or work in a public sector health center, and/or to obtain government scholarships for future training, the programs are competitive, and often the best positions are in urban centers. Community members perceive these health care professionals as not only inexperienced, but lacking an understanding of the rural population they serve.

Finally, participants demonstrated a great deal of engagement in solving or bolstering issues. Most prominently, participants described previous experiences of providing care as bystanders during emergencies, displayed willingness to engage in first aid training, and shared their own unique ideas for improvement.

Most participants felt that emergencies, particularly road traffic accidents and acute abdominal pathologies such as bowel obstructions, were frequent. Of the community members, all police officers, municipality workers, and drivers reported helping provide care or transport during an emergency at least once.

Attitudes toward positive change and eagerness to engage in such changes were a central finding. All participants, when asked, expressed a willingness to participate in first aid training. Other ideas for improvement from the community ranged from building of a local hospital, hiring permanent specialist physicians locally, and resources to provide care for the elderly living in the highlands.

Discussion

This study identified barriers and challenges to safer emergency care and transport, while at the same time, identifying engaged community members as potential advocates for new systems. Complex relational dynamics between providers and this community were also identified, which may help inform future interventions.

While the study population and setting are unique in culture and geography, these findings did not divert significantly from what is being reported in similar studies around the world. In a variety of settings lacking formal EMS systems, the burden of EMS assistance and transport often falls on untrained community members. This has prompted many programs to initiate bystander first aid trainings. “Train the trainer” models, in which a group of consultant teachers train or delegate local people to be future leaders in first aid, have certain advantages in this context, including the ability to create long-term infrastructure, as well as circumventing cultural barriers between outside teachers and local community members.

While training alone fails to address the myriad of challenges encountered in rural and under-served high mountain communities in the Andes, layperson first aid training would likely be beneficial and help to fill a gap in service delivery. This type of intervention may not only improve outcomes for injured persons in this area, but would be empowering for local layperson providers who already view themselves as engaged first responders.

Much of these data on EMS in LMICs focus primarily on factors influencing EMS, such as infrastructure and resources, in the process overlooking important socio-cultural aspects. A systematic review published in 2019 evaluated EMS systems in LMICs using Kleinman’s health theory of professional, popular, and folk sectors.⁷ Additionally, the authors utilized a “seeking, reaching, and receiving” framework to evaluate delays in emergency care. This paper highlighted the variety of socio-cultural factors and perceptions that may delay emergency care, all of which lie outside the basic performance of EMS systems from an infrastructural standpoint. These data agree with assertions. Socio-cultural factors seem to play a significant role, particularly with regard to home remedies in lieu of professional sector health care, as well as level of trust in health care providers.

As for the relationship between health providers and the community, both problems and solutions are more nuanced. Deterioration of trust in physicians is not a new dilemma. One study discussed the relationship between the commodification of health care with eroding trust in health care providers. While Perú was not included in this particular study, given the prominence of financial concerns with seeking health care in this population, commodification may be contributing to the distrust expressed by these participants.⁸ To support this idea, it is worth noting that many participants rely heavily on herbal remedies grown on their own farms. This is likely rooted in culture as discussed above, though may be reinforced by financial challenges that come with seeking health care from a clinic.

Perhaps more prominently than financial concerns as a driver of mistrust, a complicated dynamic exists between city-trained providers and rural communities, who seemed to view them as outsiders with differing values. Given these providers are often in their first years outside of medical school on SERUMS, this means that

their service to rural communities often serves as a stepping stone to further residency training or practice elsewhere. As a result, communities have concerns about knowledge gaps from less-experienced providers and are often unable to forge a lasting doctor-patient relationship.

One study examined factors that improve or erode trust in providers in developing health care systems. These authors found that factors like “shared identity” played a much lower role in generating trust than other factors such as “communication skills” or “respect.”⁹ However, other data show that communication skills are themselves highly influenced by cultural identity and ethnic background. One review article, though somewhat Western-centric, described five key predictors for culture-related communication barriers. These include: (1) cultural differences in explanatory models of health and illness; (2) differences in cultural values; (3) cultural differences in patients’ preferences for doctor-patient relationships; (4) racism/perceptual biases; and (5) linguistic barriers.¹⁰ Some of these factors may be at play in this community.

Further exploration in the Colca Valley on relational dynamics between patients and providers might inform future interventions aiming to rebuild trust. Naturally, mending these relationships would aid in general health maintenance and prevention, though could amount to the better, more collaborative handling of medical emergencies as well. This partnership between providers and community members, and the compiling of resources that follows, may be especially important in the setting of a lack of centralized system or protocol for emergency response.

Limitations

These results are intended to provide baseline knowledge to drive future research and programs and provide new knowledge about prehospital emergency care from the perspective of 28 participants. Given the cultural diversity of Perú and unique geographic location, these results cannot be extrapolated to include other populations. Further limitations exist in this study. Firstly, while several participants reported speaking both Spanish and Quechua, no interviews were conducted in Quechua. This could potentially exclude certain perspectives as Quechua-speaking communities make up a large portion of the population in this area. Additionally, differing perspectives on trust in providers and the structure of health care delivery emerged. Further study would be necessary to better understand these dynamics.

Conclusion

While structural changes such as increased infrastructure would likely be the most durable improvement, future interventions focused on empowering community members and improving the relationship between the health center and the community would be beneficial in this community. Additionally, these interview data suggest that a layperson first aid training program would be feasible and well-received.

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