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Factors that influence ambulance response time in handling emergency cases in Magelang, Central Java

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Abstract

Ambulance response time is an important factor in emergency medical services (EMS) outcomes. The Magelang region is an area with diverse conditions. However, the government has implemented a "one village one ambulance" program to improve emergency services to the community. Timely treatment can have a significant impact on patient survival and recovery. This study aims to identify and analyze factors that influence ambulance response times in handling emergency cases in the Magelang area. Using a combination of quantitative methods, data were collected from a variety of EMS providers, including urban and rural areas providing emergency services. This study examines variables such as geographic location, traffic conditions, communications, availability of ambulance units, time of day, call volume, weather conditions, and dispatch system efficiency. The sample used was the Magelang area ambulance team. The results showed that the characteristics of the respondents were 82% village ambulances, 15% volunteer ambulances and 3% government ambulances. The majority of respondents, 88%, have worked for 1-5 years and 87% already have an ambulance training certificate. Of the 34 respondents, the average response time was 11-20 minutes (47%) and the average was 21-30 minutes (26%). Factors that influence the response time to the incident location are difficult/distant locations (88%) and 6% stated a lack of effective communication. Meanwhile, factors that influence the response time from the incident location to the health service center are sometimes traffic congestion, no communication between the ambulance team and the referral health service location, and the ambulance team's preparedness is still lacking. This study also found that 88% of respondents stated that ambulance management was not yet effective and 97% of respondents wanted continuous ambulance team training.

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Keywords

Response time, Ambulance, Emergency medical services, Pre-hospital services

Introduction

Emergency conditions for critical patients can occur anywhere and at any time, and can happen to anyone (no age limit), threaten the safety and life of the victim, can occur at

any time. Handling emergencies requires speed, calmness, breadth of knowledge obtained by a person from experience or from increasing competence and skills as well as understanding emergency science by prioritizing the safety of both health workers, patients and the environment when providing emergency assistance. An officer in providing emergency assistance is obliged to pay attention to holistic bio-psycho-socio-spiritual aspects by prioritizing monitoring of the victim's vital signs consisting of airway respiratory circulation, which focuses on safety and stability (life support) [1].

The World Health Organization (WHO) notes that 90% of pre-hospital trauma care incidents occur in lower middle income countries and are the cause of around 5.8 million deaths each year [2]. Meanwhile, the number of accidents in Indonesia continues to increase every day. Accidents can take the form of traffic accidents, punctures by sharp objects, fires or natural disasters. In Indonesia, according to data from the Republic of Indonesia Police, the number of traffic accidents that occurred during January-November 2023 has reached 134,867 cases. Meanwhile, Central Java is ranked second in accident cases, namely 29,031 cases. In Magelang Regency in 2023 there will be 993 accident cases and there will be 1,232 victims, deaths, minor injuries and serious injuries.

Ambulance service is one form of prehospital assistance, especially in Indonesia. One form of ambulance service is a referral patient transportation service with certain conditions between health facilities. Prehospital is the first line of care services. Prehospital ambulance services can be used to provide first aid to patients experiencing trauma or non-trauma with various unexpected conditions. Therefore, ambulance drivers should have skills in the aspect of patient transportation so they can help ease the duties of doctors and nurses during evacuation and transportation.

In pre-hospital treatment carried out by ambulance teams, ambulance response time is one of the most important factors in determining the results of Emergency Medical Services (EMS). Fast and appropriate handling of emergency cases can contribute to reduced mortality and better patient recovery. In line with the development of health services in Indonesia, especially in the Magelang area, the Government has launched the "One Village One Ambulance" program which aims to increase the accessibility and quality of emergency medical services. This program is expected to reduce geographical barriers and increase the efficiency of ambulance responses to emergency cases that occur.

The Magelang area, which has a combination of urban and rural areas, presents its own challenges in terms of ambulance response times. Varying geographic conditions, uneven road infrastructure, and traffic jams in urban areas can slow down the arrival time of ambulances at the scene. Apart from that, other factors such as the availability of ambulance units, the readiness of medical personnel, and the efficiency of the communication system between ambulance officers and hospitals also influence the performance of ambulance responses in the field.

Method

This research uses a quantitative approach with descriptive and analytical research design to identify and analyze factors that influence ambulance response times in handling emergency cases in the Magelang area, Central Java. This study involved various emergency medical services (EMS) providers spread across urban and rural areas.

Results and Discussion

As the number of accidents increases, be it traffic accidents, natural disasters or other trauma, Indonesia is facing major challenges in terms of providing emergency medical services. The ambulance service, which is at the forefront of pre-hospital treatment, plays an important role, especially in transporting patients between health facilities and providing first aid to victims of trauma or other emergency medical conditions. The "One Village One Ambulance" program launched by the government aims to increase the accessibility of emergency medical services, especially in rural areas, but various challenges remain. The Magelang region, with its combination of urban and rural areas, presents its own challenges regarding ambulance response times. Factors such as geographical conditions, road infrastructure, traffic jams, as well as the readiness of medical personnel and ambulance units, also influence the efficiency of these services. The results of this research are as follows:

Respondent characteristics

The characteristics of respondents in this study involve various parties directly involved in emergency medical services, especially in the prehospital ambulance system in Magelang Regency. Ambulance institution can be seen on Figure 1.

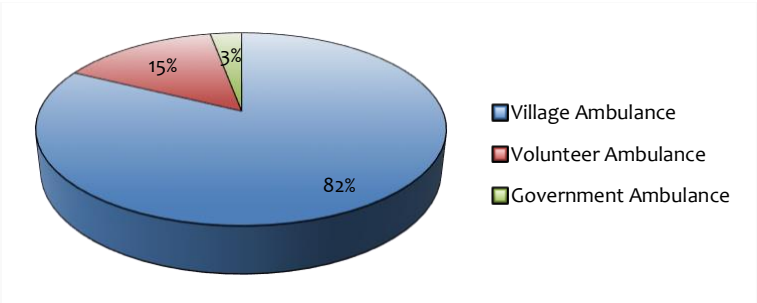

Figure 1. Ambulance institution

From the Figure 1, it shows that the majority of respondents are village ambulance teams with a percentage of 82 %. The village ambulance team is an important part of the health service system at the village level, especially in emergency services. The function of this team is very crucial, especially in providing a quick response to emergency conditions that occur in the community, such as accidents, heart attacks, childbirth, or other acute illnesses that require immediate treatment. It is hoped that the existence of this ambulance team can increase the accessibility of health services for people in rural areas who often experience limited health facilities. According to a study by Herlina et

al., the presence of a well-organized village ambulance team can reduce waiting times for patients and increase the number of timely referrals to hospitals or health centers. Village ambulances have a significant role in reducing the death rate due to delays in medical treatment. Village ambulances are not only a means of transportation, but also as the main support in efforts to improve health services in remote areas. According to the Ministry of Health of the Republic of Indonesia [3], the existence and improvement of village ambulance facilities is very important to support fair and equitable health services. Length of work can be seen on Figure 2.

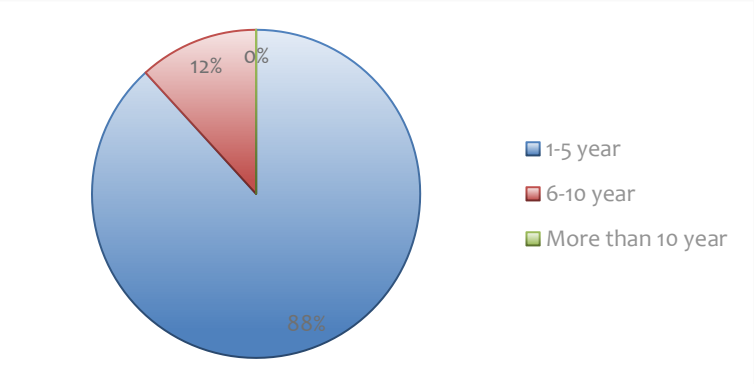

Figure 2. Length of Work

From the Figure 2, it shows that 88 % of respondents have worked as an ambulance team for between 1-5 years. Working as part of an ambulance team is a challenging, yet noble and crucial task in the healthcare system. The ambulance team is responsible for responding quickly to emergency medical calls, taking patients to the appropriate medical facility, and providing lifesaving first aid. In its implementation, this work involves various professions, including ambulance drivers, paramedics, and other medical personnel. Each team member has an important role in supporting each other to ensure patients get the right care at the right time. Therefore, working time will be the most important thing in saving patients. And Availability of competency certificates can be seen on Figure 3.

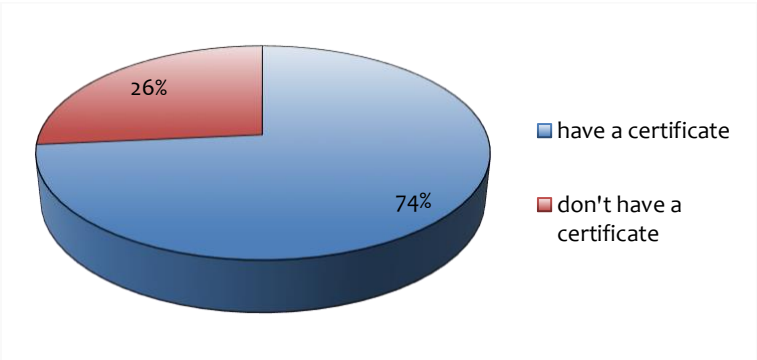

Figure 3. Availability of competency certificates

Figure 3 shows that as many as 74% of respondents have a competency certificate in the ambulance team. Ambulance teams that have various cross-professional lines are required to have certified capabilities. For example, an ambulance driver can make quick decisions regarding the best route to take to minimize travel time. Paramedics have

skills in cardiopulmonary resuscitation (CPR), bleeding control, and trauma management, and must be able to carry out medical evaluations quickly [4]. Position on the ambulance team can be seen on Figure 4.

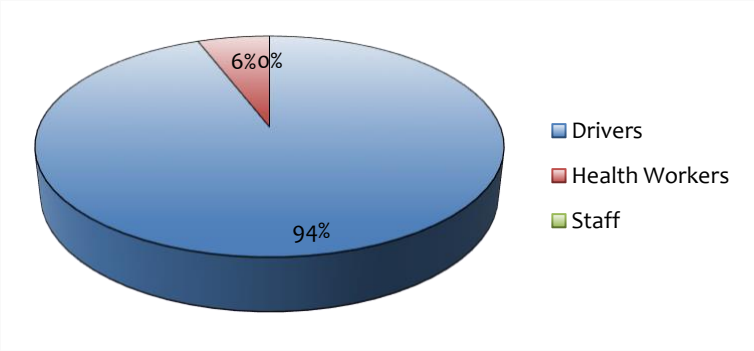

Figure 4. Position on the ambulance team

Figure 4 shows that 94 % of respondents are ambulance drivers. Ambulance drivers have a very important role in the emergency healthcare system. Apart from being tasked with driving the vehicle to the scene of the incident and the hospital, the ambulance driver must also ensure that the journey takes place safely and quickly, remembering that every second is very valuable in an emergency situation. In addition, they must be able to make quick decisions regarding the best route that can speed up travel, especially in areas with inadequate road infrastructure [5]. Other research shows that ambulance drivers often work under high time pressure. Every second counts, and delays can be fatal for the patient. This can cause stress and affect the performance of drivers, who must remain focused even in stressful situations [6]. Apart from that, effective communication between the driver and the medical team can speed up patient treatment and increase the effectiveness of emergency services [7].

Availability of standby ambulance drivers

Ambulance services in carrying out the pre-hospital emergency response stage. In this research, the availability of ambulance drivers was found as follows in Figure 5.

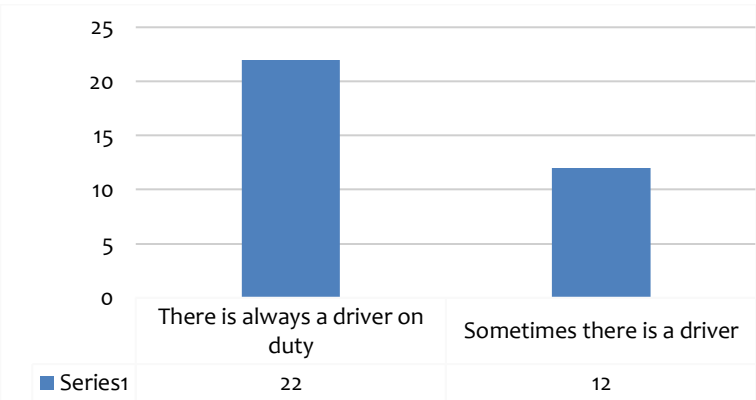

Figure 5. Driver alertness

One of the main findings is the availability of ambulance drivers who are on standby when an emergency call comes. This research shows that 61% have standby drivers. Ambulance drivers being unavailable or not at the ambulance location can slow down

response times. In some cases, reliance on a trained and available driver is a crucial factor in determining the speed of ambulance response. This is in accordance with the findings reported by a previous study, which showed that ambulance driver readiness had a significant influence on the duration of response time [8].

Geographic location and accessibility

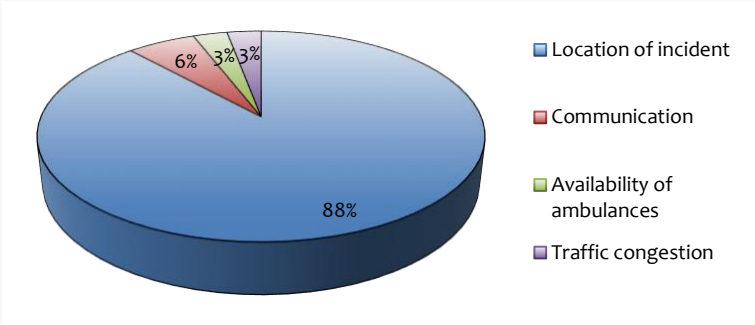

Figure 6. Delay factor

This research shows (Figure 6) that 88% of the factors for delays in emergency services are difficult incident locations. Geographic location plays an important role in determining response time. Urban areas with better road access tend to have faster response times compared to rural areas that are more remote and have limited infrastructure.

Traffic congestion

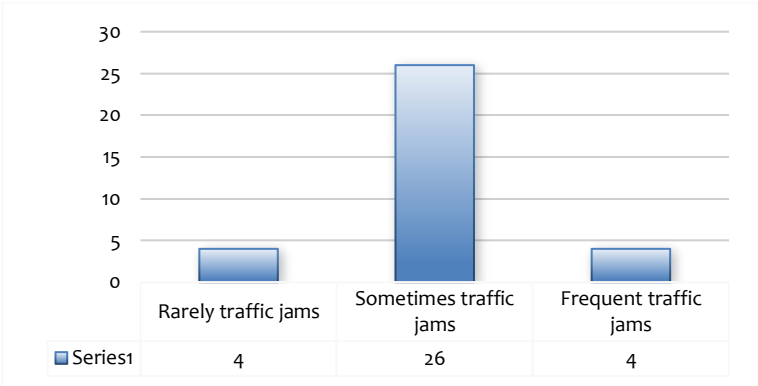

Figure 7. Traffic conditions

This research shows that 76 % of the time, traffic is often a factor in delays. Traffic conditions (Figure 7) are a very significant factor in influencing ambulance response times. The results of this study show that during peak hours or in locations with high traffic density, response times can increase significantly. This includes areas with congestion such as main roads and market areas which often become obstacles for ambulances in reaching the scene. These findings are consistent with studies [9], which shows a strong relationship between traffic density and ambulance response times. Traffic jams that often occur in downtown Magelang cause delays, so ambulances have to take longer alternative routes. This is in line with previous research which identified that traffic congestion in urban areas is the main factor that slows down response times [10].

Emergency call volume

This research also found that high call volumes, especially when concurrent emergency situations occur, lead to longer ambulance response times. Simultaneous calls, occurring at nearly the same time in different locations, cause ambulances to choose case priorities. This exacerbates delays in response times, especially if there are only a few ambulance units available to handle a large number of cases, and weather factors can be seen on Figure 8.

Weather conditions

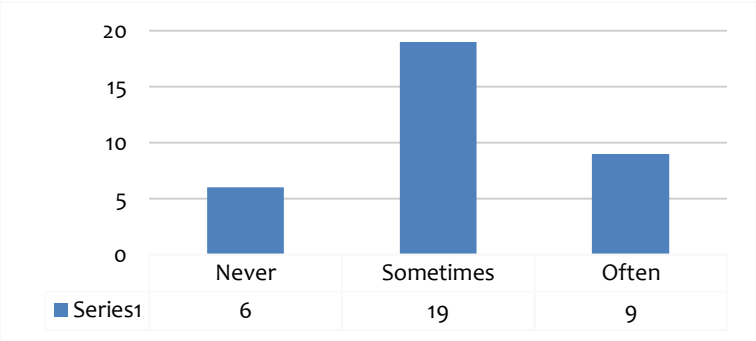

Figure 8. Weather Factors

This research shows (Figure 8) that 56% of respondents said that weather factors often hinder service. Bad weather conditions, such as heavy rain or thick fog, also worsen ambulance response times. In some cases, ambulance travel is hampered by slippery road conditions or limited visibility. Although this factor does not always occur, its impact is quite significant, especially during the rainy season. This finding is consistent with previous research which revealed that bad weather can be a major obstacle in ambulance response time [8].

Communication protocol and delivery efficiency

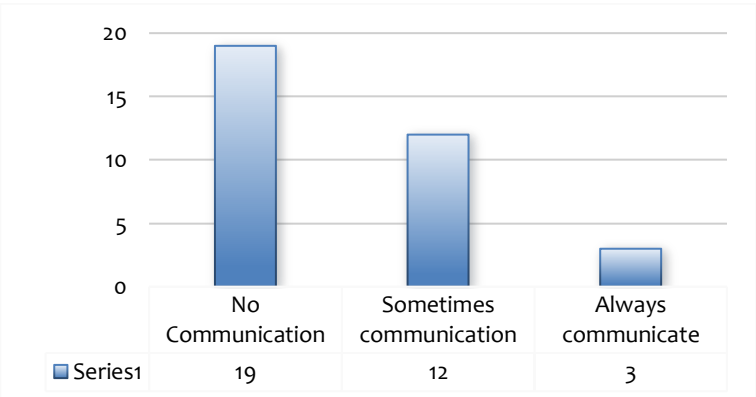

Figure 9. Communication with health facilities

This research shows that 56 % of ambulance teams do not communicate when making patient referrals. A good communication system between ambulance drivers and hospitals plays a very important role in minimizing delays. Fast and clear communication protocols between cross-village ambulance teams and hospitals can speed up the process of dispatching ambulance units and minimize response times. This also shows

(Figure 9) the importance of using an integrated information system between ambulance units, communication centers and health facilities in reducing waiting times [10].

Conclusion

From the research data carried out in this study, it shows that as follows on Figure 10. The research results show that several factors influence ambulance response times in the Magelang area including driver availability, geographic and traffic conditions, call volume, weather conditions, and communication and dispatch systems connected to hospitals. Therefore, to increase the efficiency of ambulance response times, optimal ambulance fleet management is needed, improving the quality of communication between systems, as well as developing information technology that supports integrated emergency management.

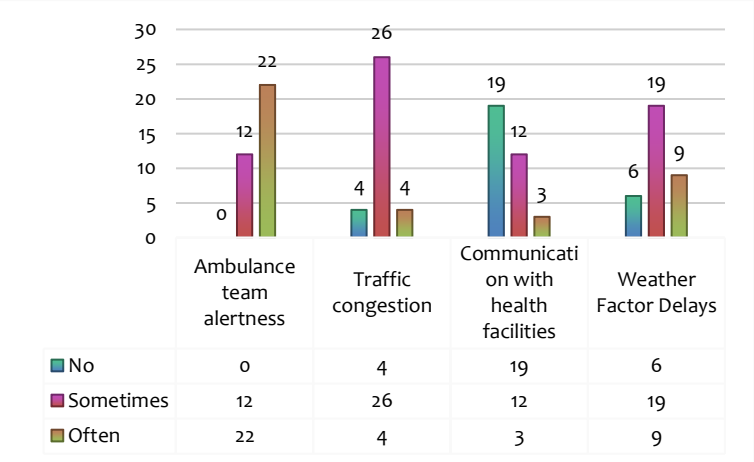

Figure 10. Inhibiting Factors Towards Health Services

Acknowledgement

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