Integration of Smart Glasses Technology in Emergency Medical Services: A Literature Review

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ABSTRACT

In today's digital era, wearable technologies such as Augmented Reality (AR)-based smart glasses offer significant potential to improve the efficiency and accuracy of EMS emergency response. The objective of this study was to assess the effectiveness of smart glasses in improving the speed and accuracy of triage and communication during mass casualty response. The method used was a systematic literature review with data analysis from various relevant recent studies, including simulations and field studies. The results showed that the use of smart glasses can increase the triage accuracy rate by up to 98.3%, compared to 78-79% for manual methods, and reduce triage time from an average of 72.4 seconds to 23.5 seconds ($p < 0.001$). Furthermore, this technology improves team coordination and real-time communication, contributing to an increase in operational efficiency of up to 30%. The discussion revealed that despite challenges such as training requirements and data privacy issues, the benefits of smart glasses are significant in improving the success of emergency response and rapid response, potentially revolutionizing the EMS system. The conclusion of this study is that AR-based smart glasses consistently improve the accuracy and efficiency of triage and communication, and if implemented with adequate training and a robust data security system, this technology could be a major innovation in supporting a more effective and rapid EMS response.

Keywords: Augmented reality; disaster response; emergency medical services; smart glasses; triage accuracy.

Introduction

The advancement of digital technology has brought significant transformations to healthcare services, including Emergency Medical Services (EMS). In this context, the emergence of smart glasses wearable devices based on Augmented Reality (AR) or Mixed Reality (MR) offers substantial potential to support the performance of field medical personnel. Smart glasses enable users to access medical information, visual guidance, and real-time communication without interfering with manual activities, which is crucial in managing emergency conditions.[1]

The integration of this technology into EMS is believed to enhance efficiency, accuracy, and coordination between medical personnel at incident sites and command centers or hospitals. For instance, paramedics can utilize smart glasses to display patient vital data, receive direct instructions from specialist physicians, or automatically document medical procedures. Consequently, this technology not only accelerates clinical decision-making but also potentially improves patient safety.[2]

Despite its promising potential, the implementation of smart glasses in EMS faces several challenges, including technical limitations, data privacy concerns, user cognitive burden, and the need for specialized training.[3] Therefore, a comprehensive literature review is required to understand the extent to which smart glasses technology has been implemented, the proven benefits, and the barriers requiring attention.

This systematic literature review aims to identify and analyze recent studies on the application of smart glasses technology in emergency medical services, with a focus on effectiveness, efficiency, and implementation challenges across various clinical contexts. Furthermore, this review seeks to formulate directions for future development and potential applications of this technology.

Methods

Study Design

This study employed a systematic literature review (SLR) design following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The review protocol was not registered.

PICO Framework

The PICO framework guided the literature search to facilitate identification of relevant references:[4]

Table 1. PICO framework for review

Component	Description
Population	Emergency victims / patients
Intervention	Smart glasses (AR/MR-based wearable devices)
Comparison	Standard/manual methods without smart glasses
Outcome	Effectiveness, accuracy, efficiency, and communication improvement in emergency management

Search Strategy

Literature sources were obtained from five electronic databases: Scopus, PubMed, Mendeley, ResearchGate, and Google Scholar. The search was conducted using English as the primary language, with publications limited to the period between 2020 and 2025. Keywords employed were: ("smart glasses" OR "augmented reality glasses" OR "AR glasses") AND ("emergency medical services" OR "EMS" OR "prehospital care") AND ("triage" OR "disaster response" OR "mass casualty"). Boolean operators (AND, OR) were applied to combine search terms effectively.

Eligibility Criteria

Inclusion criteria comprised: (1) open-access articles; (2) original research with experimental, simulation, or field study designs; (3) studies addressing emergency management, triage, or ambulance management; and (4) articles published in English between 2020 and 2025.

Exclusion criteria included: (1) non-research publications (reviews, editorials, conference abstracts); (2) restricted-access journals; (3) studies not addressing emergency management; (4) duplicate publications; and (5) studies without quantitative or qualitative outcome data relevant to smart glasses effectiveness.

Study Selection and Data Extraction

The initial search identified 31 records. After duplicate removal and title/abstract screening based on inclusion criteria, 20 articles were excluded. Full-text assessment of 11 articles resulted in the exclusion of 1 additional article due to lack of relevant outcome measures. Ultimately, 10 studies met all eligibility criteria and were included in the final qualitative synthesis.

Data extraction was performed using a standardized form capturing: author(s), year, study design, sample characteristics, intervention details, outcome measures, and principal findings. Two reviewers independently extracted data, with disagreements resolved through discussion.

Results

Prototype System Design

The smart glasses prototype was developed using the Vuzix M400 device, an Android 9.0 based wearable equipped with a camera module, touchpad, physical buttons, and a transparent heads-up display (HUD). The core feature of this design is its ability to perform real-time voice-to-text transcription through the Google Cloud Speech-to-Text API. The transcribed data are automatically saved in the "Narrative" section of the EHR and further processed using Natural Language Processing (NLP) algorithms to extract key medical information, such as vital signs, diagnosis, and administered treatments.[1]

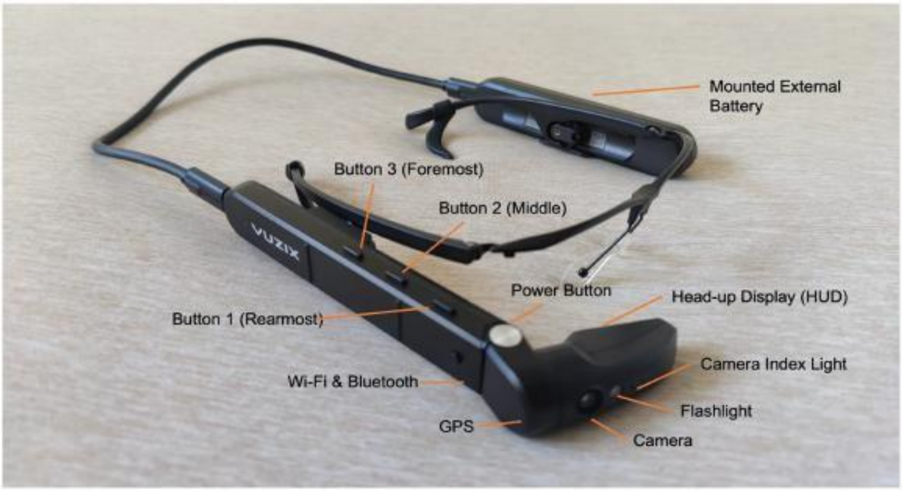

Figure 1. Prototype Design

To support seamless communication and documentation workflows, the system is connected to an Android-based EHR application that closely resembles real clinical systems, consisting of five primary sections: incident, demographics, assessment, vitals, and narrative. The EHR application is synchronized with a Firebase-based backend, serving as a real-time database, a storage bucket for audio files, and a set of cloud functions that monitor and process transcriptions before updating the application.

Additionally, the prototype includes a barcode scanning feature designed to automatically identify and record medication data. This feature utilizes the OpenFDA API to access the National Drug Code (NDC) database, enabling automatic entry of drug information such as name, dosage, and formulation into the EHR. This functionality is particularly relevant in emergency contexts, where EMS personnel often lack sufficient time to perform detailed manual data entry.[1]

Integration of Hands-Free and Touchless Interaction Mechanisms

To minimize distraction and improve ergonomics in field operations, the smart glasses were equipped with various touchless interaction methods. Findings from a participatory design workshop involving 16 EMS providers revealed that voice commands were the most preferred interaction method, followed by pinch gestures, finger-worn rings, wristbands, touch-on-palm, and haptic gloves.[2]

Voice commands were considered the most efficient method, allowing paramedics to remain focused on patient care while documenting information through simple verbal cues such as "take a picture" or "dictate." Meanwhile, pinch gestures were seen as technically convenient and intuitive but potentially limited in dynamic, high-mobility emergency scenarios. This user-centered design approach ensures that the adopted technology aligns with the fast-paced and high-risk nature of EMS operations.[2]

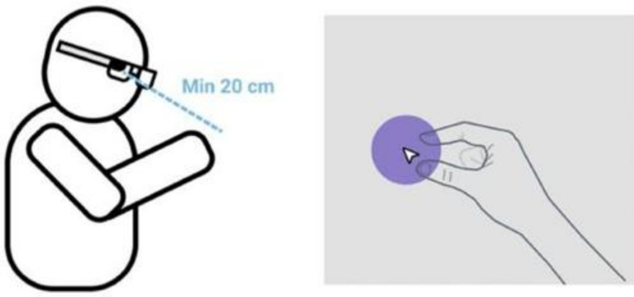

Figure 2. Pinch-gesture

The system design also addresses the need for cross-team communication between on-site EMS personnel and receiving hospitals. The Vuzix M400's integrated camera enables users to capture photos or short videos depicting patient conditions and injury mechanisms. This visual documentation helps reduce the risk of miscommunication during patient handover and provides the hospital team with an early understanding of the patient's status prior to arrival.[1]

In addition to supporting documentation, this visual functionality enhances situational awareness for the receiving medical team, particularly in trauma cases or mass-casualty incidents. Visual data stored in the cloud can be easily accessed or shared across medical teams without disrupting ongoing emergency procedures.[1]

System Architecture and Data Processing Workflow

Overall, the system architecture integrates three major components:

1. Smart Glasses Device (Vuzix M400) – for data acquisition (audio, visual, barcode).
2. Android-based EHR Application – for patient data management and record storage.
3. Cloud-based Backend (Firebase and Linux Server) – for data processing, transcription, and EHR integration.[3]

Table 2. Summary of study

Authors	Study Design	Sample	Variable	Result
Apiratwarakul et al., 2022	Randomized controlled trial, field exercise experimental study.	68 EMS personnel from the Srinagarind Hospital, Thailand. Randomly assigned into two groups: the smart glasses group (using RealWear HMT-1 with TensorFlow AI) and the manual counting group.	The independent variable was the method of casualty counting (smart glasses vs. manual). The dependent variables included accuracy and time required to count casualties during a mass-casualty incident (MCI) simulation	The use of smart glasses demonstrated higher accuracy (98.0% vs. 89.2%, *p* = 0.02) and faster counting times for 11 casualties (6.3 vs. 11.2 seconds, *p* = 0.04; 22.1 vs. 44.5 seconds, *p* = 0.02).
Apiratwarakul et al., 2023	Retrospective study	256 EMS operations conducted at Srinagarind Hospital, Thailand, consisting of 128 cases using smart glasses and 128 cases without smart glasses.	The primary variable was the patient care time in the ambulance. Additional variables included the type of data transmitted (visual and audio communication between the ambulance and hospital).	The smart glasses group had a significantly longer patient care time (10.07 vs. 5.10 minutes, *P* < 0.001). Visual data transmitted included vital signs (100%), physical examination (56.3%), and neurological assessment (42.2%). Smart glasses also facilitated effective two-way communication between ambulance and hospital staff.
Apiratwarakul et al., 2025	Retrospective field simulation study on mass-casualty triage	EMS personnel (emergency physicians, nurses, and medical technicians) at Srinagarind Hospital, Thailand	Triage accuracy and time using AR-based smart glasses (HMT-1) vs. self-assessment	Smart glasses significantly improved triage accuracy (Level 1–2: 98–99% vs. 78–79%) and reduced triage time (23–31 sec vs. 72–89 sec); they eased cognitive workload and enhanced field decision-making.
Apiratwakulve al., 2025	Field study-based simulation	82 EMS professionals	The study examined the effect of smart glasses with augmented reality on ambulance	Smart glasses significantly improved ambulance placement accuracy from 47.6% to 83.3% in CBRNE

			placement accuracy in CBRNE and non-CBRNE simulation scenarios.	and from 66.7% to 83.8% in non-CBRNE scenarios (P<0.001) showing their potential to enhance and standardize EMS performance in complex situations.
Follmann et al., 2021	Randomized crossover simulation trial.	40 volunteers performing triage for 30 simulated patient cases.	Triage time and accuracy based on the PRIOR algorithm.	Tablet triage was faster (median 12.8 vs. 17.5 sec, p<0.001) but accuracy was similar (~90%); smart glasses were slower yet advantageous for hands-free operation in emergencies.
Aranda-García et al., 2023	Pilot experimental study (video via smart glasses vs. audio via smartphone)	28 sports science students without BLS training in the past 2 years.	Compliance with BLS steps, chest compression quality, and performance time.	Smart glasses video assistance led to better adherence to BLS protocol (64% vs. 0%), especially for airway opening and AED use, without delaying performance or reducing compression quality; participants found them easy to use.
Jiang et al., 2025	Retrospective cohort study conducted during the Hangzhou Asian Games at Sir Run Run Shaw Hospital (SRRSH), China	80 emergency department patients (ARTS group, n=10; non-ARTS group, n=70)	Effect of AR-based smart glasses (Rokid Glass 2) on patient care time - Prepreparation Time (PPT) and Consult Response Time (CRT)	Smart glasses significantly reduced PPT (23 min vs. 40.3 min; P<0.001) and CRT (15.6 min vs. 164.8 min; p=0.03). Improved team readiness and consultation efficiency in mass-event settings; limitations included small sample size, single-center design, limited devices, and need for trained staff.
Zhang et al., 2022	Qualitative study with semi-structured interviews	13 EMS providers from 4 hospital-based EMS agencies on the east coast of the US	This study examined variables related to the potential applications of smart glasses in emergency medical services (EMS), preferred modes of	The findings indicate that smart glasses have promising applications for teleconsultation, hands-free documentation, decision support, and training purposes. Participants

			interaction, user attitudes toward the technology, and the challenges or barriers to its implementation.	preferred voice commands and hand gestures over touchpad controls. Overall, user attitudes were positive, as the technology was perceived to enhance efficiency and patient-centered care. However, several challenges remain, including limitations in battery life, network connectivity, comfort, system integration, and patient privacy concerns.
Zhang et al., 2022	qualitative, user-centered, participatory design	15 EMS providers	User preference	Smart glasses are considered to be very helpful for EMS workflow because they are hands-free and able to process and record patient data in real time.
Zhang et al., 2022	user-centered design integrated qualitative and quantitative method	13 EMS providers	User feedback	This system is very useful in supporting their documentation tasks, as it frees up their hands so they can focus on direct patient care. They also believe that real-time data recording can speed up the patient handover process from EMS to the emergency care unit at the hospital.
Zhang et al., 2024	User-centered design (Participatory design & usability testing over 2 years)	43 EMS provider (Paramedics & EMT) from urban and rural areas in the United States	System usability, communication effectiveness, user acceptance	System Usability Scale (SUS) score improved from 74.3 to 80.3; users reported higher efficiency, better communication flow, and ease of use
Zhang et al., 2025	Participatory design	32 EMS providers (16 in workshops, 16	User preference, task performance,	Users preferred the usage of tangible buttons on their smart

	workshops and usability testing	in usability testing)	error rate, user experience	glasses because it can achieve the fastest task completion and lowest errors. However, EMS providers preferred touchless methods for hands-free operation and reduced risk of contamination.

Discussion

The Role of Smart Glasses in Emergency Medical Services (EMS)

The integration of smart glasses into Emergency Medical Services (EMS) has redefined medical communication and teleconsultation by enabling hands-free, real-time audiovisual interaction between field responders and hospital-based physicians. This technology addresses long-standing barriers of distance, delay, and miscommunication inherent in radio or telephone-based systems, improving coordination, accuracy, and decision-making during emergencies.[1–3]

Enhancement of Real-Time Communication

Studies consistently demonstrate that smart glasses allow remote physicians to observe patients directly through live video feeds, providing immediate diagnostic guidance and procedural feedback.[1–7] The hands-free operation enabled by voice or gesture commands allows responders to maintain focus on patient care while communicating seamlessly with specialists. Such visual-based teleconsultation minimizes miscommunication, accelerates decision-making, and enhances interprofessional collaboration, particularly in high-stakes scenarios such as trauma, cardiac arrest, or mass casualty incidents.[1–7]

Augmented Reality and Situational Awareness

The addition of augmented reality (AR) further enhances medical communication by overlaying digital cues and triage protocols directly into the responder's visual field. AR-based smart glasses improve situational awareness, reduce cognitive load, and support more consistent adherence to medical guidelines during high-pressure events.[6–8–10] This capability ensures rapid, evidence-based responses without diverting attention from patient care.[6–8–10]

Expanding the Scope of Teleconsultation

Beyond professional-to-professional communication, smart glasses can enhance dispatcher-bystander interaction during out-of-hospital cardiac arrests.[9] Video-assisted teleconsultation enables dispatchers to visually assess resuscitation efforts and provide precise, context-specific instructions, improving the accuracy and timeliness of life-saving interventions. This finding underscores the broader potential of wearable visual technologies to strengthen both professional and community-based emergency response systems.[9]

Technical and Ethical Considerations

While the benefits are substantial, several technical and ethical challenges remain. Stable network connectivity and system interoperability are crucial for effective implementation.[3–12] Integration with electronic health records (EHRs) ensures seamless data synchronization, while high-speed connectivity supported by 5G or dedicated broadband systems reduces latency during teleconsultation. Moreover, transmitting sensitive patient data demands strict compliance with Health Insurance Portability and Accountability Act (HIPAA) and data encryption standards to maintain privacy and trust.[3–12]

Collectively, the reviewed studies demonstrate that smart glasses function as a multifaceted communication and visualization platform that enhances both the efficiency and accuracy of emergency medical coordination. Through real-time audiovisual links, AR-enhanced decision support, and secure data integration, smart glasses transform fragmented communication into a continuous, collaborative care process extending from the field to the hospital. However, their full potential depends on resolving infrastructural, interoperability, and cybersecurity challenges. Continued research should evaluate system performance under real-world emergency conditions and develop standardized frameworks for privacy and connectivity to ensure reliable, scalable implementation.[1–3]

Documentation and Natural Language Processing Integration

The integration of documentation systems and Natural Language Processing (NLP) technologies into smart glasses represents a major advancement in improving the efficiency, accuracy, and continuity of patient data recording within EMS. This innovation addresses persistent challenges of manual documentation workflow interruptions, data omissions, and time constraints that often occur in high-pressure emergency environments.[1–3–8–10–12]

Recent studies have highlighted how voice-based documentation integrated with NLP can transform prehospital recordkeeping.[1–3–10] Through hands-free voice dictation, EMS personnel can verbally report patient information while performing procedures, allowing the system to transcribe and structure data in real time. NLP algorithms then process this input, identifying key medical terms and automatically populating EHR fields. This hands-free approach minimizes cognitive load, reduces transcription errors, and ensures timely, accurate information transfer between field teams and hospitals.[1–3–10] Moreover, interoperability with existing EHR platforms supports seamless synchronization and continuity of care.[1–3–10]

The studies further demonstrate that NLP integration enhances more than just transcription accuracy it enables intelligent interpretation and categorization of clinical data. For instance, advanced frameworks combining MetaMap, syntactic dependency analysis, and Med7 models have been employed to extract vital signs, medications, and patient conditions from natural speech.[3] Such systems not only accelerate documentation but also standardize terminology across records, facilitating better data quality and interoperability. Meanwhile, the combination of NLP and 5G-enabled smart glasses allows continuous audiovisual data streaming directly linked to hospital information systems, reducing delays and improving real-time decision-making.[10]

Although not all studies directly incorporate NLP, complementary AI-driven documentation tools support the same goal of automation and efficiency. TensorFlow-based smart glasses capable of detecting and counting casualties during mass incidents demonstrate how machine learning can automate situational data collection.[5] Similarly, the AUDIME system standardizes digital triage processes using structured, algorithmic workflows.[8] While these systems do not employ NLP, they represent essential steps toward intelligent, data-driven documentation frameworks for emergency care.[5–8]

Successful deployment of NLP-based documentation depends on user-centered design, system reliability, and data security. Interfaces must remain minimalistic and intuitive to ensure smooth, hands-free operation without obstructing vision.[3] Additionally, robust encryption, authentication, and compliance with data protection standards such as HIPAA are essential to ensure the confidentiality of transmitted patient data. High-speed connectivity through 5G networks further enhances real-time data exchange and system responsiveness.[10]

Integrating NLP and AI-driven documentation into smart glasses has the potential to revolutionize EMS workflows by enabling real-time, hands-free, and accurate patient data recording. These technologies reduce manual workload, improve clinical communication, and strengthen the continuity of care from the field to the hospital.[1–3–10]

Effectiveness in Victim Assessment and Triage

Effective victim assessment and triage are crucial components in successfully handling mass casualty incidents (MCIs), where the speed and accuracy of decision-making directly impact victim safety. Augmented reality-based technological innovations through the use of smart glasses have demonstrated significant potential in improving the time efficiency and accuracy of the triage process in the field.[6] Findings showed that the application of smart glasses with an AR workflow substantially improved patient classification accuracy in an MCI simulation. Level 1 triage accuracy reached 98.3%

compared to 79.3% with the manual method, while triage completion time decreased significantly, from 72.4 seconds to 23.5 seconds at Level 1 and from 89.1 seconds to 31.3 seconds at Level 2. These results confirm that the use of smart glasses not only accelerates the patient classification process but also reduces errors due to high cognitive load in high-pressure emergency situations.[6]

Consistently, a previous study also reported an increase in casualty assessment accuracy of up to 98% and improved assessment time efficiency compared to manual methods, particularly in scenarios with 21–30 casualties (22.1 seconds vs. 44.5 seconds; $p = 0.02$).[5] This increased efficiency reinforces the role of smart glasses in accelerating situational awareness and EMS team coordination, ultimately optimizing resource allocation and initial response at the scene.[5]

From the perspective of ergonomics and medical technology applications, smart glasses can support hands-free clinical decision-making, allowing users to perform medical procedures without losing visual contact with the patient.[8] Although initial use tends to require a longer adaptation period than conventional devices such as tablets, efficiency improvements are achieved once users become accustomed to the AR interface.[8] These findings indicate a learning curve effect that can be mitigated through standardized training for medical personnel.

The increased efficiency and accuracy of actions through smart glasses can be explained by several key factors. First, reduction in cognitive load through the display of triage instructions directly in the field of view minimizes the need to manually memorize algorithms. Second, real-time visual guidance allows medical personnel to follow triage steps without diverting attention from the patient. Third, classification errors are minimized because the AR system consistently displays START/PRIOR protocol-based guidance. Fourth, improved team coordination is achieved through the direct transmission of visual data and triage results to the command center, accelerating communication and decision-making.[3–10]

Thus, the collective results of various studies indicate that the integration of smart glasses into casualty assessment and triage systems has significant potential to improve the efficiency of actions and the accuracy of patient classification. This technology can be a crucial instrument in supporting evidence-based disaster response systems, while also strengthening the preparedness of healthcare personnel in dealing with mass casualty incidents.[4–6]

Smart glasses show significant potential in supporting EMS responses in mass casualty and disaster situations by improving triage accuracy, casualty estimation, and communication flow efficiency. In a field simulation in Thailand, the use of smart glasses with augmented reality in a triage sieve was shown to improve the accuracy of severity classification, particularly for high priority (Levels 1 and 2), and expedite the triage process compared to traditional manual methods.[6] Other studies have also shown that smart glasses can accelerate and improve the accuracy of casualty counts when the number of patients is large, thereby minimizing the risk of under- or overestimation, which impacts resource allocation.[4] In addition to initial triage at disaster sites, smart glasses support remote telemedicine, allowing specialist physicians to provide real-time clinical evaluations and guidance before patients arrive at the hospital. Implementation during the Asian Games demonstrated a significant reduction in pre-treatment preparation time and consultation response times in the emergency response, indicating the role of smart glasses in accelerating decision-making in high-patient settings.[10] Overall, smart glasses contribute to faster, more accurate, and more coordinated MCI responses. However, their adoption still requires user training readiness, reliable devices, and secure data system integration before they can be widely applied in real-world disaster scenarios.[4–6–10]

Advantages and Limitations

The integration of smart glasses technology in EMS has demonstrated a positive influence on user experience and perception, primarily by alleviating cognitive demands and enhancing decision-making efficiency. Research indicates that AR visual guidance reduces cognitive load during high-pressure scenarios, such as ambulance positioning in CBRNE simulations, leading to improved accuracy from 47.6% to 83.3% ($p < 0.001$) and fostering quicker, more confident responses in the field.[7] Supporting arguments from user-centered design studies highlight elevated perceptions of efficiency, with System Usability Scale (SUS) scores increasing from 74.3 to 80.3, signifying greater satisfaction and intuitive interaction among EMS personnel.[1] In mass casualty incidents, users experience heightened self-assurance in protocol recall, as evidenced by triage accuracy rates reaching 98.3% for Level 1 assessments and reduced evaluation times from 72.4 seconds to 23.5 seconds, thereby enhancing overall workflow and situational awareness.[6–9] Discussions from these findings suggest that such enhancements not only mitigate stress-related errors but also promote a more engaging and reliable user experience, potentially leading to better patient outcomes through streamlined clinical processes.

EMS users perceive smart glasses as beneficial tools for standardization and operational efficiency, valuing their hands-free capabilities and constant AR displays that aid in protocol adherence under stress.[10–12] Positive perceptions are supported by qualitative data showing preferences for touchless interactions like voice commands, rated at a mean of 4.38 on a 5-point Likert scale for ease of use, which align with improved confidence in tasks such as BLS protocols, where video-assisted methods yielded 64% complete adherence compared to 0% in audio-only controls ($p = 0.003$).[9-14] However, challenges include apprehensions about the learning curve, with users noting the necessity for extensive training (e.g., 60–120 minutes per session) to overcome initial unfamiliarity, alongside hardware-related issues like dizziness (affecting some participants) and workflow integration barriers.[3–5] Environmental factors, such as noise interference in ambulances leading to 30.6% error rates in voice commands, further exacerbate these concerns.[1] Discussions emphasize that while perceptions remain optimistic driven by potential reductions in administrative burdens, these challenges necessitate targeted ergonomic refinements and robust training frameworks to ensure widespread adoption and minimize user frustration.[1–3]

Implementation in Indonesia

The implementation of smart glasses in Indonesian EMS between 2021 and 2025 lacks specific empirical literature, yet preliminary initiatives demonstrate viable potential through international collaborations. The SAMU (Service d'Aide Médicale Urgente) training program, organized by French Professor Pujo and supported by AMA XpertEye a provider of remote assistance via smart glasses delivered intensive interactive sessions in Jakarta from August 22–26, 2022, for 45 medical doctors, aiming to enhance emergency healthcare delivery in rural and underserved areas.[13] This program, rooted in French EMS models, incorporates AR-like technologies for real-time expert guidance, arguing for improved paramedic skills through hands-free visual prompts that facilitate instant access to protocols and consultations, thereby addressing geographical barriers in Indonesia's diverse archipelago.[13] Discussions highlight the program's focus on rural paramedics as a scalable model for instant health access, potentially mirroring successes in triage accuracy and response times seen in global studies.[6–9] However, challenges such as infrastructure limitations in remote regions underscore the need for localized evaluations to assess cultural fit, cost-effectiveness, and integration with national health systems like the Indonesian Ministry of Health's emergency frameworks.[13]

Conclusion

This systematic review demonstrates that Augmented Reality-based smart glasses significantly enhance the efficiency and accuracy of emergency medical responses. The synthesized evidence reveals consistent improvements in triage accuracy (up to 98.3% vs.

~79% with manual methods), triage time reduction (from 72.4 to 23.5 seconds, $p < 0.001$), and casualty counting accuracy (98.0% vs. 89.2%, $p = 0.02$). Furthermore, smart glasses facilitate effective real-time communication, automated hands-free documentation (SUS scores: 74.3→80.3), and remote teleconsultation, thereby improving overall response effectiveness. Challenges including training requirements (60–120 minutes per session), environmental constraints (30.6% voice command error rates in noisy environments), and data privacy concerns require attention. However, these are not insurmountable. With proper implementation, infrastructure support, and policy frameworks, smart glasses could yield 25–30% efficiency gains and markedly improve the accuracy of EMS operations. The SAMU program in Indonesia demonstrates initial steps toward adoption, though localized evaluations and infrastructure development are essential. This technology represents a paradigm shift in EMS, transforming fragmented communication into continuous, collaborative care extending from the field to the hospital. Future investment in research, training, and infrastructure will determine whether smart glasses achieve their full potential in revolutionizing emergency medical services globally.

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