

Original Research Article

DEVELOPMENT AND PRELIMINARY EVALUATION OF A WEB-BASED EMERGENCY RESPONSE PLATFORM FOR PREHOSPITAL FIRST AID

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ABSTRACT

Introduction. Delayed emergency recognition, limited first aid knowledge, communication difficulties, and barriers to ambulance access may hinder timely prehospital care. This study aimed to develop and preliminarily evaluate a web-based emergency response platform for prehospital first aid. **Method.** A research and development study guided by the ADDIE framework included needs analysis, platform design and development, expert validation, revision, and preliminary user evaluation. Needs were identified through literature review and focus group discussion. The platform integrated first aid education, emergency communication, location sharing, and ambulance activation. Content and media were assessed by experts, followed by community evaluation of application quality and technology acceptance. **Result & Analysis.** Needs assessment identified first aid information, emergency communication, location sharing, and ambulance access as key requirements. The platform included eleven educational modules covering emergency preparedness, victim assessment, cardiopulmonary resuscitation, medical emergencies, trauma and bleeding, burns, poisoning, disaster preparedness, home safety, road safety, and emergency activation. Expert and community evaluations showed favorable content, media, application-quality, and technology-acceptance ratings. **Discussion.** The platform demonstrated promising preliminary feasibility and acceptance as a digital approach to supporting community first aid and prehospital emergency access. Further real-world evaluation is required to determine effects on emergency activation, first aid performance, prehospital response, and patient outcomes.

Keywords: Emergency nursing, First aid, Prehospital care, Technology acceptance, Web-based application

INTRODUCTION

Emergency conditions require rapid recognition, appropriate initial intervention, and timely activation of emergency medical services. The prehospital period is particularly important because delays in recognising an emergency, initiating first

aid, communicating the location of an event, or accessing appropriate transport may delay definitive care. Early recognition, early first aid and early activation of emergency medical services are therefore important components of emergency response (Badkur *et al.*, 2024; Birkun, 2024;

Susila *et al.*, 2025). In community settings, these steps may be hindered by communication difficulties, limited access to ambulance services and insufficient knowledge of appropriate first aid. Prehospital ambulance use and response processes are influenced by service availability and location, while effective ambulance care depends on personnel competencies in assessment, triage, decision-making, communication and emergency clinical skills (Sanjana, Wihastuti and Muslihah, 2021; Sanjana *et al.*, 2023; Sanjana, Widyandari and Agustini, 2023). Continuing education and emergency training are also important for maintaining ambulance personnel competence (Syukri *et al.*, 2025).

Digital health technologies have increasingly been used to support emergency dispatch, communication, patient tracking and access to health information. Technologies that integrate communication and geolocation may facilitate interaction between community members and emergency services, while navigation and location technologies may support more accurate identification of emergency scenes (Gabella *et al.*, 2024; van Mark *et al.*, 2024; Susila *et al.*, 2025). Communication is particularly important because emergency dispatchers require timely and accurate information to support decision making and resource allocation. Recent evidence has explored live video and other digital

communication modalities during emergency calls, suggesting that richer information exchange may improve situational awareness and prehospital decision making (Bohnstedt-Pedersen *et al.*, 2024; Gude *et al.*, 2025; Munro *et al.*, 2025).

First aid education is another important component of community emergency preparedness. In emergencies such as cardiac arrest, choking, major bleeding, burns, poisoning and acute medical events, community members may hesitate or perform inappropriate actions when they lack knowledge and confidence. Accessible digital education can provide practical information at the point of need and may complement conventional emergency education (Birkun, 2024; Marks *et al.*, 2025; Susila *et al.*, 2025). A digital system that combines first aid information with emergency activation and communication may therefore provide a more coherent pathway from emergency recognition to professional assistance.

Accessibility is essential when technology is intended for use during urgent situations. Applications requiring installation, registration or multiple platforms may introduce additional barriers. Web-based systems can be accessed through internet browsers across devices without requiring installation, making them potentially useful for rapid community access (Ferrucci *et al.*, 2021) (Ferrucci

et al., 2021). Previous research on emergency and mobile health technologies also indicates that usability, perceived usefulness, system reliability and user trust are important considerations for technology adoption (Alsyouf et al., 2023; Nadal et al., 2020; Hyzy et al., 2022). Similar considerations have been reported in evaluations of digital nursing and palliative-care applications, where usability and technology acceptance are important preliminary indicators of implementation readiness (Agustini, Suyasa and Israfil, 2026).

Although numerous emergency-related digital applications have been developed, many focus on individual functions such as ambulance requests, emergency communication, triage or health education (Montano *et al.*, 2021). Recent work on emergency triage technologies and nursing triage accuracy further demonstrates the growing role of digital systems in emergency decision support (Agustini *et al.*, 2026; Vallentino *et al.*, 2026). There is nevertheless a need for integrated community-oriented platforms that connect first aid education with emergency activation, location sharing and communication with emergency services (Susila *et al.*, 2025). An integrated approach may reduce the need to switch between multiple applications and may provide a more accessible pathway for community users.

In response to these needs, the All in One Emergency Response platform was developed as a web-based system integrating first aid education and emergency ambulance access. The development was informed by literature review and focus group discussion with emergency stakeholders, followed by platform design, development, expert assessment and preliminary community evaluation. The objective of this study was to develop and preliminarily evaluate the application in terms of its content and media quality, application quality and technology acceptance.

METHOD AND ANALYSIS

Study design

This study used a research and development design guided by the ADDIE framework. The development process comprised needs analysis, platform design and development, expert validation, revision and preliminary user evaluation. The original development plan described the first three ADDIE phases as Analysis, Design and Development; expert validation and community evaluation were subsequently conducted as part of the development and preliminary evaluation process.

Setting and participants

The study was conducted at Ambulans Gawat Darurat (AGD) 118 Jakarta, Indonesia, from October 2025 to February

2026. During the analysis phase, focus group discussions were conducted with emergency-service stakeholders to identify user needs and system requirements. Experts in emergency care, media and information technology were involved in validation of the developed materials and platform. Community participants were recruited using snowball sampling for the preliminary user evaluation. Eligibility criteria were age 18 years or older, ability to operate a smartphone or internet-connected device, and willingness to participate. A total of 126 community participants completed the user evaluation.

Development process

The analysis phase combined literature review and focus group discussion to identify requirements for emergency education, emergency communication, ambulance access and location sharing. The design phase produced application flowcharts, user-interface designs, storyboards and educational content. During development, a web-based prototype was constructed and subsequently reviewed by content and media experts. The prototype was revised following expert feedback before community evaluation.

Platform features

The platform was designed to provide emergency first aid education and ambulance activation through a web-based

interface. Educational content comprised eleven modules: emergency preparedness; victim assessment; cardiopulmonary resuscitation; medical emergencies; trauma and bleeding control; burns; poisoning; disaster preparedness; home safety; road safety; and emergency activation procedures. The emergency communication component enabled ambulance contact through WhatsApp and supported location sharing. Educational materials used short explanations, pictures and step-by-step instructions intended for users without a health-care background.

Expert validation

Content validation was conducted by eight emergency-care professionals, including emergency physicians and emergency nurses. Content domains included material relevance and appropriateness, accuracy and clarity, safety considerations, and communication and language suitability. Media validation was conducted by two information-technology professionals and covered information architecture and optimisation, user interface and user experience, and functionality and system performance.

Community evaluation and instruments

Four types of instruments were used: a focus group discussion guide, expert validation questionnaires, an application-quality questionnaire, and a

Technology Acceptance Model (TAM)-based questionnaire. The application-quality questionnaire covered usability, functionality, portability, validity, reliability and user views. Technology acceptance covered perceived usefulness, perceived ease of use, attitude toward using, behavioural intention to use, and trust, reliability and acceptance. The original manuscript described the application-quality evaluation as the System Usability Scale; however, because the reported results comprise a multidomain questionnaire rather than the conventional ten-item SUS scoring structure, the present revision reports these findings as application-quality evaluation pending verification of the original instrument and scoring sheet.

Data collection

After the prototype had been revised following expert review, community participants used and explored the application, including the emergency education materials, location-sharing function and ambulance activation through WhatsApp. Participants then completed the application-quality and technology-acceptance questionnaires.

Data analysis

Focus group findings were analysed descriptively to identify themes and system requirements. Quantitative data from expert validation and community

questionnaires were analysed using descriptive statistics. Scores were transformed into percentages and interpreted according to the feasibility or acceptance criteria used in the original evaluation.

Validity and reliability

The evaluation questionnaire underwent face-validity assessment before implementation. Item-total correlations were used to assess item validity, and Cronbach's alpha was used to assess internal consistency. The reported item-total correlation coefficients ranged from 0.789 to 0.910, with $p < 0.001$ for all items. Cronbach's alpha coefficients ranged from 0.766 to 0.923 across the reported domains.

Ethical considerations

Ethical approval was obtained from the Research Ethics Committee of the Institute of Technology and Health Bali (ITEKES Bali), ethical clearance number 03.398.1/KEPITEKES-BALI/X/2025.

Participants received information about the study aims, procedures, benefits and risks and provided signed informed consent. Participant identities were kept confidential and the data were used for research purposes only.

RESULTS

Needs assessment

The literature review and focus group discussion identified four central

requirements for a community-based emergency response platform: rapid access to ambulance services, emergency communication, location sharing and accessible first aid information. Participants reported difficulties communicating emergency locations to health-care providers because descriptions based on addresses and landmarks could be challenging. GPS and location-based services were therefore identified as priority functions. Participants also considered WhatsApp familiar and accessible and identified its potential for rapid exchange of location, text, images and video. Accessible, practical and evidence-based first aid education was identified as another core requirement. A web-based approach was preferred because users could access the system through an internet browser without installing an application or completing a registration process.

Platform development

The resulting platform integrated emergency education and emergency communication. Eleven educational modules were developed covering emergency preparedness, victim assessment, cardiopulmonary resuscitation, medical emergencies, trauma and bleeding control, burns, poisoning, disaster preparedness, home safety, road safety and emergency activation. The emergency communication section enabled ambulance contact through

WhatsApp and incorporated location sharing. The interface used streamlined navigation and educational materials with short explanations, images and step-by-step instructions.

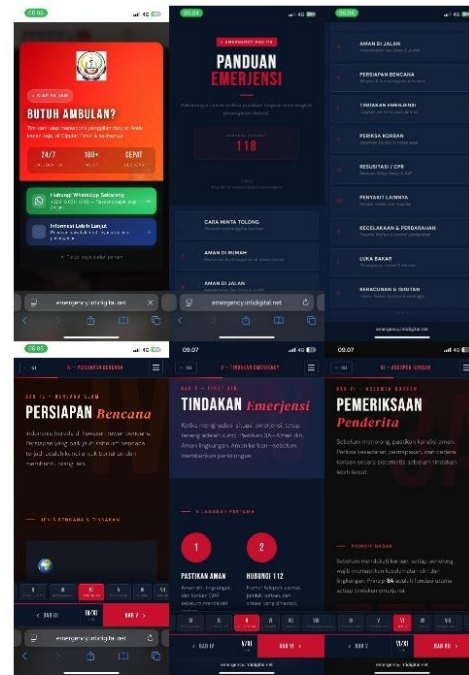


Figure 1. Representative interfaces of the web-based emergency response platform.

Expert validation

Eight emergency-care professionals evaluated the educational content. Relevance and appropriateness received the highest rating (91.67%), followed by accuracy and clarity (83.13%) and safety considerations (81.67%). Communication and language suitability received the lowest rating (76.00%) but remained within the feasibility category used in the original assessment. The findings indicated that the content was considered appropriate,

accurate and safe for community-oriented emergency education.

Table 1. Expert content validation results.

Content domain	Feasibility (%)	Interpretation
Relevance and appropriateness	91.67	Highest-rated domain
Accuracy and clarity	83.13	Favourable
Safety considerations	81.67	Favourable
Communication and language	76.00	Lowest-rated domain; feasible

Two information-technology professionals evaluated the media and technical components. Information architecture and optimisation received the highest score (80.0%), followed by user interface and user experience (78.0%). Functionality and system performance received 75.0%. These findings supported the continued use of the prototype while indicating a need for further technical optimisation.

Table 2. Expert media validation results.

Media domain	Feasibility (%)
Information architecture and optimisation	80.0
User interface and user experience	78.0
Functionality and system performance	75.0

Community participant characteristics

A total of 126 community participants completed the user evaluation. The median age was 41 years, with a range of

21–59 years. Women represented 61.9% of the sample and men 38.1%. Most participants had a bachelor's degree (65.1%), followed by senior high school education (27.0%).

Table 3. Demographic characteristics of community participants. *The source manuscript reports 4.8% for master's degree; this percentage should be verified against the original dataset because n=2 of 126 corresponds to 1.6%.

Characteristic	n	%
Gender: Male	48	38.1
Gender: Female	78	61.9
Education: Elementary school	2	1.6
Education: Junior high school	6	4.8
Education: Senior high school	34	27.0
Education: Bachelor's degree	82	65.1
Education: Master's degree	2	4.8*

Application quality evaluation

Application quality was evaluated across six dimensions. The overall mean score was 3.99, corresponding to 79.8% and classified as good in the original feasibility criteria. The validity domain received the highest score (83.2%), followed by user views (81.1%) and reliability (80.6%). Usability and portability were 79.7% and 79.6%, respectively. Functionality was the lowest domain at 76.4%, although it remained within the good category.

Table 4. Application quality evaluation.

Dimension	Mean score	Feasibility (%)	Criterion
Usability	3.98	79.7	Good
Functionality	3.82	76.4	Good
Portability	3.98	79.6	Good
Validity	4.16	83.2	Very good
Reliability	4.03	80.6	Very good
User views	4.05	81.1	Very good
Overall application quality	3.99	79.8	Good

Technology acceptance

The technology-acceptance evaluation produced an overall mean score of 4.06, corresponding to 81.3% and classified as strongly agree in the original criteria. Perceived usefulness was the highest-rated domain (83.8%), followed by perceived ease of use (81.5%), attitude toward using (80.4%), behavioural intention to use (79.7%), and trust, reliability and acceptance (79.4%).

Table 5. Technology acceptance evaluation.

Dimension	Mean score	Acceptance (%)	Criterion
Perceived usefulness	4.19	83.8	Strongly agree
Perceived ease of use	4.07	81.5	Strongly agree

Attitude toward using	4.02	80.4	Strongly agree
Behavioural intention to use	3.98	79.7	Agree
Trust, reliability and acceptance	3.97	79.4	Agree
Overall acceptance	4.06	81.3	Strongly agree

Validity and reliability of the evaluation instrument

All reported questionnaire items were statistically valid, with item-total correlations ranging from 0.789 to 0.910 and $p < 0.001$. The strongest reported correlation was 0.910 in the reliability domain, while the lowest was 0.789. Cronbach's alpha coefficients ranged from 0.766 to 0.923 across the evaluation domains, indicating satisfactory to high internal consistency.

Table 6. Internal consistency of the evaluation questionnaire.

Dimension	Items	Cronbach's alpha	Category
Usability	5	0.923	Highly reliable
Functionality	5	0.919	Highly reliable
Portability	3	0.846	Highly reliable
Validity	3	0.877	Highly reliable
Reliability	3	0.872	Highly reliable
User views	5	0.894	Highly reliable
Perceived usefulness	4	0.842	Reliable

Per- ceived ease of use	4	0.840	Relia- ble
Attitude toward using	2	0.774	Relia- ble
Behav- ioural inten- tion	2	0.766	Relia- ble
Trust, reliabil- ity, and ac- ceptance	3	0.799	Relia- ble

DISCUSSION

This study developed and preliminarily evaluated a web-based emergency response platform designed to support community first aid and access to prehospital emergency services. The development process was informed by needs identified through literature review and focus group discussion, followed by iterative design, expert assessment and community evaluation. The findings indicate favourable perceptions of the platform's content, media characteristics, application quality and technology acceptance. These findings support the platform as a promising prototype, but they do not establish effectiveness in real emergency response.

The needs assessment identified rapid ambulance access, emergency communication, location sharing and practical first aid information as the central requirements. Difficulties communicating

emergency locations were specifically identified by participants, supporting the inclusion of GPS and location-based functions. This is consistent with evidence that navigation and location technologies can influence emergency response processes and that digital tools can support emergency medical service activation (Gabella et al., 2024; van Mark et al., 2024; Susila et al., 2025). The use of a familiar communication channel such as WhatsApp may also reduce barriers for community users, although actual communication performance and ambulance response time were not tested in this study.

The high content relevance score indicates that emergency-care experts considered the educational materials appropriate for community use. The lower score for communication and language suggests that plain-language adaptation should remain a development priority. Emergency education must be understandable to users without clinical training, particularly when information may be accessed under stress. The inclusion of short explanations, pictures and step-by-step instructions was intended to support this requirement.

Media validation was favourable but also identified functionality and system performance as the weakest technical domain. This finding is important because emergency technology must function reliably under time pressure. A technically

attractive interface is insufficient if users experience delays, broken links, communication failures or poor performance across devices and network conditions. The result therefore supports further technical optimisation before the platform is evaluated in real emergency situations.

The overall application-quality score was 79.8%, with the highest user-rated domain being validity at 83.2%. Because the instrument used in this study contains six multidimensional domains, these findings are best interpreted as user-rated application quality rather than as evidence of clinical validity. The favourable scores suggest that users perceived the content and functions as relevant and usable, but they do not establish that the application produces better emergency decisions or outcomes.

Technology acceptance was also favourable, with an overall score of 81.3%. Perceived usefulness was the highest domain at 83.8%, suggesting that participants recognised practical value in combining emergency education, location sharing and ambulance activation. This is consistent with technology-acceptance literature showing that perceived usefulness and ease of use are important determinants of adoption (Nadal, Sas and Doherty, 2020; Alsayouf et al., 2023). Similar principles have been reported in evaluations of digital health and nursing applications, where

perceived usefulness, usability and technology acceptance provide important preliminary evidence for implementation readiness (Agustini, Suyasa and Israfil, 2026). The integration of several functions into one platform may reduce the need to switch between separate systems, although this assumption requires testing in real-world use.

Perceived ease of use was 81.5%, while attitude toward use and behavioural intention were 80.4% and 79.7%, respectively. These findings indicate positive preliminary acceptance but should not be interpreted as evidence of sustained adoption. Actual continued use, frequency of use during emergencies and user performance under stress were not measured. Similarly, the trust, reliability and acceptance score of 79.4% reflects user perception rather than an objective assessment of system uptime, cybersecurity or data integrity.

The internal consistency findings were favourable, with Cronbach's alpha values ranging from 0.766 to 0.923. Item-total correlations were also positive and statistically significant. These results support the internal consistency of the evaluation instrument used in this study. However, questionnaire reliability does not establish the effectiveness or clinical validity of the application itself. Future validation should therefore include independent

usability assessment, task completion, error rates and performance under realistic emergency scenarios.

Several limitations should be considered. First, community participants were recruited using snowball sampling, which limits representativeness and may introduce selection bias. Second, the evaluation was conducted in a single organisational context in Jakarta and involved a relatively modest community sample. Third, the evaluation was preliminary and relied primarily on expert ratings and user perceptions. Fourth, the study did not compare the platform with standard emergency procedures or another digital intervention. Fifth, actual emergency response time, ambulance dispatch performance, first aid performance, patient outcomes and survival were not measured. Finally, the technical functionality score was the lowest among the application-quality domains, indicating that further optimisation is required before implementation at scale.

Despite these limitations, the study contributes a practical model for integrating community first aid education with emergency communication, location sharing and ambulance access. The platform provides a foundation for subsequent implementation research. Future studies should test the system prospectively in realistic emergency scenarios, assess task completion and first aid performance,

evaluate actual emergency activation and ambulance response processes, and determine whether the platform produces measurable improvements in patient-centred or system-level outcomes.

CONCLUSION

A web-based emergency response platform integrating first aid education, emergency communication, location sharing and ambulance activation was developed through a research and development process guided by the ADDIE framework. Expert assessments and preliminary community evaluation showed favourable content and media ratings, application quality and technology acceptance. The findings support the feasibility and acceptability of the platform as a prototype for community-oriented prehospital emergency support. However, the study does not establish effectiveness in reducing emergency response time, improving first aid performance or improving patient outcomes. Further real-world implementation and effectiveness studies are required before the platform can be recommended as an established emergency-response intervention.

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DECLARATION OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this study.

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This research received no external funding and was conducted using the authors' personal resources.

DATA AVAILABILITY

The data supporting the findings are available from the corresponding author upon reasonable request. The data are not publicly available because of ethical and privacy considerations involving participant information.

ETHICAL APPROVAL

Ethical approval was obtained from the Research Ethics Committee of the Institute of Technology and Health Bali (ITEKES Bali), ethical clearance number 03.398.1/KEPITEKES-BALI/X/2025.

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