



COMPARISON OF THE EFFECTIVENESS OF EDUCATIONAL MEDIA ON KNOWLEDGE AND ATTITUDE TOWARDS HANDLING STROKE ATTACKS: A SYSTEMATIC REVIEW

Daniel Christian^{1*}, I Made Kariasa², Liya Arista²

Master's Program, Faculty of Nursing, Universitas Indonesia, Jl. Prof. DR. Sudjono D. Pusponegoro, Pondok Cina, Beji, Depok, Jawa Barat 16424, Indonesia

²Faculty of Nursing, Universitas Indonesia, Jl. Prof. DR. Sudjono D. Pusponegoro, Pondok Cina, Beji, Depok, Jawa Barat 16424, Indonesia

*daniel.christian2403@gmail.com

ABSTRACT

The success of stroke management is largely determined by the speed of symptom recognition and the decision to access emergency care. Gaps in conventional education access and low health literacy make it crucial to compare the effectiveness of digital versus non-digital educational media. This study aims to analyze the comparative effectiveness of educational media on knowledge and attitudes towards handling strokes through a systematic review. A Systematic Review was conducted following the PRISMA 2020 guidelines. Literature searches (January 2021–September 2025) in PubMed, Scopus, ScienceDirect, Taylor & Francis and Google Scholar identified 4.185 articles. Seven studies were included following a screening and eligibility assessment process. The designs comprised RCTs, quasi-experiments, and pre–post studies on adult community and family populations. Data were standardized, synthesized thematically, and quality-assessed using the JBI checklist. All studies reported significant improvements in the knowledge of stroke signs/symptoms (FAST) after interventions. Digital media (videos/animations, e-learning, web campaigns) more consistently improved quick-response attitudes and the intention to contact EMS compared to non-digital media (leaflets/flipbooks, lectures). Online campaigns and short videos significantly boosted FAST recognition by approximately 70–80% and fortified EMS activation intentions, with some respondents still opting for non-EMS routes. Non-digital media continued to be effective in low-tech environment infrequently used to gauge or alter actual behaviour. Both media types effectively enhance knowledge, but web-based media are superior in shaping rapid-response attitudes and intentions. Future programs should prioritize hybrid models that combine digital framework with face-to-face guidance and digital literacy training for patients, families, and healthcare providers to strengthen patient autonomy and digital health service efficiency.

Keywords: animated video; digital media; e-learning; non-digital media; stroke

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INTRODUCTION

Stroke is a leading cause of death and disability worldwide. According to the Global Stroke Fact Sheet by the World Stroke Organization, approximately 12.2 million people experience a stroke each year, with 6.5 million of these resulting in death (Feigin et al., 2025). Globally, stroke ranks second as a cause of death and third as a cause of disability combined among non-communicable diseases. The increasing trend in the burden of stroke is also evident in middle-income countries like Indonesia, where the prevalence of stroke increased from 7 to 10.9 per 1,000 population between 2013 and 2018, representing an increase of approximately 56% (Ministry of Health of the Republic of Indonesia, 2018). This situation confirms that stroke remains a serious challenge to the national health system.

Stroke directly impacts the affected arteries and the brain areas they supply, affecting many bodily functions such as motor activity, urinary elimination, digestion, intellectual function, spatial-perceptual changes, personality, affect, sensation, and communication (Lewis et al., 2018). Damaged brain cells cannot regenerate and are permanent. Millions of brain cells are damaged

every minute if a stroke is not treated promptly and effectively, resulting in increasingly severe neurological deficits (Kariasa, 2022).

The impact of stroke extends beyond physical impairments such as paralysis, loss of coordination, or speech impairments, but also encompasses significant psychosocial and emotional aspects. Many stroke survivors experience depression, decreased self-confidence, and limitations in activities of daily living (ADL), which impact quality of life (Ellepola et al., 2022; Anello et al., 2024). Therefore, effective interventions to improve patient and community knowledge and attitudes regarding the signs, symptoms, and early treatment of stroke are crucial in reducing morbidity and mortality from this disease.

Health education efforts have been shown to play a crucial role in strengthening individual awareness and preparedness in the face of emergencies such as stroke. Providing appropriate education can improve the public's ability to recognize the signs of stroke using the FAST (Face, Arm, Speech, Time) principle and accelerate the response to seeking medical attention (Tan et al., 2022). However, the effectiveness of educational media used to convey this information varies depending on the medium, communication strategy, and audience characteristics (Halliday, 2020). In the modern context, educational media innovations such as web-based media, interactive videos, and digital applications are beginning to be used to replace conventional methods such as leaflets and face-to-face counseling.

The development of digital technology has opened up new opportunities in health education, including stroke prevention and treatment. Web-based media allows for faster, more interactive, and more accessible information dissemination, especially in urban communities with high internet penetration (Soleimani et al., 2024). Various studies have shown that digital education can improve health literacy and behavior change more effectively than traditional methods (Kim et al., 2024). However, the effectiveness of digital media cannot be generalized because it depends on the social context, digital literacy skills, and technological readiness of users (Milenkova & Lendzhova, 2021). Therefore, systematic evaluation of the effectiveness of various educational media is still needed.

In addition to digital media, conventional educational approaches such as live lectures, simulations, and group counseling remain relevant, especially in areas with limited access to technology. Non-digital media are considered more appropriate for older adults or rural communities who still face barriers to technology use (Gallistl et al., 2021). However, there are few studies directly comparing the effectiveness of digital and non-digital educational media on improving knowledge and attitudes regarding stroke management. This comparison is crucial for determining the most targeted health communication strategies based on the demographic characteristics of the population.

Previous studies have focused on evaluating single media without examining differences in effectiveness between media types (Buchner et al., 2022). However, selecting appropriate educational media can determine the success of knowledge transfer and health behavior change (Velasco et al., 2021). This research gap raises the need for a systematic review that integrates various empirical evidence on the comparative effectiveness of educational media in the context of stroke management, both web-based and conventional media.

Based on the above description, this study aims to analyze and compare the effectiveness of various educational media on improving knowledge and attitudes regarding stroke management through a Systematic Review (SR) approach. This study is expected to provide a scientific foundation for developing more efficient, adaptive, and tailored health education strategies to the needs of modern society. In addition, the results of this study can be a reference for health workers in selecting the most effective educational media to increase public awareness and preparedness for stroke attacks.

METHOD

This study used a systematic review conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) systematic review reporting guidelines. The study used PICO to address the research objectives. Population (P): adult individuals (≥ 18 years) targeted for stroke education, including patients, families, and the general public; Intervention (I): educational programs using web-based or digital media (e.g., apps, online educational videos, e-learning, or tele-education); Comparison (C): educational programs using non-digital media (e.g., leaflets, face-to-face lectures, simulations, or conventional counseling); Outcome (O): changes in knowledge and attitudes toward the signs, symptoms, and response to stroke treatment.

Inclusion

Scientific articles examining stroke education programs with the primary variable being knowledge and/or attitudes toward stroke management, (1) published between 2021 and 2025, (3) using a quantitative or mixed-methods research design (e.g., randomized controlled trial, quasi-experimental, pre-post test, comparative study), (4) comparing at least two types of educational media (digital vs. non-digital), (5) available in English or Indonesian with abstract and full text and relevant to the topic.

Exclusion

Articles that were off-topic, lacked full text, or did not meet established methodological standards.

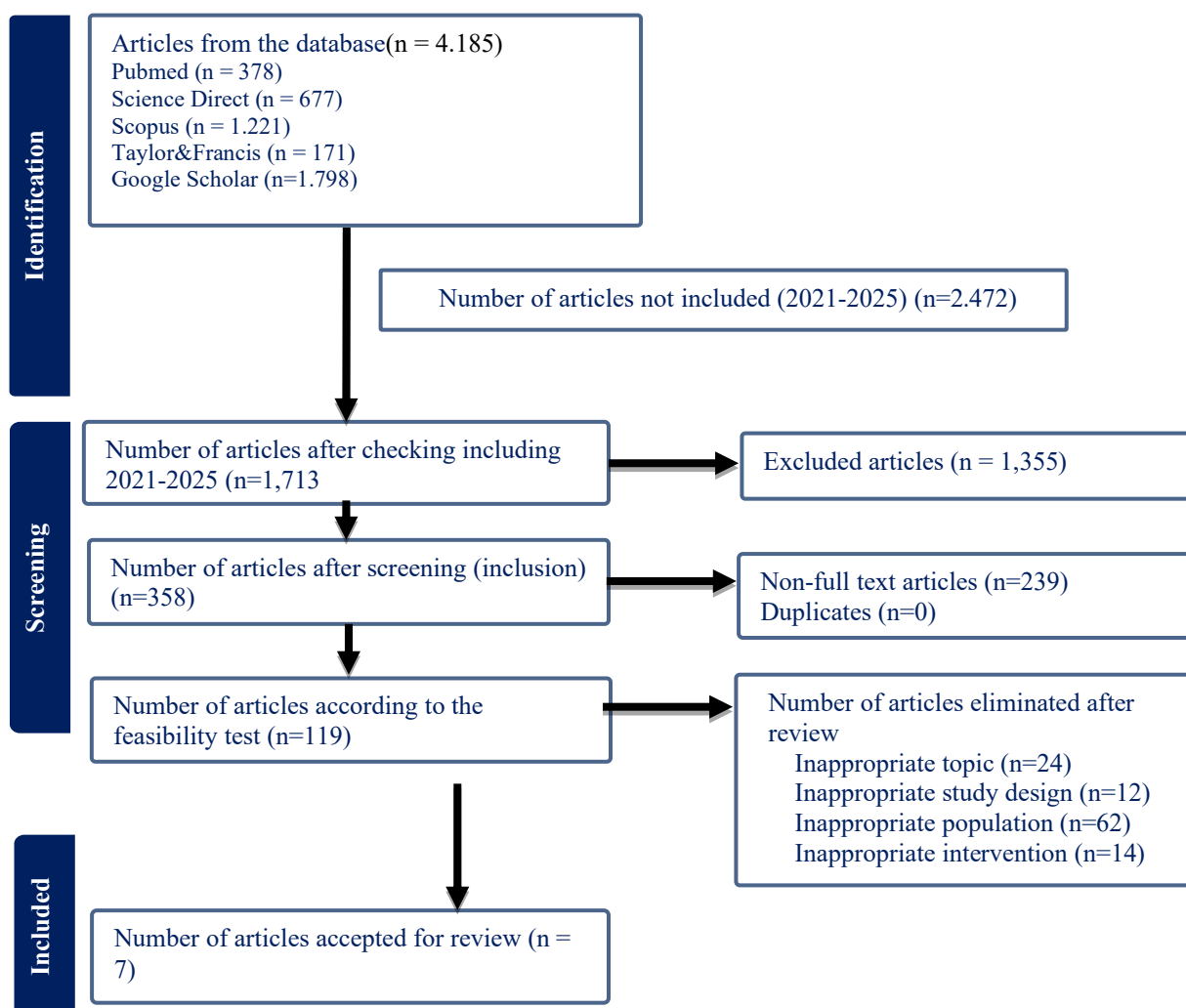
Literature Search Strategy

A systematic literature search was conducted in five major academic databases: PubMed, Google Scholar, ScienceDirect, Taylor & Francis, and Scopus, with a total of 4,185 articles identified. The search period was set between January 2021 and September 2025 to capture current research trends. The search strategy was structured using a combination of Boolean operators and Medical Subject Headings (MeSH) as follows: (“Stroke” OR “Cerebrovascular Accident” OR “Transient Ischemic Attack”) AND (“Education Program” OR “Health Education” OR “Awareness Program”) AND (“Knowledge” OR “Attitude” OR “Behavior Change”) AND (“Web-based” OR “Online Media” OR “Mobile Health” OR “E-learning” OR “Digital Education”) AND (“Leaflet” OR “Conventional Education” OR “Printed Media” OR “Face-to-Face”).

Data Selection

The selection process consisted of three stages: identification, screening, and eligibility assessment. Based on the PRISMA chart, 2,361 articles were excluded because they did not fit the publication year range (2021–2025). A total of 1,713 articles were further screened, and 358 met the initial inclusion criteria. Of these, 239 articles lacked full text and were eliminated, leaving 119 articles for eligibility testing. After in-depth review, 7 articles met all criteria and were included in the final analysis.

The selection process was conducted by two independent researchers, and any discrepancies in the selection results were resolved through joint discussion or by involving a third researcher to reach consensus. The selection stages and exclusion flow are visually illustrated using the PRISMA diagram (Figure 1).



Methodological Quality Evaluation

The methodological quality of each article was assessed using the JBI Critical Appraisal Checklist for Randomized Controlled Trials and Quasi-Experimental Studies (Tufanaru et al., 2020). Articles with a score of $\geq 75\%$ were categorized as high quality, while those with a score of 60–74% were categorized as moderate quality. No articles with low quality ($<60\%$) were included in the final synthesis. This assessment was used to ensure the reliability of the results and reduce potential bias in interpretation.

Data Extraction and Synthesis

Data from the seven selected articles were extracted into a synthesis matrix using a standardized format that included: (1) citations (author, year, country), (2) study design and sample, (3) type of educational media used, (4) methods for measuring knowledge and attitudes, (5) main outcomes, and (6) implications for stroke education practice. The synthesis was conducted narratively and thematically, comparing the effectiveness of web-based and non-digital media and identifying factors influencing intervention outcomes, such as participant characteristics, program duration, and type of media used. The analysis of the results was conducted to assess the patterns of effectiveness, consistency between studies, and opportunities for developing educational media that are more efficient and easily accessible to the wider community.

RESULT

1. Study Characteristics (Table 1)

Seven studies (Alfisyahri, 2025; Bidin, 2022; Desyani, 2024; Iskandar, 2024; Katsuki, 2023;

Kustanti & Widayarani, 2023; Suprayitna & Fatmawati, 2021) evaluated educational media for stroke sign/symptom recognition (specifically FAST) and acute care response. The dominant designs were quasi-experimental pre-post (with/without control) and one pre-post campaign survey. Sample sizes varied ($n \approx 30$ to $n = 2,721$), and intervention contexts included community/prehospital settings, at-risk families (hypertension), schools, and the general public across countries.

2. Participant Characteristics

The population included general adults (Bidin, 2022; Iskandar, 2024), families with risk factors for hypertension (Desyani, 2024), the prehospital community (Alfisyahri, 2025; Kustanti & Widayarani, 2023), and elementary/middle school students and parents (Katsuki, 2023). The overall focus was on promoting stroke preparedness at the community/family level, not among hospitalized patients.

3. Types of Educational Media & Implementation

Digital/online media dominated: animated/short videos (Desyani, 2024; Iskandar, 2024), web/social-based multi-channel campaigns (Bidin, 2022), and on-demand e-learning (Katsuki, 2023). Non-digital methods tested included the FAST flipbook (Kustanti & Widayarani, 2023) and in-person lectures (Suprayitna & Fatmawati, 2021). One study conducted a head-to-head digital vs. print comparison (Alfisyahri, 2025). The intervention duration was short (a single 3–10-minute session/video or a one-month campaign) with pre-post measurements.

4. Measured Outcomes

The primary outcome was knowledge of signs and symptoms (FAST); several studies also assessed attitudes toward rapid response (Desyani, 2024; Iskandar, 2024; Alfisyahri, 2025) and response intentions/behaviors (e.g., likelihood to contact EMS/go to the hospital quickly) in the campaign or prehospital context (Bidin, 2022; Alfisyahri, 2025). Lectures (Suprayitna & Fatmawati, 2021) assessed prevention knowledge (not specifically FAST).

5. Media Effectiveness (Knowledge, Attitude, Intention/Behavior)

All studies showed a significant/strong increase in knowledge; the effect was most consistent with digital media (Desyani, 2024; Iskandar, 2024; Bidin, 2022). Attitudes to act quickly increased significantly with video/online interventions (Desyani, 2024; Iskandar, 2024), and in a video vs. print comparison, video was superior (Alfisyahri, 2025). Response intention/behavior (call EMS/go to the hospital quickly) improved with digital campaigns (Bidin, 2022) and prehospital contexts that emphasized the time component (Alfisyahri, 2025), although some respondents still preferred non-EMS routes (Bidin, 2022). Non-digital (flipbooks/lectures) increase knowledge, but rarely assess attitudes or intentions to act (Kustanti & Widayarani, 2023; Suprayitna & Fatmawati, 2021).

6. Practical Implications & Feasibility

Short videos/animations and web materials have proven to be concise, inexpensive, easy to distribute, and suitable for community health centers (Puskesmas), Prolanis/Posbindu (Community Health Posts), schools, and public campaigns (Alfisyahri, 2025; Desyani, 2024; Iskandar, 2024; Katsuki, 2023). Flipbooks/lectures are suitable for areas with limited digital access (Kustanti & Widayarani, 2023; Suprayitna & Fatmawati, 2021). A blended model (e-learning + printed materials) is effective in expanding the reach of families/schools (Katsuki, 2023).

7. Methodological Strengths & Weaknesses

Strengths: Direct media comparisons (Alfisyahri, 2025), control groups (Desyani, 2024; Suprayitna & Fatmawati, 2021), and large cross-country samples (Iskandar, 2024). Weaknesses: Some studies lack randomized controls, small/moderate samples, short-term follow-up, and actual actions (EMS calls) are not always measured, resulting in limited evidence for real behavior change (Bidin, 2022; Desyani, 2024; Katsuki, 2023).

8. Conclusions & Recommendations

Evidence across studies shows that digital educational media—particularly short videos, animations, e-learning, and web campaigns—more consistently increase FAST knowledge, shape positive attitudes toward rapid action, and improve emergency response intentions/tendencies compared to non-digital media, which tend to only increase knowledge (Alfisyahri, 2025; Bidin, 2022; Desyani, 2024; Iskandar, 2024 vs. Kustanti & Widyarani, 2023; Suprayitna & Fatmawati, 2021). Recommendations: (a) prioritize web-based/video media as the primary intervention, supported by printed materials for low-tech areas; (b) conduct RCTs/quasi-experiments with follow-up to assess knowledge retention and actual behavior (EMS activation/arrival time); (c) use standardized short messages (FAST with emphasis on “Time”) and periodic reinforcement (boosters) in digital campaigns (Bidin, 2022; Iskandar, 2024); (d) in the school/family context, consider a blended model to expand reach and participation (Katsuki, 2023).

Table 1.

Data evaluation: study characteristics, educational interventions, and outcomes (n = 7)

Citation (Author, Year & Title)	Purpose	Design & Sample	Population/Media	Implementation	Phase (Digital vs. Non-digital)	Outcomes Measured	Outcomes Key Findings	Implications & Feasibility	Strengths /Weaknesses	Conclusions & Recommendations
Alfisyahri et al., 2025 – Edukasi FAST di lingkup pre-hospital	Assessing the effectiveness of print vs. audiovisual media for early detection (FAST)	Quasi-experimental, pre-post & between two groups; n=30 (drawn from 129 recruited)	Community/prehospital	One educational session; pre-post questionnaire; t-test analysis	Audiovisual (Digital) vs Print (Non-digital)	FAST knowledge/attitude; intention/fast response	Both significant p=0.000; audiovisual more effective than print	Practical for Puskesmas/prehospital; easily replicated	+ Head-to-head media; – Small, purposive sample	Audiovisual media enhances early detection of FAST; recommendation: adopt standardized short videos + accompanying print materials
Bidin et al., 2022 – ResQ Stroke Campaign (Malaysia)	Assessing the impact of an awareness campaign on knowledge, actions, and attitudes	Cross-sectional pre-post campaign; n=171 adults	General public (≥18 yrs)	Multi-channel education during World Stroke Month; pre-post questionnaire	Multi-channel predominantly Digital (media-driven)	FAST knowledge; care-seeking actions & attitudes	FAST recognition ↑ to +80%; primary action: call EMS/hospital ≤4.5 hours; some still choose non-EMS routes	Campaign effective but needs frequent repetition	+ Real-world context; – No randomized control; self-report	Digital campaign improves knowledge & intentions; recommendation: reinforcement of “call EMS” message and long-term follow-up
Desyani et al., 2024 – Video animasi FAST (keluarga hipertensi)	Testing the effect of a FAST animated video on family knowledge and attitudes	Quasi-experimental pre-post with control; n=50	Families of hypertension patients (community)	10-minute video; pre-post; paired t-test	Digital (animated video) vs control	FAST knowledge & attitude	Significant increase in knowledge p=0.000; attitude p=0.000	Feasible for prolanis/posbindu program; low cost	+ Control group available; – Moderate sample size; short-term follow-up	Animated video effective; recommendation: micro-module package & retention measurement
Iskandar et al., 2024 – Video online 3 menit (4 negara Arab)	Testing the effect of a 3-minute video about stroke on public	Web-based pre-post study; n=2,721	General public (≥18 yrs), cross-country	Pretest → watch video → posttest; t-test & RM-ANOVA analysis	Digital (short online video)	Total & subcomponent knowledge scores (risks, signs, prevention, immediate action)	All scores ↑ significant (p<0.001) across countries	Broad scale, easy to disseminate; concise content	+ Large sample size across countries; – No randomized control; long-term impact not	Short video effectively increases knowledge; recommendation: RCT & retention/real-action/evaluation

Citation (Author, Year & Title)	Purpose	Design & Sample	Population/Media	Implementation	Phase (Digital vs. Non-digital)	Outcomes Measured	Outcomes Key Findings	Implications & Feasibility	Strengths /Weaknesses	Conclusions & Recommendations
Katsuki et al., 2023 – E-learning sekolah + manga	Evaluating school-based education through on-demand e-learning and manga	Educational campaign; post-education survey (pre vs. post comparison on the same respondents); n students=261; parents=211	Elementary/Junior High School students & parents; community	Distribution of e-learning & manga (online & paper); 2-month post survey	Digital (e-learning) + Non-digital (paper manga)	Knowledge of signs/symptoms & responses	Correct answers ↑ significant (students 51.7% → 78.5%; parents 44.1% → 93.8%); mRS of local hospital patients appears to be improving (indicative)	School model is feasible; can be combined with printed materials	+ Family population reach; – Low response rate; not an RCT	Combination of e-learning+manga improves knowledge; recommendation: increase participation & head-to-head test of media
Kustanti & Widyarani, 2023 – FAST flipbook (prehospital)	Assessing the effectiveness of a FAST flipbook on early detection knowledge	Pre-experimental one-group pre-post; n (final sample details not specified)	Community/prehospital	Education once with flipbook; pre-post	Non-digital (printed flipbook)	Knowledge FAST	Score increased 72.88±2.82 → 82.24±1.64; p=0.000	Low-cost solution for areas with low digital access	+ Simple, low cost; – No control; potential for testing bias	Flipbooks are effective in increasing knowledge; recommendation: compare in-person vs. video/web
Suprayitna & Fatmawati, 2021 – Ceramah/seminar pencegahan stroke (hipertensi)	Assessing the impact of a lecture on stroke prevention knowledge	Quasi-experimental pre-post control; n=36 (simple randomization)	Hypertension patients (Puskemas)	Lecture/seminar session; validated questionaire; t-test analysis	Non-digital (face-to-face/lecture) vs control	Prevention/knowledge	Intervention: 66.2 → 101.56; p=0.000; control unchanged; inter-group difference p<0.001	Appropriate as a minimum standard for offline education	+ Control present; – Not specific FAST/acute response; small size	Lecture effectively increases knowledge; recommendation: compare with video/web for FAST response

RCT (Randomized Controlled Trial), mRS (modified Rankin Scale), FAST (Face drooping–Arm weakness–Speech difficulty–Time), EMS (Emergency Medical Services), ANOVA (Analysis of Variance), MANOVA (Multivariate Analysis of Variance).

Table 2. Media components in stroke recognition and response education

Study (year)	Media Type	Platform / Channel	Knowledge of signs and symptoms (FAST)	Attitude towards rapid response	Response intention/behavior (call EMS/go to hospital)	Summary of design & population
Alfisyahri (2025)	Comparison: Video vs. Print	Short educational videos; leaflets/posters	✓ (both ↑; video > print)	✓	✓ (Time message emphasized)	Quasi-experimental pre-post + between-group; n=30; prehospital (community health center)
Bidin (2022)	Online/Digital dominant (campaign)	Social media/online, public campaign materials	✓ (FAST ↑ ~+80%)	✓	✓ (EMS intention ↑; some still choose non-EMS)	Pre-post campaign survey; n=171; general (adult)
Desyani (2024)	Online/Digital	FAST animated videos (10 minutes)	✓ (p=0,000)	✓ (p=0,000)	(–) (actual action not measured)	Quasi-experimental pre-post with control; n=50; hypertension families

Study (year)	Media Type	Platform / Channel	Knowledge of signs and symptoms (FAST)	Attitude towards rapid response	Response intention/behavior (call EMS/go to hospital)	Summary of design & population
Iskandar (2024)	Online/Digital	3-minute online videos (web)	✓ (p<0,001)	✓ (the importance of "acting fast"↑)	✓ (intention/confidence to act ↑)	Web-based pre-post; n=2,721; 4 countries; adults
Katsuki (2023)	Mixed	On-demand e-learning + manga (online & paper)	✓ (students & parents ↑)	✓ (indicative)	✓ (indicative; action not specifically measured)	School campaign; pre-post; students & parents
Kustanti (2023)	Non-digital	FAST flipbooks (print)	✓ (p=0,000)	(—)	(—)	Pre-experimental single-group; prehospital community
Suprayitna (2021)	Non-digital	Face-to-face lectures/seminars	✓ (prevention knowledge ↑; not FAST specific)	(—)	(—)	Quasi-experimental pre-post with control; hypertension patients

Symbols: ✓ = assessed/improved; (—) = not assessed. Media categories: Online/Digital = web/e-learning/online video/animation; Non-digital = print/flipbook/face-to-face lecture; Mixed = a combination of both.

Table 2 presents the distribution of educational media types across seven studies (Alfisyahri, 2025; Bidin, 2022; Desyani, 2024; Iskandar, 2024; Katsuki, 2023; Kustanti, 2023; and Suprayitna, 2021), classified into three main categories: online/digital, non-digital, and mixed media. All studies showed an increase in knowledge of the signs and symptoms of stroke (FAST), with the highest effects demonstrated by studies based on video media and online campaigns (Bidin, 2022; Desyani, 2024; Iskandar, 2024; Alfisyahri, 2025). Improved attitudes toward rapid response were also significant in four digital studies (Alfisyahri, 2025; Bidin, 2022; Desyani, 2024; Iskandar, 2024), while one mixed study (Katsuki, 2023) showed an indicative increase. Response intentions and behaviors, such as the likelihood of contacting emergency services (EMS) or going to the hospital, increased positively in the four digital studies, although some respondents (Bidin, 2022) still indicated a preference for non-EMS routes. Meanwhile, non-digital media (flipbooks and lectures) used by Kustanti (2023) and Suprayitna (2021) were consistently effective in increasing knowledge, but did not assess attitudes or behavior. Comparatively, research by Alfisyahri (2025) showed that video media was more effective than print media in increasing knowledge, attitudes, and awareness of the importance of rapid action ("Time") in prehospital situations. In general, it can be concluded that digital-based educational media is superior in shaping knowledge and attitudes toward rapid action, while conventional media is more limited in increasing knowledge alone.

Table 3. Classification of intervention effects per component and media type

Study	Type Media	Knowledge FAST	Attitude towards fast response	Intention/Response behavior (EMS/RS)	Effect description & p-value
Alfisyahri 2025	Video vs. Print	√(+) both; video > print	√(+)	√(+)	Pre-post both p=0.000; comparison shows video is more effective
Bidin 2022	Digital Campaign	√(+)	√(+)	√(+)	FAST recognition ↑ ~80%; EMS call intention ↑, but some still choose non-EMS
Desyani 2024	Animated Video	√(+) (p=0,000)	√(+) (p=0,000)	√(±)	Actual action not measured; "act fast" message given
Iskandar 2024	Online Video 3	√(+) (p<0,001)	√(+)	√(+)	All knowledge subscores & "act fast" component p<0.001
Katsuki 2023	Mixed (e-learning + manga)	√(+)	√(±)	√(±)	Knowledge ↑ (students 51.7→78.5%; parents 44.1→93.8%); fast action not specifically measured
Kustanti 2023	Flipbook	√(+) (p=0,000)	∅	∅	Knowledge focus: prehospital context
Suprayitna 2021	Lecture	√(+) (prevention knowledge ↑)	∅	∅	Specific hypertension prevention; not FAST/acute action

Symbols: $\surd(+)$ = positive/significant effect; $\surd(\pm)$ = positive/indicative (no test or partial); \emptyset = not evaluated.

Table 3 classifies intervention effects based on media type and outcome components. All studies using online/digital media (Bidin, 2022; Desyani, 2024; Iskandar, 2024; and some studies using Alfisyahri, 2025) showed a positive and significant effect [$\surd(+)$] on increasing FAST knowledge, with a p-value <0.05 in all studies. Furthermore, attitudes toward rapid response also significantly improved in the four studies, indicating that exposure to digital education led to a change in perceptions of the urgency of emergency action. Regarding response intentions/behaviors, positive effects were also seen in the studies by Iskandar (2024) and Bidin (2022), although actual behavior did not completely change.

In contrast, non-digital media such as flipbooks (Kustanti, 2023) and lectures (Suprayitna, 2021) only had a significant effect on knowledge, with no data related to attitudes or behavior. Mixed media (Katsuki, 2023) produced a positive effect on knowledge and an indicative effect on attitudes and immediate action intentions, but did not measure actual behavior separately. Overall, the findings of these seven studies indicate that video-based, web-based, and e-learning-based education have a stronger and more consistent effect on increasing knowledge, developing positive attitudes, and immediate action intentions in stroke situations, compared to conventional media such as lectures or printed flipbooks.

Table 4.
Results of Critical Appraisal with the JBI Critical Appraisal Checklist

Author, Year	JBI Critical Appraisal Checklist percentage	Evaluation Quality
Alfisyahri et al. (2025)	84,6% (11/13)	Good quality
Bidin et al. (2022)	84,6% (11/13)	Good quality
Desyani et al. (2024)	84,6% (11/13)	Good quality
Iskandar et al. (2024)	84,6% (11/13)	Good quality
Katsuki et al. (2023)	76,9% (10/13)	Sufficient quality
Kustanti & Widyarani (2023)	84,6% (11/13)	Good quality
Suprayitna & Fatmawati (2021)	84,6% (11/13)	Good quality

Category: Good quality: 100–80% ; Fair quality: 79–50% ; Poor quality: $<50\%$

DISCUSSION

Improving Knowledge Through Educational Media

Stroke remains a leading cause of death and disability worldwide, with delays in symptom recognition and initial intervention significantly impacting patient outcomes. Public education about the early signs of stroke using the Face, Arm, Speech, Time (FAST) method has been shown to improve early detection and prompt response to medical care. Over the past two decades, numerous studies have highlighted the effectiveness of educational media, both digital (such as videos, animations, and web campaigns) and non-digital (such as leaflets, flipbooks, posters, and lectures), in increasing public knowledge of the signs and symptoms of stroke (Alfisyahri, 2025; Bidin, 2022; Desyani, 2024; Iskandar, 2024).

Digital media tends to demonstrate greater consistency in increasing knowledge than conventional media. A study by Alfisyahri (2025) showed that an educational video based on the FAST method increased stroke symptom recognition by more than 70% in the intervention group, compared to 45% in the group receiving only verbal education. These results are supported by the findings of Desyani (2024) and Iskandar (2024), who demonstrated a significant increase in participants' knowledge scores after watching a two-minute animated video explaining the FAST steps visually and with a simple narrative. The key characteristic that makes digital media more effective is the combination of visual, auditory, and emotional elements, which encourages deeper cognitive

engagement compared to print media.

However, non-digital media still play a crucial role in communities with limited access to technology. Kustanti and Widyarani (2023) and Suprayitna and Fatmawati (2021) found that flipbooks and face-to-face lectures effectively improved basic knowledge in communities with low digital literacy. Interactive lectures using a question-and-answer method increased understanding of FAST concepts by up to 60%, although the impact on actual behaviors such as contacting Emergency Medical Services (EMS) was limited. Thus, while digital media demonstrates advantages in scalability and interactivity, non-digital media remain relevant as educational tools in low-tech settings that require a face-to-face approach and humanized interactions.

Attitude Change and Intention to Act Quickly in the Dominance of Digital Media

Transforming knowledge into attitudes and behavior is a crucial dimension in public health education. Evidence across studies shows that web-based media, particularly short videos, interactive e-learning, and digital campaigns, are more consistent in driving attitude change and intention to act quickly when facing a stroke (Desyani, 2024; Iskandar, 2024; Bidin, 2022; Bhutta, 2024). Bidin's (2022) study reported that a mass digital campaign with the message "Act FAST, Call 119" successfully increased awareness of FAST by up to 80% in an urban population, and 65% of participants expressed willingness to immediately contact EMS if they experienced stroke symptoms. However, approximately 30% still chose non-EMS routes, such as taking the patient to the hospital themselves, indicating a gap between intention and actual behavior.

Psychologically, attitude change is influenced by the perceived benefits and urgency of action. Abdelkhalik's (2024) study on acute coronary syndrome showed that a six-minute educational video significantly changed respondents' beliefs and attitudes toward immediate action, through emotional triggers and concrete visual explanations. This finding is relevant to the context of stroke because both involve time-sensitive responses. Video media acts as a behavioral trigger, activating both cognitive and affective pathways, resulting in deeper attitude change than text or lectures.

Furthermore, the effectiveness of digital media also lies in its ability to convey repeated messages across social and web platforms. A study by Bhutta (2024) found that an online campaign featuring short (60-second) stories of stroke patients not only increased audience empathy but also strengthened the perception of urgency for action. This finding supports the Health Belief Model (HBM), where perceived threats and benefits of action play a crucial role in forming positive attitudes toward healthy behaviors (Mat Said, 2021; Liu, 2024). Meanwhile, non-digital media plays a greater role in building basic understanding and initial awareness, but is less effective in shaping intentions to act. For example, community lectures in rural areas (Suprayitna & Fatmawati, 2021) increased FAST understanding but did not result in significant changes in EMS contact intentions. This may be due to limited emotional drive and lower exposure intensity compared to dynamic and repetitive digital media. Therefore, educational strategies.

The Impact of Web Media and Digital Applications

Web-based media has extensive potential to reach diverse populations, including stroke survivors with mild to moderate disabilities. A study by Clancy (2022) showed that 79% of stroke survivors use the internet daily, and nearly half actively seek health information. This fact confirms that web media is a viable and inclusive channel for educational interventions. Web-based applications such as PreventS-MD (Feigin, 2024) demonstrated high usability scores, with adherence to recommendations reaching over 80% after one month of use. This demonstrates that digitizing stroke education is not simply an informational tool, but also a behavioral instrument that encourages long-term adherence.

The advantages of web media lie in the integration of interactive functions, real-time feedback, and personalized content. In the context of professional training, a study by Hood (2021) demonstrated that virtual reality (VR)-based simulations of acute stroke management pathways increased healthcare workers' confidence in rapid decision-making. The principles of immersion and immediate feedback have been shown to strengthen the connection between declarative knowledge and procedural skills. In parallel, web-based educational modules for the general public featuring interactive quizzes, animations, and short videos have had a similar impact on knowledge retention and readiness to act.

Beyond patients and healthcare professionals, web-based applications are also effective in controlling stroke risk factors. Studies by Liu (2024) and Tarwoto (2025) showed that the use of HBM-based digital applications improved medication adherence, blood pressure control, and healthy lifestyle management. Thus, web-based education can be seen as part of an integrated stroke risk management ecosystem—connecting dimensions of knowledge, attitudes, and actual behavior. Key success factors for web media are high user engagement and the ability to create adaptive learning experiences. The higher the user engagement, the greater the opportunity for behavior change. Therefore, web-based stroke education must be designed with attention to interface design, ease of navigation, and local relevance. The use of simple language, contextual illustrations, and multi-platform support (desktop and mobile) significantly influence message effectiveness, especially among populations with low digital literacy (Mat Said, 2021; Page, 2023).

Although study results indicate that educational media, both digital and non-digital, are effective in improving public knowledge and attitudes toward stroke management, several limitations require attention, particularly in intervention management and implementation in the field. The primary limitation lies in the lack of face-to-face interaction between educators and participants, which can hinder comprehensive assessment of clinical conditions or participant understanding. In the context of web-based education, many studies still use a self-directed learning approach without direct feedback mechanisms or observation of participant behavior. This potentially creates a gap between theoretical understanding and actual ability to recognize and respond quickly to stroke symptoms. The lack of face-to-face support can also lead to misinterpretation of educational messages, especially for participants with cognitive limitations or limited healthcare experience.

The limited ability of tele-education to address variations in clinical conditions and individual responses presents a particular challenge. Most web-based interventions emphasize only improving knowledge and attitudes without mechanisms to adapt to sudden changes in participants' physical or psychological conditions. In practice, this can lead to delays in early detection and suboptimal clinical decision-making, especially when participants experience atypical stroke symptoms. These limitations have serious clinical implications because they can prolong the time to medical intervention and reduce the effectiveness of acute care. Therefore, a hybrid model combining digital education with face-to-face mentoring or community visits needs to be developed to make the educational process more adaptive and responsive to field dynamics.

On the other hand, barriers to access and digital literacy remain significant obstacles to the implementation of web-based educational media. Low digital technology skills not only hinder access to educational applications but also reduce the effectiveness of two-way communication between participants and healthcare professionals. This barrier is particularly pronounced among vulnerable groups such as the elderly, communities in remote areas, or individuals from low socioeconomic backgrounds. As a result, educational messages delivered through digital platforms are often not optimally received, reducing the potential for desired behavior change. Furthermore, a lack of training and technical support for both participants and healthcare professionals also weakens the effectiveness of technology-based stroke education programs. Many healthcare professionals at the primary level have not received training on how to facilitate digital learning or

monitor patient responses through online media. This leads to limitations in monitoring, follow-up, and evaluation of educational outcomes. Therefore, strengthening the capacity of healthcare workers and providing digital literacy training for patients and their families are strategic steps that need to be integrated into public health education programs.

CONCLUSION

This systematic review confirms that educational media, both digital and non-digital, play a significant role in improving public knowledge and attitudes regarding stroke management, particularly through the FAST (Face, Arm, Speech, Time) method. Cross-study findings indicate that web-based media, such as animated videos, online campaigns, and e-learning modules, are consistently more effective in changing attitudes and increasing public intention to act quickly when responding to stroke symptoms.

This advantage is primarily due to their broad reach, high interactivity, and the ability to convey messages repeatedly and visually. However, this effectiveness requires further development, particularly in aspects of intervention management and inclusiveness of access. Limited direct interaction and low digital literacy among vulnerable groups hinder optimal outcomes and potentially create disparities in health information between urban and rural communities. The clinical implications of this condition include the risk of delayed early detection and inappropriate behavioral adjustments during a stroke.

Therefore, developing a hybrid education model that integrates the advantages of digital media with face-to-face approaches is urgently needed. This approach can not only broaden the reach of education but also ensure accurate understanding, emotional support, and the development of stronger adaptive behaviors. In the long term, this strategy has the potential to continuously improve the effectiveness of stroke education, speed up patient response times to medical care, and reduce disability and mortality due to delayed treatment.

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