Original Article

Utilization and Management of Ambulance Services: Perspectives of Providers and Recipients

Raka NZ[1], Haque MA[2], Nawrin S[3], Rimi A[4], Alam MA[5], *Nurunnabi M[6]

Abstract

Background: Ambulance services are essential for emergency healthcare, but their utilization and management face significant challenges. **Objectives:** This study examines the utilization of ambulance services by recipients and the management of services by providers. **Methods:** A descriptive cross-sectional study was conducted among 184 service receivers and 28 providers, including administrators, ambulance drivers, and patients, at Shaheed Suhrawardy and Shaheed Tajuddin Ahmad Medical College Hospitals in Gazipur, Bangladesh. Interviews were carried out using a pretested, semi-structured questionnaire from January to December 2022. **Results:** The majority of service users were aged 36-45, with a mean age of 38.2 years. Timeliness of ambulance response varied, with 51.6% receiving a timely response, and most users (52.7%) needed to contact the service multiple times. The majority accessed the ambulance via the hospital's direct number (93.5%), and 89.7% had an ambulance arrive within 16-30 minutes. Equipment limitations were prominent, with few ambulances having oxygen systems (9.8%) or first aid supplies (7.1%). Despite these, 96.7% of users found drivers cooperative, and 94% did not need to pay extra. Service providers were primarily ambulance drivers, with decisions made by the hospital's assistant director and emergency medical officer. The facilities generally had more than five ambulances, but many lacked maintenance support and skilled drivers. Most drivers were inexperienced, performed repairs themselves, and transported fewer than ten patients daily. While most were satisfied with their salaries, there was no training plan for ambulance service management for doctors and nurses. **Conclusion:** This study reveals key challenges in ambulance services, including reliance by lower-income individuals, lack of medical staff, inadequate equipment, and limited driver experience. Despite timely response times and cooperative drivers, the findings highlight the need for improved service delivery, better equipment, and training to enhance overall efficiency and quality.

Keywords: Utilization, management, ambulance services, public hospital, Bangladesh.

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Introduction

Ambulance services are essential to the healthcare system. Their critical role became even more evident during the COVID-19 pandemic, highlighting their importance as a vital public health concern for both healthcare providers and seekers.[1] Ambulance has been appeared as a fundamental requirement in times of medical emergency.[2] However, in low- and middle-income countries, recommendations to improve ambulance services remain insufficient, with ambulances identified as the weakest link in the chain of survival.[3,4] Given the importance of ambulance services, it is recommended that ambulances reach 90% of urban populations within 8 minutes and 90% of rural populations within 25 minutes.[5] Numerous studies conducted on Hospital

Author's Affiliation:

1. Nushrat Zaman Raka, Scientific Research Officer, Public Health Department, Crescent Gastroliver and General Hospital, Dhaka 1205, Bangladesh.
2. Md Ashraful Haque, Project Research Physician, International Centre for Diarrheal Disease Research, Bangladesh, Dhaka 1212, Bangladesh.
3. Sabrina Nawrin, Medical Officer, NICU and Pediatrics Department, Ashiyan Medical College and Hospital, Dhaka 1219, Bangladesh.
4. Afsana Rimi, Medical Officer, Ashiyan Medical College and Hospital, Dhaka 1219, Bangladesh.
5. Mohammad Asraful Alam, Assistant Professor, Department of Public Health and Hospital Administration, National Institute of Preventive and Social Medicine, Dhaka 1212, Bangladesh.
6. *Mohammad Nurunnabi, Assistant Professor, Department of Community Medicine and Public Health, Sylhet Women's Medical College, Sylhet 3100, Bangladesh..

Address of Correspondence : *Mohammad Nurunnabi, Assistant Professor, Department of Community Medicine and Public Health, Sylhet Women's Medical College, Sylhet 3100, Bangladesh. nur.somch@gmail.com , https://orcid.org/0000-0001-9472-9369

Incident Command System (HICS) revealed that prompt transportation from the scene of an incident to the right hospital, along with efficient professional basic first aid and advanced life support pre-clinical care, could provide timely and efficient clinical care, as well as prevent a significant number of deaths and disabilities.[4,6]

Dhaka, one of the largest and most populous metropolitan cities, has now turned into a city of traffic.[7] Sometimes, the traffic congestion makes situations worse for patients who need emergency medical attention in situations like coronary heart disease.[8] Moreover, 90% of all trauma-related fatalities take place in developing countries, and modernization is likely to make this situation worse.[9] It becomes very difficult for them to arrive to the hospitals in a timely manner due to severe traffic congestion. To provide a service for unanticipated urgency, life-threatening health issues and to avoid disease related complications, an efficient management of ambulance services is essential. Patients who call the emergency services go through a variety of steps before being discharged or sent to additional care, including initial contact, telephone-based evaluation and prioritization, on-scene assessment, management, and discharge.[10,11] Ambulance clinicians make critical decisions at every stage, usually in the patient's best interest. However, errors at individual, process, or organizational levels can sometimes lead to adverse events.[12]

Health policy in Bangladesh encourages the use of non-conveyance by ambulance services as a manner of providing care closer to home, even though some non-conveyance is brought on by patient refusal to go. Non-conveyance can improve the effectiveness of the emergency and urgent care system in which ambulance services operate in addition to providing the best response to patients' needs. For instance, low rates of preventable emergency admissions have been linked to high rates of non-conveyance by ambulance services.[13] Although the ambulance service often offers both emergency response and patient transfer on behalf of the healthcare industry, emergency pre-hospital medical treatment is the main responsibility of all ambulance services.[4,14] Through advanced communications infrastructure, they facilitate simple access to health services, especially after hours, and greatly contribute to telephone triage and telephone health services. It has recently been clear that the growing strains on the health system cannot be alleviated solely by additional resources; instead, new approaches to service delivery must be taken.[15,16]

Managing ambulance services poses challenges at multiple workforce levels, particularly miscommunication between managers and healthcare providers in pre-hospital care settings.[17,18] Studies consistently emphasize that effective communication between these stakeholders is crucial for optimal organizational performance in pre-hospital medical practice.[19,20]

Methods

A descriptive cross-sectional study was conducted to evaluate the utilization and management of ambulance services by both service providers and recipients in two purposively selected government tertiary medical college hospitals: Shaheed Suhrawardy Medical College and Hospital and Shaheed Tajuddin Ahmad Medical College Hospital, Gazipur, Bangladesh.

The study purposively included 184 service receivers and 28 service providers, comprising administrators (assistant directors, and emergency medical officers), ambulance drivers, and patients from selected hospitals. Administrators and drivers with at least one year of ambulance service experience met the inclusion criteria. From January to December 2022, participants were interviewed using a pretested, semi-structured, face-to-face questionnaire at their convenience. The pretesting was piloted at Kurmitola General Hospital.

Data were reviewed for completeness and accuracy to exclude any missing or inconsistent entries. Then, it will be entered into IBM SPSS software (version 26) for analysis. Descriptive statistics include frequency and percentage calculations for qualitative data, while mean and standard deviation (SD) used for quantitative data.

Prior to the interviews, the researcher obtained informed consent and permission to record from the participants. Participant confidentiality was upheld throughout the study. The study was approved by the Institutional Review Board (IRB) of the National Institute of Preventive and Social Medicine (NIPSOM), Dhaka 1212, Bangladesh (Reference: NIPSOM/IRB/2017/09).

Results

The results highlight both the utilization of ambulance services by recipients and the management by service providers. Table 1 presents the socio-demographic status of service users, showing that the majority (53.3%) were aged 36–45, while the 18–25 age groups had the lowest usage (4.9%). The mean age of service users was 38.2±10 years. Ambulance use was most common (56.5%) among individuals with a school-level education (SSC) but significantly lower (2.7%) among graduates. Additionally, those earning less than 30,000 taka per month relied more heavily (87.5%) on ambulance services compared to higher-income individuals.

Table 2 reveals a mixed response regarding the timeliness of ambulance service. While 51.6% received a timely response, others did not. Most users (52.7%) had to contact the service at least twice before getting a reply. The majority of service users (93.5%) accessed the ambulance by calling the hospital's direct number, while only 6.5% contacted the emergency helpline (999). In 89.7% of cases, the ambulance arrived within 16-30 minutes at the service recipients' location. None of the respondents (100%) reported the presence of a doctor

or nurse with the ambulance. Regarding equipment, only 9.8% of ambulances had an inbuilt oxygen system, 1.1% was air-conditioned, and 7.1% had first aid supplies. Despite these limitations, 96.7% of users found ambulance drivers to be cooperative, and in 94% of cases, no additional payment was required beyond the agreed-upon fare.

Table 3 presents the socio-demographic characteristics of service providers, with the majority (39.3%) belonging to the 36–45 age group, while a significant portion also falls within the 46–55 age range. Most respondents (75.1%) were ambulance drivers. Service provision decisions were primarily made by the hospital's assistant director (53.6%) and the emergency medical officer (46.3%).

Table 4 outlines the management of ambulance services by the service provider. It reveals that in 53.6% of cases, more than five ambulances were available for service at the facility, and in 64.3% of cases, five or more ambulances were operational. Only 14.3% of ambulances were connected to the emergency helpline (999). In 53.6% of cases, there were more than five driver positions at the facility, but only 17.9% of the time did more than five ambulance drivers actually present during service. Most drivers (57.1%) had less than five years of experience, and none were technologically proficient. The study also showed that none of the facilities had motor mechanics for maintenance support, and in most cases (57.1%), maintenance bills were received as late as a year after the work was done. Additionally, 75% of the time, drivers had to perform repairs themselves. The majority of drivers (53.6%) transported fewer than ten patients a day. While most drivers (78.6%) were satisfied with their salaries, 60.7% received incentives for their services. Reserve drivers were always available at the facilities, but no facilities had a training plan for doctors and nurses in ambulance service management.

Table 1: Socio-demographic status of the service receivers (n=184)

Attributes		Frequency (n)	Percent (%)
Age groups (in years)	18-25	9	4.9
	26-35	21	11.4
	36-45	98	53.3
	46-55	37	20.1
	>55	19	10.3
	Mean±SD	38.2±10.9	
Sex	Male	98	53.3
	Female	86	46.7
Education	Illiterate	32	17.4
	Secondary and below	104	56.5
	Higher secondary and below	43	23.4
	Graduate	5	2.7
Monthly family income (in Taka)	≤30,000	161	87.5
	30,001-50,000	17	9.2
	>50,000	6	3.3
	Mean±SD	25,245.5±6,351.6	

Table 2: Utilization of the ambulance services by the service receivers (n=184)

Attributes		Frequency (n)	Percent (%)
Responses by service provider at time	Yes	95	51.6
	No	89	48.4
Response frequency after contacting ambulance drivers	1 time	84	45.7
	2 times	97	52.7
	>3 times	3	1.6
Waiting times for availing ambulance (in minutes)	≤15	8	4.3
	16-30	165	89.7
	>30	11	6.0
	Mean±SD		28.1±6.6
Presence of doctor or nurse in ambulance	Yes	0	0
	No	184	100
Presence of oxygen supply system in ambulance	Yes		9.8
	No		90.2
Presence of air condition system in ambulance	Present	2	1.1
	Absent	182	98.9
Presence of first aid facility in ambulance	Yes	13	92.9
	No	171	7.1
Attitude of co-operation of ambulance drivers	Cooperative	178	96.7
	Non- cooperative	6	3.3
Had paid extra amount out of rent	Yes	11	6.0
	No	173	94.0
Availed ambulance by calling	Hospital ambulance number	172	93.5
	Emergency help line (999)	12	6.5

Table 3: Socio-demographic status of the service providers (n=28)

Attributes		Frequency (n)	Percent (%)
Age groups (in years)	18-25	2	7.1
	26-35	5	17.9
	36-45	11	39.3
	46-55	10	35.7
	Mean±SD	42.8±6.2	
Respondent's designation	Assistant director	2	7.1
	Emergency medical officer	2	7.1
	Driver superintend	3	10.7
	Drivers	21	75.1
Decision-maker for provision of ambulance services	Assistant director	15	53.6
	Emergency medical officer	13	46.4

Table 4: Management of the ambulance services by the service providers (n=28)

Attributes		Frequency (n)	Percent (%)
Presence of ambulances in the facility	≤5	13	46.4
	>5	15	53.6
Number of functional of ambulances in the facility	≤5	18	64.3
	>5	10	35.7
Number of post for ambulance drivers	≤5	13	46.4
	>5	15	53.6
	Mean±SD		7.5±2.5
Number of ambulance drivers presented in their post	≤5	23	82.1
	>5	5	17.9
	Mean±SD		5.1±2.4
Administrators provide regular necessary bills	Yes	17	60.7
	No	11	39.3
Post for motor mechanic	Yes	0	0.0
	No	28	100
Presence of ICU in ambulance	Yes	12	42.9
	Not in all	13	46.4
	No	3	10.7
Experience of ambulance driver	≤5 years	16	57.1
	>5 years	12	42.9
Technology use by drivers	Yes	0	0.0
	No	28	100
Duration of paying repairing bill	7 days	4	14.3
	1 month	5	17.9
	6 months	3	10.7
	1 year	16	57.1
Regular register check by driver supernatant	Yes	22	78.6
	No	6	21.4
Number of patients carry in a day	≤10	15	53.6
	>10	13	46.4
Drivers' satisfaction with salary structure	Yes	22	78.6
	No	6	21.4
Driver get incentives	Yes	17	60.7
	No	11	39.3
Self-repair ambulance during patient transfer if minor issues arise	Yes	21	75
	No	7	25
Daily distance covered by drivers	≤10	20	71.4
	>10	8	28.6
Ambulance connected with emergency helpline (999)	Yes	4	14.3
	No	24	85.7
Ambulance used for non-clinical purposes	Yes	0	0.0
	No	28	100
Received phone calls for ambulance services	Yes	0	0.0
	No	28	100
Checking ambulance waiting time by drivers	Yes	0	0.0
	No	28	100
Availability of reserve ambulance driver	Yes	28	100
	No	0	0.0
Proposed position for motor mechanic	Yes	0	0.0
	No	28	100
Training plan for doctors and nurses in ambulance service management	Yes	0	0.0
	No	28	100

Discussion

One of the major patterns that are revealed from utilization trends shown for ambulance services with respect to users' demographic characteristics and the operational effectiveness of the service administration is the finding of the research. It is evident from the results that ambulance services are being used mainly by persons aged from 36 to 45 years, accounting for 53.3% of total usage. Young people from 18 to 25 years form the category of least usage of ambulance services, accounting for only 4.9%. The mean age of users of the service is 38.2 years, indicating that middle-aged individuals are more prone to needing emergency medical transport. A study in Ethiopia shows similarity with this study where average age of ambulance service takers is between 25-44 years.[21] This resemblance can be explained by younger median age of both Bangladesh and Ethiopia.[21,22] Another study shows males are the majority of service takers which resonates this study.[23]

While considering service utilization, service takers from this study clearly shows similar trend with other study where most of the people receive ambulance service in time.[24,25] This study has explored a discrepancy with ambulance service in Nepal which shows that about half of Nepali ambulance has first aid box and almost all has built in oxygen system.[26] These differences can be described by the well-structured ambulance service in Nepal comparing to Bangladesh despite of their position among the lower middle income countries.[27,28] While investigating the waiting time for ambulance service, differences appear between this study and survey conducted in Karnataka and Tamil Nadu where most of the service takers are reluctant to receive the service because of its longer waiting time.[29] But it is more in line with the results from a study in Malaysia that shows 95% ambulances are able to arrive in time.[30]

Conclusion

This study provides valuable insights into the utilization and management of ambulance services. It identifies that the majority of service users are aged 36-45, with lower-income individuals being more dependent on ambulance services. While response times were generally timely, there were significant challenges related to the lack of medical staff and inadequate equipment in ambulances. Additionally, issues such as limited driver experience, insufficient maintenance support, and the absence of training for medical personnel were highlighted. Despite these shortcomings, drivers were cooperative and generally satisfied with their compensation. The findings emphasize the critical need for improvements in service delivery, equipment, and training to enhance the overall quality and efficiency of ambulance services.

References

1. Vuilleumier S, Spichiger T, Denereaz S, Fiorentino A. Not only COVID-19 disease impacts ambulance emergency demands but also lockdowns and quarantines. BMC emergency medicine. 2023;23(1):4.
2. Lentz T, Groizard C, Colomes A, Ozguler A, Baer M, Loeb T. Collective Critical Care Ambulance: an innovative transportation of critical care patients by bus in COVID-19 pandemic response. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine. 2021;29(1):78.
3. Sanson G, Verduno J, Zambon M, Trevi R, Caggegi GD, Di Bartolomeo S, Antonaglia V. Emergency medical service treated out-of-hospital cardiac arrest: Identification of weak links in the chain-of-survival through an epidemiological study. European journal of cardiovascular nursing. 2016;15(5):328-36.
4. Yesmin T, Shaheen S, Rahman T, Rahman MS, Moulee ST, Ferdous J, Ferdouse M, Akter F, Nurunnabi M. Management of Emergency Department Services at a Secondary Level Hospital. Journal of Monno Medical College. 2024;10(1):36-42.
5. Pons PT, Markovchick VJ. Eight minutes or less: does the ambulance response time guideline impact trauma patient outcome. The Journal of emergency medicine. 2002;23(1):43-8.
6. Shooshtari S, Tofighi S, Abbasi S. Benefits, barriers, and limitations on the use of Hospital Incident Command System. Journal of Research in Medical Sciences. 2017;22(1):36.
7. Numbeo. Traffic Index by City 2019 [Internet]. Numbeo.com. 2019. Available from: https://www.numbeo.com/traffic/rankings.jsp (Cited on October 21, 2024)
8. Khaled MF, Adhikary DK, Islam MM, Alam MM, Rahman MW, Chowdhury MT, Perveen R, Ahmed S, Ashab E, Shakil SS, Ansari S. Factors responsible for prehospital delay in patients with acute coronary syndrome in Bangladesh. Medicina. 2022;58(9):1206.
9. Dijkink S, Nederpelt CJ, Krijnen P, Velmahos GC, Schipper IB. Trauma systems around the world: a systematic overview. Journal of trauma and acute care surgery. 2017;83(5):917-25.
10. Islam MM, Hoque MB, Alam MB, Nahar A, Ferdousi N, Nurunnabi M. Outpatients' Satisfaction on Healthcare Services of a Medical College Hospital in Dhaka. Z H Sikder Women's Medical College Journal. 2023;5(1):22-27

11. Booker MJ, Simmonds RL, Purdy S. Patients who call emergency ambulances for primary care problems: a qualitative study of the decision-making process. Emergency Medicine Journal. 2014;31(6):448-52.

12. Chowdhury N, Nurunnabi M, Refat MNH, Miah KA, Islam MZ. Out-of-Pocket Expenditures of the Injured Patients Admitted in Casualty Unit of CMCH. Journal of Preventive and Social Medicine. 2022;41(1):35-40.

13. O'Cathain A, Knowles E, Bishop-Edwards L, Coster J, Crum A, Jacques R, James C, Lawson R, Marsh M, O'Hara R, Siriwardena AN. Understanding variation in ambulance service non-conveyance rates: a mixed methods study. Health Services and Delivery Research. 2018;6(19):1-244.

14. Anantharaman V, Han LS. Hospital and emergency ambulance link: using IT to enhance emergency pre-hospital care. International journal of medical informatics. 2001;61(2-3):147-61.

15. Nurunnabi M, Tarafdar MA. Factors affecting Patient Satisfaction at Outpatient Department in a Tertiary Level Hospital. Osmani Medical Teachers Association Journal. 2017;16(2):140-143.

16. Nurunnabi M, Tarafdar MA, Kaiser FR. Study on Level of Satisfaction of the Patients Attending Outpatient Department of a Tertiary Level Hospital at Sylhet. Journal of Sylhet Women's Medical College. 2018;8(1):16-21.

17. Guil JO, Rodriguez-Martin MA, Olle ME, Blanco CA, Rodellar MT, Pedrol EN. Emergency department management of ambulance services. Emergencias. 2009;21(3):183-5.

18. Alruwaili A, Alanazy A, Alanazi TM, Alobaidi N, Almamary AS, Faqihi BM, Al Enazi FH, Siraj R, Almukhlifi Y, Al Nufaiei ZF, Alsulami M. Managing High Frequency of Ambulance Calls in Hospitals: A Systematic Review. Risk Management and Healthcare Policy. 2024:287-96.

19. Chowdhury SM, Islam ANMS, Rahman MR, Zabir MA, Khan S, Azizi S, Nurunnabi M. Levels of Patient Satisfaction Regarding Healthcare Services in Upazila Health Complexes. Eastern Medical College Journal. 2023;8(2):31-38.

20. O'Hara R, Johnson M, Hirst E, Weyman A, Shaw D, Mortimer P, Newman C, Storey M, Turner J, Mason S, Quinn T. A qualitative study of decision-making and safety in ambulance service transitions. Health services and delivery research. 2014;2(56).

21. Adem MA, Tezera ZB, Agegnehu CD. The practice and determinants of ambulance service utilization in pre-hospital settings, Jimma City, Ethiopia. BMC Emergency Medicine. 2024;24(1):81.

22. World Health Organization Data: Bangladesh Health data overview. World Health Organization: 2023. Available from: https://data.who.int/countries/050 (Cited on October 21, 2024)

23. Asfaw FZ, Yalew AZ, Godie M, Fikadu A, Workina A. Ambulance service satisfaction level and associated factors among service users in Addis Ababa, Ethiopia. BMC Emergency Medicine. 2024;24(1):92.

24. Huabbangyang T, Sangketchon C, Piewthamai K, Saengmanee K, Ruangchai K, Bunkhamsaen N, Keawjanrit P, Tonsawan R. Perception and satisfaction of patients' relatives regarding emergency medical service response times: A cross-sectional study. Open Access Emergency Medicine. 2022:155-63.

25. Pham JC, Patel R, Millin MG, Kirsch TD, Chanmugam A. The effects of ambulance diversion: a comprehensive review. Academic Emergency Medicine. 2006;13(11):1220-27.

26. Acharya R, Badhu A, Shah T, Shrestha S. (2017). Availability of Life Support Equipment and its Utilization by Ambulance Drivers. Journal of Nepal Health Research Council. 2017;15(2):182-86.

27. Waterstone AM, Prendergast NJ, Gongal R, Il'yasova D, Walker R. Ten Years of the Nepal Ambulance Service: Successful and Sustainable Efforts. Wilderness & Environmental Medicine. 2022;33(4):454-59.

28. World Bank Country and Lending Groups. World Bank: 2023. Available from: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups (Cited on October 21, 2024)

29. Raj AX. Saving lives through rural ambulance services: Experiences from Karnataka and Tamil Nadu states, India. Transport and Communications Bulletin for Asia and the Pacific. 2014;84:52-66.

30. Sujak AF. A Study on Ambulance Response Time in Kuala Lumpur, Malaysia. (Doctoral dissertation) Universiti Sains Malaysia. 2008.