JURNAL KEPERAWATAN TERPADU
(Integrated Nursing Journal)
http://jkt.poltekkes-mataram.ac.id/index.php/home/index
p-ISSN: 2406-9698 (Print)
e-ISSN: 2685-0710 (Online)

The Role of Telemedicine in Emergency Medical Services in Remote Areas of West Nusa Tenggara: An Evaluative Study

Hadi Kusuma Atmaja[1], Erien Luthfia[2], Ani Haryati[3], Muhammad Hasbi[4], Lale Wisnu Andrayani[5], Lina Sundayani[6]

[1,3,4,5]Department of Nursing, Poltekkes Kemenkes Mataram, Indonesia
[2,6]Department of Midwifery, Poltekkes Kemenkes Mataram, Indonesia

Abstrak

Di banyak negara, termasuk Indonesia, akses terhadap layanan medis darurat masih menjadi tantangan besar, terutama di daerah terpencil. Teknologi Telemedis (*telemedicine*) diharapkan dapat menjadi solusi yang efektif untuk meningkatkan aksesibilitas dan kualitas layanan kegawatdaruratan. Penelitian ini bertujuan untuk memberikan gambaran menyeluruh tentang implementasi *telemedicine* dalam layanan medis darurat di daerah terpencil di Pulau Lombok, Nusa Tenggara Barat. Data dikumpulkan melalui observasi partisipatif, wawancara mendalam dengan pemangku kepentingan, seperti tenaga medis dan masyarakat setempat, serta analisis dokumen terkait penerapan *telemedicine*. Hasil penelitian ini menunjukkan bahwa *telemedicine* secara signifikan meningkatkan aksesibilitas, memungkinkan warga untuk mendapatkan konsultasi medis tanpa harus melakukan perjalanan jarak jauh, sehingga mengurangi waktu dan biaya untuk mendapatkan layanan tepat waktu. Selain itu, *telemedicine* meningkatkan waktu respons dan koordinasi antara tim medis lapangan dengan pusat layanan kesehatan, sehingga memungkinkan diagnosis yang lebih akurat dan penanganan keadaan darurat yang efektif. Namun, penelitian ini juga mengungkapkan beberapa tantangan dalam implementasi *telemedicine*, diantaranya adalah mencakup terbatasnya infrastruktur teknologi dan kurangnya personel terlatih dalam menggunakan teknologi *telemedicine*. Untuk mengoptimalkan penerapan *telemedicine*, diperlukan upaya penguatan infrastruktur teknologi dan peningkatan kapasitas tenaga medis di daerah terpencil. Hasil penelitian ini merekomendasikan beberapa masukan bagi pengembangan kebijakan dan praktik untuk meningkatkan efektivitas dan inklusivitas layanan medis darurat melalui *telemedicine*, yang diharapkan dapat berkontribusi pada pemahaman yang lebih luas tentang bagaimana teknologi dapat dimanfaatkan untuk meningkatkan pemberian layanan kesehatan di daerah terpencil dan pedesaan.

Kata Kunci : *Telemedicine*; Kegawatdaruratan; Daerah Terpencil; Pelayanan medis

Abstract

In many countries, including Indonesia, access to emergency medical services remains a significant challenge, especially in remote areas. Telemedicine technology is expected to be an effective solution for improving accessibility and the quality of emergency services. this research aims to provide a comprehensive overview of the implementation of telemedicine in emergency medical services in remote areas at Lombok Island, West Nusa Tenggara. The research procedure is structured into several main stages, including planning, data collection, data analysis, and reporting. Data is collected through participatory observation, in-depth interviews with stakeholders such as healthcare workers and the local community, as well as document analysis related to the implementation of telemedicine. The results showed that telemedicine significantly improves accessibility, allowing residents to obtain medical consultations without having to travel long distances, thereby reducing the time and cost of receiving timely services. Furthermore, telemedicine enhances response time and coordination between field medical teams and health service centers, enabling more accurate diagnoses and effective management of emergencies. However, this research also reveals several challenges in the implementation of telemedicine, including limited technological infrastructure and a lack of trained personnel in using telemedicine technology. To optimize the implementation of telemedicine, efforts are needed to strengthen technological infrastructure and enhance the capacity of medical personnel in remote areas.

Thie study research recommend several inputs for the development of policies and practices to enhance the effectiveness and inclusiveness of emergency medical services through telemedicine.

Keywords: Telemedicine; Emergency; Medical Services; Remote Areas

INTRODUCTION

Access to quality healthcare services is a fundamental right of every individual. However, in many parts of the world, especially in remote and rural areas, the challenge of accessing healthcare services remains very significant. (WHO, 2021). Indonesia, as an archipelagic country with more than 17,000 islands, faces these issues in a tangible way, especially for communities living in remote areas (Kemenkes, 2020). Geographical obstacles, inadequate infrastructure, and a shortage of medical personnel are the main factors that hinder residents in remote areas from receiving timely emergency medical care (Putra et al., 2022). As a result, morbidity and mortality are often unavoidable.

Telemedicine technology has emerged as a potential solution to address these challenges. Telemedicine is the use of telecommunications technology to provide healthcare services remotely, allowing patients in remote areas to consult with medical professionals without the need for long physical travel (Bashshur et al., 2016). In the context of medical emergencies, telemedicine becomes very important because it can expedite the necessary diagnosis and treatment, as well as provide access to specialists even if they are far from the incident location (Scott & Mars, 2020).

Despite its great potential, the implementation of telemedicine in remote areas still faces several major challenges. One of them is the limitation of technological infrastructure, such as unstable internet access, as well as the lack of skilled human resources in operating telemedicine technology. (Moehr et al., 2017). Moreover, comprehensive evaluations of the impact of telemedicine on emergency medical services in remote areas are still rare (Dharmawan et al., 2021), so the development of effective strategies to maximize the use of telemedicine in these regions has not yet been optimal.

Through case studies in several remote villages on Lombok Island, this research aims to provide a comprehensive overview of the implementation of telemedicine in emergency medical services. The study seeks to describe its role in improving the accessibility of emergency care, reducing response times, and enhancing coordination between healthcare workers in the field and health service centers. This approach is intended to identify potential benefits, challenges, and opportunities that can be optimized to strengthen healthcare services in remote areas.

The benefits of this research include the development of more inclusive and effective policies in providing emergency medical services in remote areas. Additionally, this research is also expected to provide practical recommendations for strengthening technological infrastructure and training for medical personnel in using telemedicine, thereby addressing the existing barriers.

METHOD

This research uses a qualitative case study design to evaluate the effectiveness of telemedicine in improving emergency medical services in remote areas. The case study approach was chosen because it allows for an in-depth understanding of the experiences and outcomes related to the implementation of telemedicine in remote villages. This case study provides an opportunity to explore the contextual factors that influence the success and challenges in the implementation of telemedicine.

A. Research Procedure

The research process consists of several main stages, namely: planning, data collection, data analysis, and reporting.

1. Planning Phase

a. The study focused on remote villages on Lombok Island, Indonesia, where access to emergency medical services is limited. Three villages were selected based on their geographical isolation and lack of healthcare infrastructure.

b. The selection criteria included distance from healthcare centers, population size, and the presence of telemedicine services.

c. Participants included healthcare providers, patients, and community leaders involved in telemedicine use. A purposive sampling method was used to select 15 respondents: five healthcare providers, five patients, and five community leaders.

d. Data collection instruments included interview guides, observation checklists, and document review templates.

2. Data Collection Phase

Data collection is conducted through several methods, namely participatory observation, in-depth interviews, and document analysis.

a. Observation: Researchers document the use of telemedicine in emergency situations in real-time at the selected location

b. Semi-structured interviews were conducted face to face with 15 respondents in their respective villages. The respondents were selected using a purposive sampling method to ensure a diverse representation of stakeholders involved in telemedicine implementation.

1. Respondents: The interviews included five healthcare providers, five patients who had utilized telemedicine for emergency services, and five community leaders familiar with the telemedicine initiative.
2. Selection Criteria:
    a. Healthcare providers were chosen based on their direct involvement in delivering telemedicine services during emergencies.
    b. Patients were selected if they had used telemedicine for emergency medical assistance within the past six months.

c. Community leaders were included to provide contextual insights into telemedicine's broader impact on the village.

3. Procedure: The interviews explored the respondents' experiences, perceptions, challenges, and suggestions regarding telemedicine use. The interviews were conducted in person to facilitate open communication and ensure a detailed understanding of each participant's perspective.
4. Document Analysis: Related documents, such as medical records, will be reviewed to provide additional information regarding the implementation of telemedicine.

3. Data Analysis Phase

a. Interviews were recorded, transcribed verbatim, and analyzed using NVivo qualitative data analysis software. The objective of the analysis was to capture and describe the implementation of telemedicine in remote villages, focusing on identifying challenges, outcomes, and the contextual factors influencing its application.
b. Triangulation is conducted to ensure the validity and reliability of the data by verifying information from various sources.

4. Reporting Phase

a. Research findings are synthesized into a comprehensive report, covering the evaluation of telemedicine effectiveness, supporting and inhibiting factors, as well as policy and practice recommendations.
b. The results of this research will be provided to stakeholders, including healthcare providers and policymakers, and published in relevant academic journals.

B. Validity Testing and Data Acquisition

1. Validity Testing: To ensure the validity of the data collection instrument, a trial was conducted in a village with similar characteristics but not included in the main research location. The validity and reliability of the data were tested through triangulation of various data sources, namely observation results, interviews, and document analysis (Cohen et al., 2011).
2. Data Acquisition
   a. Observation: Conducted during the intervention to obtain real-time data regarding the processes and outcomes of telemedicine use
   b. Interviews: Semi-structured interviews were conducted to gain insights from healthcare providers, patients, and other relevant stakeholders regarding their experiences with telemedicine.
   c. Document Analysis: Documents such as emergency response records will be analyzed to provide additional context in understanding the effectiveness of telemedicine implementation.

RESULTS AND DISCUSSION

Data collected from observations, interviews, and document analysis were organized and analysed to provide a comprehensive understanding of the impact of telemedicine on emergency medical services in remote areas. The results of this study provide insights into the effectiveness, challenges, and outcomes of telemedicine implementation in remote villages. Here is a detailed presentation of the research results.

A. Improvement in Accessibility of Emergency Medical Services

One of the most significant findings of this research is the improvement in accessibility to emergency medical services through the use of telemedicine. Based on the data obtained, telemedicine provides an opportunity for people in remote areas to receive emergency medical consultations without having to travel far to healthcare facilities.

This study recorded a notable increase in the number of emergency consultations conducted through telemedicine during the research period. Specifically, in the selected villages, the number of telemedicine-based consultations rose from an average of 15 consultations per month prior to the implementation to 30 consultations per month over the six-month observation period. To provide a clearer comparison, the baseline data was collected from medical records for the three months preceding the telemedicine implementation. The increase was monitored and compared on a monthly basis during the research period, highlighting a consistent upward trend in telemedicine utilization. For instance, in the first month, 20 consultations were conducted, which steadily grew to 30 consultations by the fourth month. This upward trend suggests that telemedicine has contributed to improving access to emergency medical services in these remote areas, addressing the limitations of traditional healthcare delivery.This supports previous research stating that telemedicine can extend the reach of healthcare services in remote areas (Smith et al., 2020).

B. Reduction of Response Time

The research results show that the implementation of telemedicine was observed to significantly reduce response times for handling emergency medical cases. This finding was based on a comparative analysis of response time data collected before and after the introduction of telemedicine in the studied villages. Before telemedicine implementation, the average response time for emergency medical cases was recorded at 45 minutes, as derived from local health center records. Following the implementation, response times decreased to an average of 25 minutes, representing a 44% improvement. These figures were obtained through a review of emergency service logs maintained by healthcare providers in the selected villages.

The reduction in response time can be attributed to the direct communication and consultation enabled by telemedicine, which allowed healthcare workers to provide initial advice or interventions while waiting for physical medical assistance to arrive. This measurable improvement highlights telemedicine’s potential to address time-sensitive medical emergencies in remote areas effectively.Before the implementation of telemedicine, the average response time reached 45

minutes. However, after telemedicine was implemented, the response time decreased to 25 minutes, as shown in Table 1 below. This reduction is primarily due to direct access to medical professionals through telemedicine, which allows for case evaluation and initial instructions before the physical medical team arrives on site.

Table 1 Response Time

Description	Before Telemedicine	After Telemedicine
Average Response Time (minutes)	45	25

These findings are consistent with other research that shows telemedicine can expedite medical care in remote areas, which often experience delays due to geographical and infrastructural challenges (Jones et al., 2019).

C. Improved Coordination and Decision-Making

Telemedicine also provides benefits in terms of coordination between field medical teams and central healthcare facilities. Data collected through observations and interviews show that the frequency of communication and consultation between field health officers and specialists located far away has significantly increased. By using telemedicine, field medical teams can quickly consult with specialists regarding emergency cases, thereby facilitating faster and more accurate decision-making. This result is consistent with research that states that telemedicine technology can strengthen the coordination network among healthcare professionals, especially in handling emergency situations (Kim et al., 2021).

D. Challenges in Telemedicine Implementation

Despite the positive results achieved, the implementation of telemedicine in remote areas still faces several significant challenges. The results of interviews with healthcare providers revealed that infrastructure issues, such as limited access to stable internet and inadequate telecommunications devices, are one of the main obstacles. Additionally, the limited number of trained personnel to use telemedicine technology has also been identified as an obstacle hindering optimal implementation. Figure 3 illustrates the various main challenges faced during the implementation of telemedicine, including infrastructure, personnel training, and technical support. Several previous studies have also identified similar issues related to the implementation of telemedicine technology in remote areas (Brown & Lee, 2018).

E. Impact on the Quality of Medical Services

This study shows that telemedicine has a significant positive impact on the quality of emergency medical services in remote areas. This improvement in quality is mainly evident in two key aspects, namely the accuracy of diagnosis and the speed of medical intervention. Through remote consultations with specialist doctors, field medical personnel can obtain more accurate information and recommendations in handling emergency cases. This allows for faster and more accurate decision-making, enabling earlier medical interventions, which in turn increases the chances of saving patients' lives (Sari & Wijaya, 2022).

One of the healthcare service providers stated, "telemedicine allows us to consult with specialists in minutes, without needing to take patients to large hospitals that require hours of travel." In an emergency context, this becomes very important because the critical condition of the patient requires immediate attention (Kurniawan, 2021). Additionally, the analysis of medical record documents shows an improvement in diagnostic accuracy, which is one of the important indicators in assessing the quality of medical services (Purnomo, 2020).

F. Improvement of Medical Personnel Capacity and Competence

The results of this study indicate that telemedicine contributes to the enhancement of medical personnel capacity and competence in remote areas. Through continuous experience in using telemedicine technology and consulting with specialist doctors, local healthcare workers can enhance their clinical skills. Based on interviews, many medical personnel reported that they felt more confident in handling emergency cases after receiving direct guidance from specialist doctors (Harsono & Putri, 2021).

One of the informants from the medical team in the field said, "Through telemedicine, we not only receive direct assistance but also learn many new things about handling rare emergency cases." This is in line with the literature that shows that the use of health technology such as telemedicine can serve as a training tool for medical personnel in remote areas, who often lack access to advanced medical education (Suryani et al., 2020).

G. Challenges in Telemedicine Implementation

Although the results obtained from this study are quite positive, several challenges in the implementation of telemedicine in remote areas have also been identified. The main challenge encountered is the limitation of infrastructure, such as poor internet connectivity, especially in remote villages. This issue causes disruptions in communication between field medical personnel and specialist doctors, which sometimes hinders the smoothness of remote consultations (Nurhadi & Susilo, 2022).

As expressed by a field medical worker, "Sometimes the internet signal is unstable, especially during bad weather." This has become a major obstacle because we cannot conduct remote

consultations when they are urgently needed. This infrastructure problem is exacerbated by the lack of adequate technological devices, such as laptops, to optimally support telemedicine services (Sulaiman et al., 2021).

In addition to infrastructure, another challenge faced is the lack of formal training for medical personnel to use telemedicine technology efficiently. Based on interview results, most medical personnel reported that they learned independently how to use telemedicine devices, and some of them felt less confident in using the technology for more complex cases (Purnomo et al., 2021).

CONCLUSION

This research demonstrates that the implementation of telemedicine significantly enhances the accessibility, response times, and coordination in emergency medical services in remote areas. The findings show that telemedicine has improved the timeliness and accuracy of medical diagnoses and interventions, contributing to a more efficient emergency response. However, the study also highlights key challenges, including the limitations of technological infrastructure, such as unstable internet access, and the insufficient training for healthcare personnel in utilizing telemedicine effectively. Despite these obstacles, telemedicine presents a promising solution to strengthen healthcare services in remote areas. For optimal benefits, further improvements in infrastructure and training programs are needed to overcome these challenges.

Based on the findings of this research, here are some recommendations that can be considered to improve the effectiveness of telemedicine in emergency medical services in remote areas: infrastructure improvement, systematic training programs, collaboration with stakeholders, continuous monitoring and evaluation, and community outreach.

REFERENCES

Angrosino, M. (2007) Doing ethnographic and observational research. London: Sage.

Bashshur, R.L., Shannon, G.W., Krupinski, E.A. & Grigsby, J. (2016) The empirical foundations of telemedicine interventions for chronic disease management. Telemedicine and e-Health, 20(9), pp.769-800.

Bowen, G. A. (2009) 'Document analysis as a qualitative research method', Qualitative Research Journal, 9(2), pp. 27-40.

Brown, J. & Lee, S. (2018) 'Challenges of Implementing Telemedicine in Rural Areas: Infrastructure and Training Issues', Journal of Telehealth, 12(3), pp. 123-135.

Bryman, A. (2016) Social research methods. 5th edn. Oxford: Oxford University Press.

Cohen, L., Manion, L. & Morrison, K. (2011) Research methods in education. 7th edn. London: Routledge.

Corbin, J. & Strauss, A. (2015) Basics of qualitative research. 4th edn. Thousand Oaks, CA: Sage.

Creswell, J. W. (2013) Research design: Qualitative, quantitative, and mixed methods approaches. 4th edn. Thousand Oaks, CA: Sage.

Denzin, N. K. & Lincoln, Y. S. (2011) The Sage handbook of qualitative research. 4th edn. Thousand Oaks, CA: Sage.

Dharmawan, T., Nugroho, H. & Hartanto, S. (2021) Evaluasi penggunaan telemedicine di daerah terpencil Indonesia: Studi kasus. Jurnal Kesehatan Masyarakat, 14(2), pp.123-134.

Harsono, A. & Putri, N. (2021) 'Telemedis dalam Meningkatkan Kompetensi Tenaga Medis di Daerah Terpencil', Jurnal Kesehatan Masyarakat, 10(2), pp. 45-56.

Jones, M., Patel, N., & Williams, G. (2019) 'Telemedicine and Emergency Response: A Case Study in Remote Regions', International Journal of Medical Technology, 22(4), pp. 222-231.

Kemenkes (2020) Profil Kesehatan Indonesia 2020. Jakarta: Kementerian Kesehatan RI.

Kim, H. J., Park, J. H., & Lee, Y. K. (2021) 'Telemedicine Enhancing Coordination between Remote Areas and Medical Centers', Journal of Global Health, 14(1), pp. 98-109.

Kurniawan, T. (2021) 'Implementasi Telemedis pada Layanan Medis Darurat di Indonesia', Indonesian Journal of Health Research, 15(1), pp. 12-24.

Kvale, S. (2009) Interviews: Learning the craft of qualitative research interviewing. 2nd edn. Thousand Oaks, CA: Sage.

Miles, M. B., Huberman, A. M. & Saldana, J. (2014) Qualitative data analysis: A methods sourcebook. 3rd edn. Thousand Oaks, CA: Sage.

Moehr, J., Schaaf, T. & Whitten, P. (2017) Telemedicine in developing countries: Opportunities and challenges. Journal of Telemedicine and Telecare, 23(4), pp.319-326.

Nurhadi, D. & Susilo, M. (2022) 'Tantangan Teknologi Kesehatan di Daerah Pedesaan', Jurnal Teknologi Kesehatan, 7(3), pp. 55-67.

Patton, M. Q. (2002) Qualitative research and evaluation methods. 3rd edn. Thousand Oaks, CA: Sage.

Purnomo, D. et al. (2021) 'Persepsi Tenaga Kesehatan Terhadap Penggunaan Telemedis dalam Layanan Darurat', Jurnal Ilmu Kesehatan Indonesia, 8(4), pp. 88-97.

Putra, Y., Suryadi, H. & Indah, A. (2022) Sistem kesehatan di daerah terpencil: Tantangan dan solusi di Indonesia. Jurnal Kesehatan Indonesia, 12(3), pp.101-111.

Saldana, J. (2016) The coding manual for qualitative researchers. 3rd edn. London: Sage.

Sari, F. & Wijaya, B. (2022) 'Peran Telemedis dalam Akses Layanan Darurat di Daerah Terpencil', Jurnal Penelitian Kesehatan Indonesia, 18(3), pp. 22-35.

Scott, R.E. & Mars, M. (2020) Telehealth in the developing world: Current status and future prospects. Global Health Action, 13(1), pp.1-11.

Seidman, I. (2013) Interviewing as qualitative research: A guide for researchers in education and the social sciences. 4th edn. New York: Teachers College Press.

Smith, A., et al. (2020) 'Expanding Healthcare Access Through Telemedicine: A Rural Perspective', Healthcare Innovations, 8(2), pp. 67-78.

Stake, R. E. (1995) The art of case study research. Thousand Oaks, CA: Sage.

Sulaiman, R. et al. (2021) 'Infrastruktur Teknologi dan Telemedis di Daerah Terpencil', Journal of Remote Health Technology, 9(2), pp. 33-47.

Suryani, E., Rahman, A. & Lestari, D. (2020) 'Manfaat Telemedis untuk Pelatihan Tenaga Kesehatan di Pedesaan', Indonesian Journal of Health Education, 5(2), pp. 40-51.

World Health Organization (2021) Universal health coverage (UHC). Available at: https://www.who.int/health-topics/universal-health-coverage#tab=tab_1 (Accessed: 15 August 2024).