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Factors Predicting Hospital Arrival among Acute Stroke Patients: A Systematic Review

Phearith Nhim[1], Nichapatr Phutthikhamin[2], Wiphawadee Potisopha[3], Ha Thi Thu Trang[4]
[1]Faculty of Nursing, Khon Kaen University, Khon Kaen, Thailand-40002, phearith.nhim@kkumail.com
[2]Faculty of Nursing, Khon Kaen University, Khon Kaen, Thailand-40002, thithi@kku.ac.th
[3]Faculty of Nursing, Khon Kaen University, Khon Kaen, Thailand-40002, wiphpo@kku.ac.th
[4]Faculty of Nursing, Khon Kaen University, Khon Kaen, Thailand-40002, hatrang.hmtu@gmail.com

***Abstract*—** *Stroke disease causes disability and death worldwide. Early hospital arrival was declared to be significant in reducing complications and disabilities from a stroke. Currently, there is a limited study related to factors influencing early or delayed hospital arrival. Therefore, this study aimed to identify early and delayed hospital arrival predictors in acute stroke patients. A systematic review was sought from many databases, including Scopus, PubMed, and Google Scholar, full-text articles using the statistical regression analysis, published in English, studied in all subtypes of stroke patients and published during 2011-2021. The studies were excluded if they used a small sample size and were not original articles. Two independent reviewers assessed the risk of bias. Two independent researchers verified the quality of selected papers using the STROBE guideline (Strengthening the Reporting of Observation Studies in Epidemiology). Ten studies were recruited for this review. Factors predicting early hospital arrival were higher household income, higher educational level, medical history of atrial fibrillation, coronary artery disease, previous ischemic stroke/transient ischemic attack, unconsciousness at present, presence with hemiplegia, seizure, high national institutes of health stroke scale (NIHSS) score, hemorrhagic stroke, and daytime onset, use of emergency medical service (EMS), early presence at an emergency department, stroke recognition, distance from the hospital ≤ 15 kilometers, absence of traffic jams, and symptoms development at home. Factors predicting delayed hospital arrival were older age, female gender, financial problem, and distance from the hospital >20 kilometers. Other predictors were worsened symptoms at an emergency department, consciousness at present, low NIHSS score, unknown or awakening or nighttime onset, self-presence at an emergency department, referred, stroke unaware, stroke treatment ignorance, and symptoms development at home. Findings suggest the educational intervention to raise stroke public knowledge and promote early care-seeking. Increase the use of EMS is an essential method to speed hospital arrival.*

***Keywords*—** *Acute stroke patients, factors predicting, delayed hospital arrival, early hospital arrival, systematic review*.

I. INTRODUCTION

Stroke or cerebrovascular disease causes disability and death worldwide. Globally, around 13.7 million people who have their first stroke attack could die in half a million people, and the trends will increase the number of deaths annually to 6.7 million people [1]. The World Health Organization Region of South-East Asia estimated that the stroke incidence in low-income and middle-income countries has more significantly than double since the last 40 years. The incidence has declined by 42% in high-income countries [2]. Therefore, more efforts should be made to reduce these disparities. In acute stroke patients, the time from symptom onset to the hospital is the most critical consideration in determining eligibility for intravenous recombinant tissue plasminogen activator (rt-PA) [3]. The delay of hospital arrival after acute stroke development is the important reason patients are excluded from receiving rt-PA [3]. The studies related to factors influencing the early or delayed hospital arrival are diverse, and some are still ambiguous. Two previous reviews have some limitations on the statistics, which were non-inferential [4, 5]. Thus, the results limited the ability to judge the probability of observation in predicting hospital arrival [6]. This systematic review aimed to identify the predictors of early and delay hospital arrival among acute stroke patients.

II. METHODS

A. Literature Search

The systematic review is conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [7]. Databases included Scopus, PubMed, and Google Scholar were sought. The search terms and keywords based on the Medical Subject Heading (MeSH) were ‘stroke’ or ‘cerebrovascular accident’ or ‘cerebral stroke’ and ‘time factors’ or ‘factors predicting’ or ‘factors related’ or ‘factors associated’ and ‘hospitals’ or ‘delay hospital arrival’ or ‘early hospital arrival.’

B. Inclusion Criteria

The inclusion criteria for study recruitment were: (1) full-text articles, (2) using the statistical regression analysis, (3) writing in English, (4) studying in all subtypes of stroke patients, and (5) publishing during 2011-2021.

C. Exclusion Criteria

The exclusion criteria were: (1) using sample size<58, based on Green’s Rule of thumb of 1 predictor minimum sample size [8], and (2) not the original articles.

D. Data Extraction

The authors extracted data included aims/objectives, study country, study design, sample size, stroke subtype, the cut point of early or delay hospital arrival, the statistical analysis, statistical parameters of the significant predictors of early or delayed hospital arrival.

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E. Quality Assessment

Two independent reviewers assessed the risk of bias. STROBE guideline (Strengthening the Reporting of Observation Studies in Epidemiology) is used for quality assessment of the selected articles [9]. The guideline consists of 22 items, scoring one point for each item. The total score is 22, and the score of < 13 is considered a low-quality study, and it would be withdrawn.

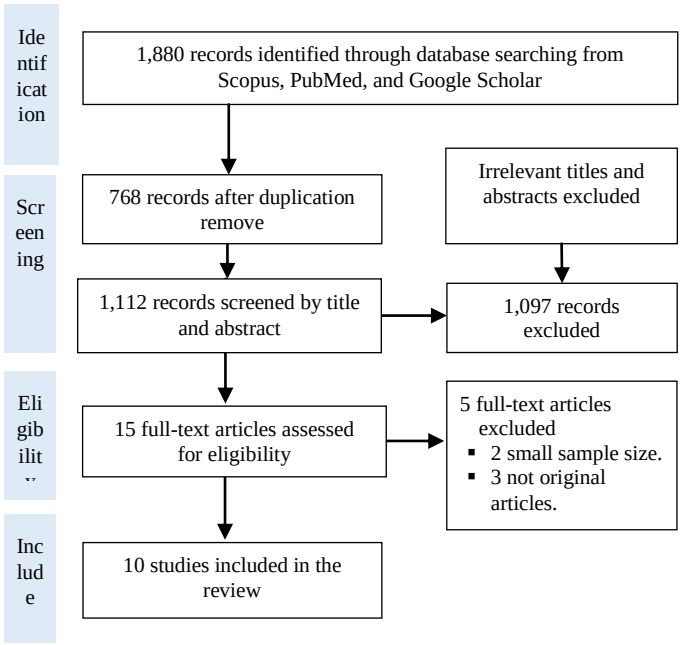


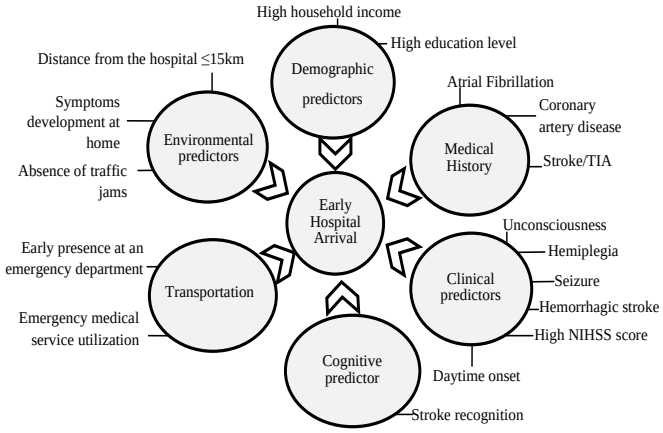
Fig. 1. Flowchart of studies selection based on PRISMA

III. Results

There were 1,880 studies retrieved from the electronic databases (Figure 1). There were 768 studies excluded due to duplications. The 1,112 studies were title screened, of which 1,097 study abstracts were excluded due to irrelevant. The 15 articles were eligible, of which two papers were excluded according to the small sample size, and three documents were not original articles. Finally, ten reports remained. STROBE had been used to assess the quality of the ten pieces. The scores range from 19-21, which reflect good-quality studies (Appendix 1).

A. Study characteristics

Among ten studies recruited, four studies were conducted in East Asia, including Korea, Japan, and China [10–13], two studies in South Asia including India and Nepal [14, 15], two studies in Turkey, western Asia [16, 17], one studied in Zimbabwe, southern Africa [18], and one study in Thailand, southeastern Asia [19]. Six articles were studied in ischemic stroke patients [10, 12, 13, 15–17], while the rest were studied in all stroke subtypes [11, 14, 18, 19]. It is worth noting that the cut off hospital arrival time varied from 2 hours [10, 12], 3 hours [11, 15, 17, 18], 4 hours [14], and 4.5 hours [13, 16, 19] (Table I).



(Km=kilometers; TIA=Transient Ischemic Attack; NIHSS=National Institutes of Health Stroke Scale)

Fig. 2. Summary of factors predicting early hospital arrival.

B. Factors predicting early hospital arrival

Seven out of ten studies [10, 11, 13–15, 17, 19] revealed 17 predictors of early hospital arrival in acute stroke patients (Figure 2 & Table II) described as the following.

a) Demographic predictors

The demographic predictors of early hospital arrival in the acute stroke patients included the household income above 1000 USD per year (OR=3.521, 95%CI=1.524-8.136, P=0.003) [15], and education level (OR=5.14, 95%CI= 1.95-13, P=0.001) [14].

b) Medical history

Medical history or underlying disease significantly influenced early hospital arrival enclosed atrial fibrillation [13, 16, 17], coronary artery disease (OR=3.84, 95%CI=1.77-8.3, P=0.001) [14], and history of ischemic stroke/TIA (OR=0.522, 95% CI=1.080-2.631, p=0.022) [19].

c) Clinical Predictors

Stroke severity is the overriding predictor of early hospital arrival among acute stroke patients. Stroke severity encompassed unconsciousness at present (OR=1.81, 95%CI=1.47-2.22, P<0.001) [11], present with hemiplegia (OR=5.5, 95%CI=1.89-16.6, P=0.001) [14], high NIHSS score (OR= 0.818, 95%CI=1.397-3.675, p=0.001) [19], and seizure (OR=0.867, 95% CI=1.125-5.035, p=0.023) [19]. Stroke subtype predicted early hospital arrival was haemorrhagic subtype in India (OR=2.23, 95%CI=1.91-2.61, P<0.001 [11], and Thailand (OR=0.661, 95% CI=1.242-3.018, p=0.004) [19]. A study in Japan and Korea published that daytime onset of stroke significantly speculated early hospital arrival (OR= 2.799, 95% CI=2.173-3.605, P<0.001 [13].

d) Stroke recognition

Koksal et al. discovered that stroke recognition was the dominant predictor of early hospital arrival in Turkey (OR=3.4, 95%CI=1.2-9.3, P=0.01) [17].

e) Transportation

Transportation by an emergency medical service (EMS) is the prominent predictor of early hospital arrival in China (OR=1.66, 95%CI=1.34–2.05, P<0.001) [11], and Korea and Japan (OR=2.127,95%CI=1.700-2.661, P<0.001) [13].

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TABLE I. The study characteristics of the systematic review

Authors	Country	Study design	Study objective	Time (hr.)	Sample size	Stroke Subtype		
						IS	HS	TIA
Haki, Cetiner, & Kaya, 2020	Turkey	Cross-sectional study	To investigate factors causing the delay of hospital arrival of the ischemic stroke patient to the hospital.	4.5	251	100%	-	-
Hong, Kim, Kim, Ahn, & Hong, 2011	Korea	Prospective study	To investigate the factors related to the prehospital delay of more than 2 hours among acute stroke patients.	2	184	100%	-	-
Kim, Ahn, Kim, & Hong, 2011	Korea	Retrospective study	To investigate factors associated with prehospital delay among scute ischemic stroke patients.	2	247	100%	-	-
Nepal et al., 2019	Nepal	Prospective study	To evaluate prehospital delay status and thrombolysis in Nepal.	3	228	100%	-	-
Seremwe, Kaseke, Chikwanha, & Chikwasha, 2017	Zimbabwe	Cross-sectional study	To investigate the time taken from acute stroke symptoms development to hospital arrival time.	3	121	72%	28%	-
Jin et al., 2012	China	Prospective study	To evaluate factors associated with the delay of hospital presentation.	3	6102	74%	25%	-
Ashraf, Girija, Maneesh, Praveenkumar, & Saifudheen, 2015	India	Prospective study	To investigate factors influencing both early and delay of hospital presentation among acute stroke patients in South India.	4	264	72.3%	14%	13.6%
Song et al., 2015	Korea & Japan	Retrospective cohort study	To investigate the factors associated with early hospital arrival in two different stroke centers in Japan and Korea.	4.5	1,966	100%	-	-
Koksal, Gazioglu, Boz, Can, & Alioglu, 2014	Turkey	Prospective study	To investigate the factors related to early hospital arrival among acute ischemic stroke patients.	3	172	100%	-	-
Wannarong, Chotik-anuchit, & Nilanont, 2019	Thailand	Retrospective study	To investigate the factor influencing hospital arrival time among acute stroke patients in Thailand.	4.5	1,045	72.5%	18.9%	7.4%

IS= Ischemic Stroke, HS= Hemorrhagic Stroke, TIA=Transient Ischemic Stroke

f) Early presence at an emergency department

Early presence at an emergency department is the paramount predictor of early hospital arrival in acute stroke patients in India (OR=9.72, 95% CI=3.82-24.7, P < 0.001) [14] and Nepal (OR=3.805, 95%CI=1.196, 12.107, P=0.024) [15].

g) Environmental predictors

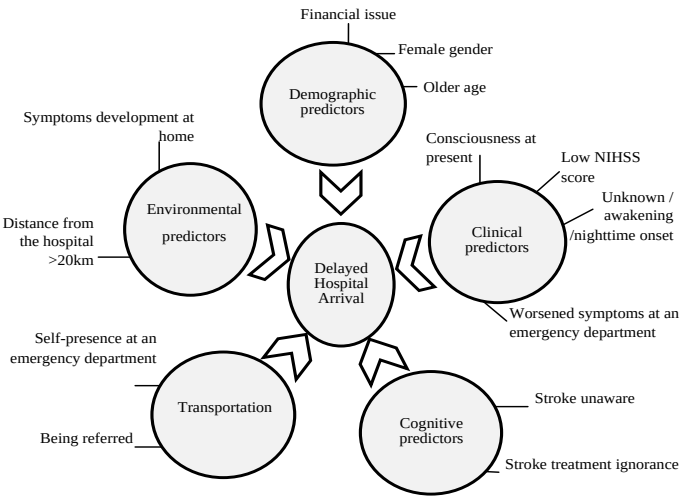
The predictors of early hospital arrival in the acute stroke patients included distance from the hospital ≤15 kilometres (OR=2.7, 95% CI=1.08-6.67, P=0.03) [14], absence of traffic jams (OR=3.421, 95%CI=1.453-0.054, P=0.005) [15], and symptoms development at home (OR=8.836, 95%CI=3.559-21.937, P=0.00) [15].

C. Factors Predicting Delay Hospital Arrival

Among ten studies, six articles [10, 12, 15, 16, 18, 19] reported 13 predictors of delayed hospital arrival in acute stroke patients (Fig. 3 & Table III) delineated as follows.

a) Demographic predictors

Demographic factors predicting early hospital arrival in the acute stroke patients incorporated older than 65 years of age (OR=1.056, 95%CI=1.024–1.089, P=0.000) [12], female gender (OR=2.21, 95% CI=1.22-3.99, P=0.009) [16], and financial problem (OR =6.64, 95% CI=2.05-21.53, P=0.002) [18].



Km=kilometers; NIHSS=National Institutes of Health Stroke Scale

Fig. 3. Summary of factors predicting delayed hospital arrival

b) Clinical predictors

Stroke severity predicting delayed hospital arrival in acute stroke patients comprised worsened symptoms at emergency department (OR=10.892, 95%CI=1.712-68.096, P=0.011) [10] and (OR=7.708, 95%CI=1.557–38.151 P=0.012) [12], consciousness at present (OR=2.938, 95%CI=1.066–8.104, P=0.037) [12], and low NIHSS score (OR=0.91, 95% CI=0.85-0.96, P=0.001) [16]. Unknown or awakening or

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night-time onset was another predictor of delayed hospital arrival in Thailand (OR 1.524; 95% CI 0.152-0.313, P<0.001) [19].

TABLE III. Summary of factors predicting early hospital arrival

Authors	Statistical analysis	Factors predicting	Statistical parameters
Hong, Kim, Kim, Ahn, & Hong, 2011	Multivariate logistic regression	History of atrial fibrillation	OR=0.14, 95%CI=0.03-0.68 P=0.015
Koksal, Gazioglu, Boz, Can, & Alioglu, 2014	Logistic regression analysis	History of atrial fibrillation	OR=4.30, 95%CI=1.10-15.70, P=0.02
		Stroke recognition	OR=3.40, 95%CI=1.20-9.30, P=0.01
Nepal et al., 2019	Logistic regression analysis	Symptoms development at home	OR=8.84, 95%CI=3.56-21.94, P<0.001
		Early presence at an emergency department	OR=3.81, 95%CI=1.20-12.11, P=0.024
		No traffic jams	OR=3.42, 95%CI=1.45-8.05, P=0.005
		Household income above 1000 USD/year	OR=3.52, 95%CI=1.52-8.13, P=0.003
Jin et al., 2012	Multiple Logistic Regression	Emergency medical service transportation	OR=1.66, 95%CI=1.34-2.05, P<0.001
		History of atrial fibrillation	OR=1.72, 95%CI=1.32-2.25, P<0.001
		Hemorrhagic stroke	OR=2.23, 95%CI=1.91-2.61, P<0.001
		Unconscious at present	OR=1.81, 95%CI=1.47-2.22, P<0.001
Ashraf, Girija, Maneesh, Praveenkumar, & Saifudheen, 2015	Multiple logistic regression	Distance ≤ 15 km from the hospital	OR=2.70, 95% CI=1.08-6.67, P=0.03
		Direct arrival at an emergency department	OR=9.70, 95% CI= 3.82-24.70, P < 0.001
		History of coronary artery disease	OR=3.84, 95% CI=1.77-8.30, P=0.001
		Higher educational level	OR=5.14, 95%CI= 1.95-13.00, P=0.001
		Present with hemiplegia	OR=5.5, 95%CI=1.89-16.60, P=0.001
Song et al., 2015	Multiple logistic regression	History of atrial fibrillation	OR=1.51, 95% CI=1.17-1.94, P=0.002
		Severe stroke (high NHISS score)	OR=1.04, 95% CI=1.02-1.05, P<0.001
		Daytime onset	OR=2.80, 95% CI=2.17-3.60, P<0.001
		Emergency medical service transportation	OR=2.13,95%CI=1.70-2.66, P<0.001
Wannarong, Chotik-anuchit, & Nilanont, 2019	Multivariate logistic regression analysis	Previous ischemic stroke/TIA	OR=0.52, 95% CI=1.08-2.63, p=0.022
		Severe stroke (NIHSS score >15)	OR=0.82, 95%CI=1.40-3.68, p=0.001
		Seizure as an initial symptom	OR=0.87, 95% CI=1.13-5.04, p=0.023
		Hemorrhagic stroke	OR=0.66, 95% CI=1.24-3.02, p=0.004

USD=United States Dollar; km=kilometers; TIA=Transient Ischemic Attack; NIHSS=National Institutes of Health Stroke Scale; OR=Odds Ratio; 95%CI=95% Confidence Interval

c) Cognitive predictors

Nepal et al. circulated that being unable to recognize stroke symptoms predicting delayed hospital arrival (OR=0.117, 95%CI=0.033-0.409, P=0.001) [15]. They also disclosed that stroke treatment unawareness influenced delayed hospital arrival (OR=0.1 41, 95%CI=0.042-0.469, P=0.001) [15].

d) Transportation

Two studies in Korea disseminated that self-present at an emergency department significantly influenced delayed hospital arrival [10, 12]. Additionally, being referred also predicted delayed hospital arrival in Korea and Thailand [10, 12, 19].

e) Environmental predictors

The environmental predictors of delayed hospital arrival in the acute stroke patients included distance from the hospital > 20 kilometres (OR=0.282, 95%CI=0.121, 0.658, P=0.003) [15], and stroke symptoms develop at home (OR=19.890, 95%CI=2.699-146.604, P=0.003) [10].

TABLE III. Summary of factors predicting delay hospital arrival

Authors	Statistical analysis	Factors predicting	Statistical parameters
Hong, Kim, Kim, Ahn, & Hong, 2011	Multivariate logistic regression	Worsened symptoms at an emergency department	OR=10.89, 95%CI=1.71-68.10, P=0.011
		Symptom development at home	OR=19.89, 95%CI=2.70-146.60, P=0.003
		Self-presence at an emergency department	OR=4.63, 95%CI=1.10-19.44, P=0.036
		Being referred	OR=12.11, 95%CI=2.51-58.43, P=0.002
Kim, Ahn, Kim, & Hong, 2011	Multivariate logistic regression	Being consciousness	OR=2.94, 95%CI=1.07-8.10, P=0.037
		Older age	OR=1.06, 95%CI=1.02-1.09, P<0.001
		Self-presence at an emergency department	OR=3.83, 95%CI=1.58-9.26, P=0.003
		Being referred	OR=16.79, 95%CI=5.45-51.75, P<0.001
		Worsened symptoms at an emergency department	OR=7.71, 95%CI=1.56-38.15, P=0.012
Nepal et al., 2019	Logistic regression	Stroke unaware	OR=0.12, 95%CI=0.03-0.41, P=0.001
		Stroke treatment ignorance	OR=0.14, 95%CI=0.04-0.47, P=0.001
		Distance > 20 km from hospital	OR=0.28, 95%CI=0.12-0.66, P=0.003
Seremwe et al., 2017	Logistic regression	Financial issue	OR=6.64, 95%CI=2.05-21.53, P=0.002
Wannarong, Chotik-anuchit, & Nilanont, 2019	Multivariate logistic regression	Awakening or unknown-onset stroke	OR=1.52, 95%CI 0.15-0.31, P<0.001
		Being referred	OR=1.05, 95%CI=0.20-0.61, P<0.001
Haki, Cetiner, & Kaya, 2020	Multivariate logistic regression	Female gender	OR=2.21, 95%CI= 1.22-3.99, P=0.009
		Not severe stroke (Low NIHSS score)	OR=0.91, 95%CI=0.85-0.96, P=0.001

Km=kilometers; NIHSS=National Institutes of Health Stroke Scale; OR=Odds Ratio; 95%CI=95% Confidence Interval

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IV. Discussion

The findings from this systemic review highlight the essential predictors of early and delayed hospital arrival in acute stroke patients. A comparable debate between the predictors of early hospital arrival and hospital delay is formulated below.

Several predictors such as age, gender, education level, household income/financial problem, symptoms develop at home, distance from the hospital, and traffic jams are paramount factors predicting hospital arrival in acute stroke patients. Kim et al. discovered that the delayed group had an average of 65.4 years (SD=12.3) [12]. Elderly patients may be unaware of the stroke symptoms because of physical and cognitive conditions [12]. However, the findings are incongruent with other studies; some reported non-significance in multivariate analysis [11, 14]. The female gender significantly influenced prehospital delay since the women may be home alone or busy with children or chores while men are more active in work life and socialization [16]. However, some studies reported indifference [11, 15]. These findings raise a particular concern with the elderly and women when design stroke interventions.

Higher education levels prompt early arrival as the patients recognize stroke symptoms and immediately seek early care [14], but Kim et al. declared no difference. Household income and the financial issue also predict hospital arrival [12]. Higher household income facilitates appropriate transportation or emergency medical service use, expediting hospital arrival [15]. Conversely, people with a financial problem may not afford to use their vehicle or emergency medical service, especially in countries where emergency medical service is not readily available [11, 14, 15, 18]. Hong et al. discovered that symptoms development at home predicted delayed arrival. The authors pointed that the patients and their witnesses unrecognized stroke symptoms or preferred to wait until the symptoms improve spontaneously [10]. Nepal et al. reported differently, with no reason supported. Distance from the hospital is the fundamental predictor of hospital arrival [15]. Findings are in harmony: shorter distances from the hospital can anticipate early arrival, whereas longer distances delay arrival [15]. Similarly, the absence of traffic jams shortened the delay [15]. These findings raise the need for public knowledge and concern about stroke symptoms and strategies to overcome distance and transportation barriers.

Medical history or underlying diseases play an essential role in predicting early arrival, particularly atrial fibrillation, coronary artery disease, and previous stroke or transient ischemic attack. Song et al. disclosed that stroke caused by atrial fibrillation or embolic stroke is usually more severe and sudden in onset [13]. The patients or their witnesses need to seek medical care earlier. High public awareness of heart disease reminds coronary artery disease [14], and previous stroke or transient ischemic attack urges the patients to arrive earlier typically [19]. However, some studies conveyed no differences in atrial fibrillation [15, 19], coronary artery disease [11, 13, 15], and transient ischemic attack [11, 14, 15]. The patients who misperceived or neglected their condition seriousness may find difficulty differentiated between pre-existing symptoms and new symptoms [11].

The clinical predictors reflecting stroke severity are the distinctive predictors of hospital arrival. The patients presented with unconsciousness [11], hemiplegia [14], hemorrhagic stroke [11, 19], seizure [19], and high NIHSS score [13, 19] prompted early arrival. These findings reflect that perceived urgency due to condition severity result in speed arrival [11]. In parallel, present with consciousness [12, 15], worsened symptoms at an emergency department [10, 12], and low NIHSS score [16, 19] associated with delayed arrival. The results imply that the patients and their witnesses ignore the symptom severity. They may prefer to wait for spontaneous improvement and misinterpret stroke symptoms as other diseases [10, 12]. Stroke recognition and symptoms severity are likely to be an urgent predictor for early arrival. The patients with unrecognized stroke symptoms did not seek care within the first hour, and those unaware of stroke treatment took longer to reach the hospital [15, 19]. These results evoke stroke symptoms treatment education.

Daytime onset associated with early arrival as a witness can recognize stroke symptoms when the patients have a stroke attack [13]. In contrast, unknown or awakening or nighttime onset delayed arrival since no witness at night, and the patients may wait until the morning to go to the hospital [19]. Stroke response by employing transportation is a supreme factor predicting hospital arrival. Utilizing emergency medical services indicates an earlier appearance by speeding the transportation and triage processes at an emergency department [11, 13]. Similarly, direct arrival or early presence at an emergency department fastened the hospital arrival [14, 15]. Unfortunately, self-present at an emergency department might delay stroke alert and spend more time on the triage processes [10, 12]. The patients being referred may take a long time waiting for local facility decision before transferring to reperfusion treatment institutes [10, 12, 15, 19]. These results suggest using emergency medical services to expedite hospital arrival.

V. Conclusions

This systemic review suggests education strategies to improve public knowledge of stroke symptoms and respond utilizing urgent transportation. Promote the use of EMS is a promising method to expedite hospital arrival. Furthermore, it is critical to developing an alert system when people are likely to experience stroke at home and transfer them directly to hospitals with thrombolysis treatment.

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APPENDIX

APPENDIX I. Quality assessment of the articles based on STROBE (Strengthening the Reporting of Observation Studies in Epidemiology)

		Introduction											Results					Discussion				Other	
Study	Title & abstract	Background/Rationale	Objectives	Study design	Setting	Participants	Variables	Data sources/Measurement	Bias	Study size	Quantitative variables	Statistical methods	Participants	Descriptive data	Outcome data	Main results	Other analyses	Key results	Limitations	Interpretation	Generalizability	Funding	**Total score**
1st	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	19
2nd	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	21
3rd	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	20
4th	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	21
5th	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	20
6th	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	20
7th	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	19
8th	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	21
9th	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	20
10th	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	20

1st: Haki, Cetiner, & Kaya, 2020.
2nd: Hong, Kim, Kim, Ahn, & Hong, 2011.
3rd: Kim, Ahn, Kim, & Hong, 2011
4th: Nepal et al., 2019
5th: Seremwe, Kaseke, Chikwanha, & Chikwasha, 2017.
6th: Jin et al., 2012.
7th: Ashraf, Girija, Maneesh, Praveenkumar, & Saifudheen, 2015
8th: Song et al., 2015.
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