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## Teleradiology Systems SPO Military Field Hospital In Disaster Areas

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### KEYWORDS

Disaster, Teleradiology  
Standard Operating  
Procedures (SPO),  
Military Field Hospital

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### ABSTRACT

In disaster areas, medical care is often limited by difficult access and logistics. Radiology services play a crucial role in providing timely health services during emergencies. Telemedicine, including teleradiology, enables patient-doctor communication via online platforms when physical access is restricted. This research aims to develop and validate Standard Operational Procedures (SOP) for teleradiology systems in military field hospitals in disaster areas, using a mixed-method R&D design. Expert validation involved three professionals: a field hospital commander, a radiology specialist, and a radiographer. Six respondents, including radiology specialists, radiographers, and administrators, assessed the relationship between SOP feasibility and user satisfaction. The SOP model was found feasible with a significant p-value of 0.007 ( $p < 0.05$ ), and a significant relationship between SOP feasibility and user satisfaction with a Sig. (2-tailed) value of 0.034 ( $p < 0.05$ ). In conclusion, the SOP model for teleradiology systems is feasible for implementation in military field hospitals, positively impacting user satisfaction. This implementation can enhance radiology services in disaster areas, improving patient outcomes and supporting medical personnel.

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### INTRODUCTION

Indonesia has the longest coastline in the world and is on the path of subduction of three earth plates, this causes Indonesia to have high tectonic activity and harbors the potential for earth echoes and tsunamis (Muhlisah et al., 2021). According to the Law of the Republic of Indonesia Number 24 of 2007 concerning Disaster Management, it is explained that natural disasters are disasters caused by events or a series of events caused by nature, including earthquakes, tsunamis, volcanic eruptions, floods, droughts, typhoons, and landslides.

Natural disasters can cause casualties and serious injuries to communities. This can overwhelm healthcare facilities with a high number of patients and urgent medical conditions. On the other hand, hospitals, health centers, and other health facilities can be severely damaged by disasters. This could interfere with public access to necessary medical care. Disruptions to communication and transportation infrastructure can hamper coordination between health facilities and aid agencies. This could hamper the distribution of medical supplies and the evacuation of patients who need further treatment.

Non-natural disasters, one of which is the COVID-19 pandemic, is developing rapidly around the world, in Indonesia the first case was officially announced on March 2, 2020. To reduce the severity of COVID-19 infection, a "flattening of the curve" is needed that aims to prepare the health system so that the capacity of hospitals is able to treat patients and provide health care workers (Alvin et al., 2020). During the COVID-19 pandemic, the health system in hospitals has policies in handling by reducing morbidity and mortality of patients infected with COVID-19 through early diagnosis and treatment. Disease prevention focuses on health workers and the provision of personal protective equipment (PPE), in addition to the use of ventilators to prevent the possibility of an increase in patients.

Chest imaging using CT Scan is the main diagnosis to identify patients with clinical respiratory diseases, but in the case of COVID-19 patients is not yet the main choice for diagnosis, this is influenced

by the readiness of available equipment and human resources (Rubin, 2019). However, chest implantation with CXR is considered very important for the treatment of COVID-19 diagnosis if reverse transcriptase polymerase chain reaction (RT-PCR) equipment is not available, so in the event of a pandemic emergency, equipment preparation such as laboratory construction and equipment provision is one of the obstacles, as a result of which many patients cannot be identified and may not be able to receive proper treatment (Strunk et al., 2014). Therefore, it is necessary to prepare radiology installations related to radiology service procedures during the COVID-19 pandemic by providing equipment and human resources during the pandemic, assisting in the enforcement of diagnosis, as well as patient care, and carrying out infectious control in radiology installations (De Souza et al., n.d.).

Emergency hospitals are usually prepared to handle victims in disaster areas because of the paralysis of health facilities due to the impact of the disaster (Dutta et al., 2016; Tabish & Syed, 2015). One of the emergency hospitals established in the disaster area is the field hospital. The Field Hospital functions to provide urgent medical services to disaster victims or affected patients in a short period of time. Field hospitals can be installed, operated, and dismantled quickly. They are designed so that they can be moved or terminated relatively easily when they are no longer needed. Used to respond to a surge in the need for health services after a disaster or in other emergency situations.

Field hospitals are often established by humanitarian organizations, the military, or relief agencies in crisis or emergency situations to provide urgent medical care to those affected by disasters or conflicts (Kushner, 2017; Organization, 2018). This is an important part of quick and responsive response to emergencies. Field hospitals in military agencies are used for health support in the form of emergency handling, outpatient care, temporary hospitalization, surgical and evacuation measures, as well as preventive health in the field both in training activities, in War Military Operations (OMP) tasks and disaster management in Non-War Military Operations (OMSP).

Public health threats always come whether caused by nature, non-natural, or intentional, these threats can cause emergencies (Tang et al., 2014). According to Talati et al (2014), disasters pose unique challenges for each medical service agency in terms of infrastructure, capacity and readiness from a hospital perspective. A disaster occurs when the number of casualties far exceeds the capacity of medical personnel to provide emergency care, forcing hospitals to deploy additional resources for care to a large number of victims (Talati et al., 2014).

Then in order to implement optimal health services, it must be supported by an adequate communication network (Algaet et al., 2014; Al-Jaroodi et al., 2020). Especially in terms of providing treatment to patients to determine appropriate and accurate actions. With the shutdown of electricity facilities in disaster areas, an independent internet network is needed that can overcome these problems. The internet network plays a very important role in health services in natural disaster areas. It allows health care providers, relief organizations, governments, and volunteers to communicate, coordinate, and provide better services to those affected by disasters.

Radiological services in disaster areas play an important role in providing fast and appropriate health services in the midst of emergencies. Disaster areas, such as natural disasters (earthquakes, floods, volcanic eruptions, etc.) or human disasters (industrial accidents, terrorist attacks, etc.), often face emergency situations with many victims requiring medical care.

In disaster areas, medical care is often limited by difficult access and logistics. Mobile or portable radiology services allow medical teams to perform scans at nearby locations, which can help with evacuation decision-making and logistics management of medical resources.

Radiology also contributes to facilitating communication and coordination between medical teams in the field and teams in hospitals or disaster control centers. The scan results can be quickly communicated for further decision-making.

It is important to remember that in a disaster situation, radiology services must operate with affordable, portable, and well-integrated equipment within the disaster management team. Good training and preparation are also important so that radiology professionals and medical teams can function effectively and efficiently in the midst of emergency situations.

The internet network allows health teams in the field to communicate quickly and efficiently with teams in coordination centers, hospitals, and other medical institutions. Information on patient conditions, supplies of medicines, medical equipment, and urgent needs can be conveyed quickly,

allowing for better coordination in disaster management. In addition, the internet network allows healthcare practitioners to provide telemedicine services through telemedicine.

In disaster situations where physical access to medical facilities is limited, telemedicine allows patients to communicate with doctors or medical personnel via video conferencing or other online platforms to obtain consultations, diagnoses, and treatment recommendations. This includes teleradiology, which is radiological images, such as X-ray results, CT scans, MRIs, and other radiological images, analyzed and interpreted by a radiologist or radiologist located far from the place where the images were taken. This is usually done using telecommunication technology and computer networks, so that radiologists can receive these images electronically and provide the results of their interpretation to the doctor or other medical professional treating the patient.

In satellite communication, it is known as a small earth station or more commonly called VSAT (Very Small Aperture Terminal). VSAT is widely used as a communication tool to reach areas that are not reached by other communication devices. The main thing to consider in satellite communication is the modem. Therefore, the setting of the satellite modem must be correct and can be sure that it is connected. If the satellite modem is already connected, it can be easily set to a personal computer or to a mobile satellite (Rahmatia & Sulistya, 2017).

Currently, Mobile VSAT (also known as Komob Car) is being developed which plays an important role in disaster management. These cars are specialized vehicles that are equipped with the necessary equipment and facilities to respond to and coordinate efforts in emergency and disaster situations.

The Komob car functions as a coordination center in the field. Disaster management teams can use it to communicate with a variety of related parties, including government agencies, rescue agencies, and relief organizations. With advanced communication equipment, the car helps ensure that important information can be passed on quickly and accurately.

In the field of health services, Komob Cars have a significant role, especially in disaster areas. With internet access and communication technology, medical teams can conduct remote consultations with doctors or other specialists to get guidance in handling complex cases. In the current development, the Military Field Hospital is equipped with Komob Car facilities.

In the Field Hospital Title Guidebook, there are no radiologist specialist personnel in the organizational structure of the hospital (Bess & Roberge, 2016). Thus, it means that there are no radiologists on standby at the Field Hospital. With this SPO, it is hoped that it can provide a solution to the limitations of radiology services from the aspect of military service.

To obtain radiology results, the radiology staff of the Military Field Hospital brought the radiology tapes to the referral hospital to be printed and expertise by radiologists. Of course, it can hinder the treatment of the victim, because the DPJP has to wait a long time to get the radiology results. In addition, it is possible for accidents to radiology staff in carrying out delivery activities due to road damage due to disasters.

This research emerged based on previous research that stated that teleradiology systems can be used for radiology services in certain areas such as battlefields and remote areas. On this basis, the researcher made a study to provide convenience and minimize risks in radiology services at Military Field Hospitals in disaster areas with the title "Standard Operational Procedures for Teleradiology Systems of Military Field Hospitals in Disaster Areas".

## **METHODS**

The research design used is research and development or research and development methods. Research and development research combines qualitative and quantitative approaches, therefore it is called mixed method research (MMR). The research and development procedure consists of 5 (five) main steps, namely: 1) information collection, 2) product design, 3) expert validation and revision, 4) product testing and 5) product results.

## **RESULTS and DISCUSSION**

### **Standard Operating Procedures for Teleradiology Systems**

The results of the information collected resulted in the conclusion that radiology services in military field hospitals require an innovation to facilitate the handling of patients, especially in disaster

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areas, one of which is by making a Standard Operational Procedure for Teleradiology Systems. Teleradiology is a medical practice in which radiological images, such as X-rays, CT scans, MRIs, and others are sent electronically from one location to another for interpretation and diagnosis by a radiologist or skilled medical professional.

This teleradiology system SPO can be a good solution to overcome obstacles in disaster areas such as limited road access. This SPO can also improve field hospital health services in disaster areas that require speed and accuracy in the treatment of disaster victims. With teleradiology, medical images can be analyzed in a short period of time, which speeds up the diagnosis and treatment process. This is important in emergency situations where every second counts to save lives.

Medical facilities in disaster areas are often overwhelmed with the number of victims. By transferring medical images to other locations for analysis, the workload at local hospitals can be reduced, allowing medical staff to focus on the patient's immediate care. Teleradiology images and reports can be stored electronically, which makes it easy to document medical and track patient care history. This is very helpful in the long-term management of post-disaster patients.

In disaster areas, the risk of spreading infectious diseases is often high. With teleradiology, the need to move patients to get a diagnosis can be reduced, which in turn reduces the risk of spreading the infection. Overall, teleradiology is an invaluable tool in medical response to disasters that helps to improve the quality and speed of healthcare services in very critical situations. So that the SPO of this teleradiology system is expected to be used as a guideline for radiology services for military field hospitals in disaster areas.

### **Analysis of the Application of SPO Teleradiology as an Effort to Improve the Quality of Radiological Services in Military Field Hospitals in Disaster Areas**

#### **SPO**

Respondents in implementing the SPO teleradiology system were measured using a questionnaire with a total of 3 questions using a likert scale, namely a score of 5 strongly agree, 4 agree, 3 hesitate, 2 disagree, 1 strongly disagree. The quality of the SPO of the teleradiology system can be seen from the results of the SPO feasibility test to be applied in the field. The average score of the feasibility test conducted by validators who are experts in their fields was obtained with a score of 83.33% with a p-value of  $0.007 < 0.05$ . This means that the SPO is suitable for use as a guideline in radiology services for military field hospitals in disaster areas.

The feasibility of a Standard Operating Procedure (SPO) is a process that is implemented to ensure that operations or processes in an organization run efficiently, effectively, and in accordance with established regulations and standards. Ensure all operations comply with relevant laws, regulations, and standards. Assess whether operations are executed in the most efficient manner, optimizing the use of resources and time.

Guarantee that the products or services produced meet the standards. Furthermore, SPOs can assess the impact of operations on the environment and ensure sustainable practices are implemented.

#### **Relationship between SPO Eligibility and user satisfaction**

The feasibility of Standard Operating Procedures (SPOs) has a significant relationship with user satisfaction because an effective and efficient system can directly improve user experience and satisfaction. SPO eligibility ensures that operational processes run in accordance with established standards, which in turn results in consistently high-quality products or services.

The Standard Operational Procedure of the teleradiology system is meaningfully related to User Satisfaction in Military Field Hospitals in Disaster Areas, proven to have a p-value of  $0.034 < 0.05$ . An effective SPO helps identify and reduce errors and failures in the radiology service process. Users who do not experience problems will have a more positive experience, increasing their satisfaction.

SPO eligibility often includes mechanisms for handling user complaints and issues quickly and efficiently. The ability to handle complaints and resolve user issues quickly can greatly increase their satisfaction.

## **CONCLUSION**

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Based on the results of the study, it can be concluded that the Standard Operating Procedures (SOP) for the teleradiology system are both feasible and significantly related to user satisfaction in military field hospitals in disaster areas. The SOP for the teleradiology system was found suitable for use in such environments, as evidenced by a p-value of 0.007 ( $p < 0.05$ ). Additionally, there is a meaningful relationship between the SOP and user satisfaction, with a Sig. (2-tailed) value of 0.034 ( $p < 0.05$ ), indicating a significant correlation. These findings support the implementation of the teleradiology SOP in military field hospitals to enhance service efficiency and user satisfaction in disaster situations.

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