Accepted Manuscript

Accepted Manuscript (Uncorrected Proof)

Title: Calculation of Five- and Ten-Year Stroke Risk Using the Persian Version of the Stroke Riskometer Mobile Application

Authors: Amir Ahmad Khandaghi[1], Mahasti Alizadeh Mizani[2,3], Mohammad Yazdchi Marandi[1], Mahta ZareDini[1], Mehdi Farhoudi[1,*]

1. *Neurosciences Research Center, Aging Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran*
2. *Social Determinants of Health Research Center, Tabriz University of medical Sciences, Tabriz, Iran*
3. *Department of Community Medicine, Tabriz University of Medical Science, Tabriz, Iran*

***Corresponding Author**: Mehdi Farhoudi, Neurosciences Research Center, Aging Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran. Email: farhoudim74@gmail.com, farhoudim@tbzmed.ac.ir

To appear in: **Basic and Clinical Neuroscience**

Received date: 2026/07/20

Revised date: 2026/10/3

Accepted date: 2026/10/3

Accepted Manuscript (Uncorrected Proof)

This is a “Just Accepted” manuscript, which has been examined by the peer-review process and has been accepted for publication. A “Just Accepted” manuscript is published online shortly after its acceptance, which is prior to technical editing and formatting and author proofing. *Basic and Clinical Neuroscience* provides “Just Accepted” as an optional and free service which allows authors to make their results available to the research community as soon as possible after acceptance. After a manuscript has been technically edited and formatted, it will be removed from the “Just Accepted” Web site and published as a published article. Please note that technical editing may introduce minor changes to the manuscript text and/or graphics which may affect the content, and all legal disclaimers that apply to the journal pertain.

Please cite this article as:
Khandaghi, A.A., Alizadeh Mizani, M., Yazdchi Marandi, M., ZareDini, M., Farhoudi, M. (In Press). Calculation of Five- and Ten-Year Stroke Risk Using the Persian Version of the Stroke Riskometer Mobile Application. Basic and Clinical Neuroscience. Just Accepted publication Jul. 10, 2026. Doi: http://dx.doi.org/10.32598/bcn.2026.8674.1
DOI: http://dx.doi.org/10.32598/bcn.2026.8674.1

Accepted Manuscript (Uncorrected Proof)

Highlights

- The ten-year absolute risk of stroke was approximately twice the five-year risk
- The five- and ten-year relative risks of stroke were almost the same.
- Participant and physician agreement was lowest for the questionnaire's quantitative parameters.
- The Stroke Riskometer^{TM} application can be implemented, in particular, by physicians.

Plain Language Summary

Stroke is the second leading cause of death worldwide. Therefore, evaluating the future risk of stroke using accessible, uncomplicated mobile applications can prompt lifestyle changes and subsequent stroke prevention. The Persian version of the Stroke RiskometerTM application was implemented to calculate five- and ten-year absolute and relative stroke risk in adult residents of North West Iran. Moreover, agreement between participants' and physicians' responses was assessed. The five- and ten-year absolute stroke risks were approximately 3% and 7%, respectively. However, the five- and ten-year relative risks of stroke, which were calculated compared with an individual of the same age and sex, were 2.90 and 2.26, respectively. For quantitative measures such as systolic blood pressure, weight, and height, agreement between participants' perceived and measured values was lower than for responses to medical history–related questions. In conclusion, the Persian version of the Stroke Riskometer™ application can provided an accessible approach for estimating five- and ten-year stroke risk in this study population.

Accepted Manuscript (Uncorrected Proof)

Abstract

Background: The growing priority on primary stroke prevention, alongside recent advances in smartphone technologies has led to the development of the Stroke Riskometer™ application.

Objective: This study aimed to estimate the five- and ten-year stroke risk using the Persian version of this application and to assess the agreement between physicians' and participants' responses.

Method: In this prospective study, adult residents of Tabriz city, located in East Azerbaijan province, Iran, who were covered by primary healthcare clinics, were randomly enrolled. Following blood pressure and body metrics measurements, a general practitioner assisted in completing the questionnaire, after which stroke risk was calculated. Patient-physician agreement regarding questionnaire responses was also evaluated using Cohen's κ coefficient.

Result: Stroke risk was calculated for 150 participants with a mean (SD) age of 63.3 (12.6) years, including 88 men. The median [IQR] five- and ten-year absolute stroke risks were 2.99% [3.59] and 6.97% [9.27], respectively. The median [IQR] five- and ten-year relative risks of stroke were 2.90 [2.8] and 2.26 [2.15], respectively. Agreement between participants' perceived and measured values was not observed for systolic blood pressure (κ = 0.05); however, responses to medical history–related questions displayed strong to almost perfect agreement (κ = 0.88 to 1.00).

Conclusion: The Persian version of the Stroke Riskometer™ application can provided an accessible approach for estimating five- and ten-year stroke risk in this study population, particularly when used by a physician. Future clinical trials are warranted to evaluate the effective implementation of the Stroke Riskometer™ application and the clinical significance of its impact on future cerebrovascular events.

Keywords: Application, Five-Year, Risk, Stroke, Ten-Year

Accepted Manuscript (Uncorrected Proof)

Introduction

Stroke affected approximately 100 million people in 2019 and remains the second leading cause of death and the third leading cause of disability and mortality worldwide[1]. Despite a decline in age-standardized stroke incidence and mortality rates from 1990 to 2019, the number of incident stroke cases increased by 15% among individuals younger than 70 years of age [1]. Furthermore, a similar trend was observed among the Iranian population aged 50-69 years between 1990 and 2019 [2].

Considering that a substantial percentage of stroke events are linked to modifiable risk factors, the prompt identification of these factors and the provision of management education, along with the estimation of future cerebrovascular events risk, could contribute to stroke prevention, particularly in younger adults. Therefore, in the era of advancing digital health communication technologies, personalized health management mobile applications could satisfy the demand for risk prediction models [3,4].

Several smartphone applications have been developed for Android and iOS to address stroke-related risk factors, including blood pressure control, weight management, and glycosylated hemoglobin levels—as well as self-management behaviors [5–9]. However, the clinical usefulness of these tools depends on the accuracy of user data and the effectiveness of their algorithms.

In 2014, the Stroke Riskometer™ mobile application, an updated version of the Framingham Stroke Risk Score (FSRS) prediction algorithm [10], was developed at the National Institute for Stroke and Applied Neurosciences (NISAN) at Auckland University of Technology (AUT University). The application calculates five- and ten-year stroke risk using established demographic, clinical, and lifestyle-related risk factors and it also offers users educational resources and guidance to mitigate modifiable risk factors. In addition, individuals could record

Accepted Manuscript (Uncorrected Proof)

and reassess their present health status over time [11,12,13]. The validity and generalizability of this scoring system have been assessed in both English-speaking countries (Australia, the United Kingdom, the United States, and New Zealand) and non-English-speaking countries (Brazil, France, India, Italy, Kazakhstan, Malaysia, Nigeria, Russia, Ukraine, and the Netherlands) using translated versions of the application [12–14].

Although previous studies have shown that implementing the Stroke Riskometer tool leads to positive lifestyle modifications when compared to regular medical care offered in primary healthcare clinics [15], estimate is based on user-supplied data..

Our study aims to measure the five- and ten-year stroke risk using the Persian version of the Stroke Riskometer™ app among adults attending primary care centers in Tabriz, Iran. Furthermore, the accuracy of the provided information was compared to general practitioner inputs, and the degree of agreement between physicians' and participants' responses to each question was assessed.

Methods

Study design and population

In this prospective study conducted in 2019, residents of Tabriz City, East Azerbaijan Province, Iran, who were covered by primary care clinics and aged ≥ 20 years were included. The sample size was calculated based on sensitivity analyses with alternative sensitivity assumptions of 100% and 80%. Ultimately, 150 participants were randomly selected using a random number table. Participants who provided written informed consent and had no disabling physical or psychiatric disorders that could hinder effective questionnaire completion were enrolled. Participants completed the questionnaire following the provided instructions. Furthermore, the same questionnaire was completed in collaboration with a general practitioner after a medical

Accepted Manuscript (Uncorrected Proof)

examination and medical history-taking. The study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.978).

Stroke Riskometer

The Stroke Riskometer™ mobile application, developed by Valery Feigin at Auckland University of Technology in 2014, was recently assessed for reliability and expanded [12]. It was translated into multiple languages [14], including Persian, under the supervision of the central office in New Zealand and through the efforts of members of the Neuroscience Research Center at Tabriz University of Medical Science in 2015. Furthermore, the Persian version was presented at the Annual Iranian National Congress on March 3, 2017 (supplementary file).

This application reliably estimates the five- and ten-year relative and absolute risk of stroke in adults aged ≥ 20 years using a brief guided questionnaire [12]. Furthermore, educational videos regarding the warning signs and prevention of stroke are provided. In addition, the opportunity to participate in global research projects on stroke risk factor management is provided in accordance with confidentiality and ethical principles.

Independent Variables

The Stroke Riskometer™ questionnaire collects data on both modifiable and non-modifiable risk factors, including age, sex, ethnicity, height, weight, smoking status (current smoker, smoker within the past year, or nonsmoker), daily alcohol consumption, daily intake of six servings of fruits and vegetables (yes/no), engagement in at least 2.5 hours of physical activity per week, and exposure to intense psychological or mental stress during the previous year (consistent or intermittent). The questionnaire also evaluates a history of stroke or myocardial infarction in parents younger than 65 years of age, systolic blood pressure (SBP), antihypertensive medications, clinical diagnosis of diabetes mellitus, cardiovascular disease, left ventricular hypertrophy, arterial

Accepted Manuscript (Uncorrected Proof)

fibrillation, stroke or transient ischemic attack, traumatic brain injury, and cognitive disorders such as Alzheimer's disease. Self-reported or relative-reported memory impairment was also noted [12]. Weight, height, and blood pressure were self-reported by the participants, whereas standard measurements were obtained during physician evaluation.

Outcome Variables and Definitions

Both five-year and ten-year absolute and relative stroke risks were calculated using the application. Relative stroke risk was defined as the ratio of stroke risk in a given participant to that of an age-, sex-, and ethnicity-matched individual without stroke risk factors. Relative stroke risk was characterized as the ratio of the estimated stroke risk for a specific participant compared to the corresponding estimated stroke risk for a reference individual of the same age, gender, and ethnicity who was assumed to have none of the specified stroke risk factors. Consequently, the relative risk reported by the Stroke Riskometer™ represents a model-driven comparison against a risk-factor-free reference profile and should not be interpreted as a conventional epidemiological relative risk derived from observed incidence rates in two study cohorts. The agreement between participants' and physicians' answers to the eleven potentially differing questions was evaluated using Cohen's κ coefficient.

Statistical analysis

Categorical variables were displayed as frequencies and proportions, while continuous variables were expressed as mean ± standard deviation (SD) for normally distributed data or otherwise as median and interquartile range (IQR). To compare stroke risk between sexes and age groups (< 65 years vs. ≥ 65 years), the independent t-test was used for normally distributed variables, and the Mann–Whitney U test was applied for non-normally distributed data. For comparative analyses, effect estimates with corresponding 95% confidence intervals (CIs) were calculated and reported

Accepted Manuscript (Uncorrected Proof)

when applicable. Statistical significance was defined as p- value < 0.05. All analyses were performed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA).

Results

Demographics of participants

Stroke risk among 150 participants, with a mean (SD) age of 63.3 (12.6) years and 58.7% male, was calculated using the Stroke Riskometer^{TM} in collaboration with a general practitioner. All participants were Persian, and the mother tongue of 143 respondents was Azari. Participants were categorized into two age groups: < 65 (n = 82) and ≥ 65 years (n = 68).

Weekly physical activity exceeding two and a half hours was reported by 82% of participants, while 47.0% had a normal BMI based on on-site height and weight measurements.

Other variables, including daily vegetable consumption, alcohol intake, smoking status, and mental stressors over the past year, are presented in Table 1 according to gender and age group. Blood pressure was also measured clinically by a physician (Table 1). Only six participants were aware of their systolic and diastolic blood pressure due to periodic measurements. Systolic blood pressure was markedly elevated in individuals aged ≥65 years in comparison to those under 65 years (137.03 ± 25.0 mmHg vs. 126.81 ± 19.1 mmHg, respectively; p = 0.005; mean difference, 10.22 mmHg; 95% CI, 3.09–17.34). In addition, systolic and diastolic blood pressure in men and women older than 64 years were not statistically different (p = 0.187 and p = 0.239, respectively); however, mean diastolic blood pressure (DBP) was notably higher in men younger than 65 years compared with women in the same age group (p = 0.027; 95% CI: 0.7 -11.9).

Accepted Manuscript (Uncorrected Proof)

Absolute Stroke Risk Calculation

The 10-year stroke risk in the male population (median [IQR]: 10.45 [12.88]) was significantly higher than in the female population (7.03 [IQR = 9.21], p = 0.03) (Table 2).

In subgroup analysis, no significant differences in stroke risk were observed between males and females in the older population (p = 0.27). A similar pattern was also observed among participants younger than 65 years.

The median and IQR of the five-year and ten-year absolute stroke risk among participants were 2.99% [3.59] and 6.97% [9.27], respectively. Notably, older participants (≥ 65 years) demonstrated a significantly higher five-year and ten-year stroke risk compared with the younger age group (5-year risk: 4.69 [3.06] vs. 1.54 [1.63], p < 0.01; 10-year risk: 11.67 [7.21] vs. 3.63 [4.24], p < 0.01) (Table 2). The 10-year stroke risk in the male population (median [IQR]: 10.45 [12.88]) was significantly higher than in the female population (7.03[9.21], p = 0.03).

In subgroup analysis, no significant differences in stroke risk were observed between males and females in the older population (p = 0.27). A similar pattern was also observed among participants younger than 65 years.

Relative Stroke Risk Calculation

The median and IQR of the 5-year relative risk of stroke were 2.90 [2.8]. Notably, this parameter was significantly higher in the female population compared with the male group (median [IQR]: 4.36 [3.18] vs. 2.37 [1.5], p < 0.01); however, no significant difference was observed between age groups (p = 0.097) (Table 3).

The 10-year relative stroke risk was a median [IQR] of 2.26 [2.15]. Similarly, female participants demonstrated a significantly higher risk compared with males (median [IQR]: 3.5 [2.56] vs. 1.89 [1.18], p < 0.01), while no statistically significant difference was observed between age groups (p

Accepted Manuscript (Uncorrected Proof)

= 0.612). In a subgroup analysis, 5-year and 10-year relative stroke risks are higher in females than in males within both < 65 and ≥ 65-year age groups (5-year: $p < 0.01$ and $p = 0.014$; 10-year: $p < 0.01$ and $p = 0.011$, respectively) (Table 3).

Physician, participant agreement

In eleven questions of the application's questionnaire, patient and physician responses could differ. There was no agreement between participants' perceptions of their SBP and the measured blood pressure values (Cohen's $\kappa = 0.05$). Moreover, self-reported weight and height showed weak and moderate agreement with measured values, respectively (Cohen's $\kappa = 0.56$ and 0.65). In contrast, the remaining factors, mainly related to medical history, demonstrated strong to almost perfect agreement (Cohen's $\kappa = 0.88 – 1.00$) (supplementary file).

Discussion

The Persian version of the Stroke Riskometer™ mobile application was used to estimate the absolute and relative five- and ten- year stroke risk among adult residents of Tabriz City, East Azerbaijan Province, northwest of Iran. In subgroup analyses, stroke risk was compared across different age and gender groups.

In addition, to assess potential discrepancies between individual and physician responses, Cohen's κ agreement coefficient was calculated for the relevant variables, and the results demonstrated high agreement across most items. In contrast, one item showed almost no agreement. Participants were predominantly middle-aged, and approximately 80% percent fell within BMI categories of normal weight, overweight, and class I obesity. However, sufficient levels of weekly physical activity and vegetable intake were also reported by the majority of participants.

Accepted Manuscript (Uncorrected Proof)

The ten-year absolute risk of stroke was approximately twice the five-year risk; however, the five- and ten-year relative risks of stroke were almost the same. These results may highlight the impact of age on absolute stroke risk, which was justified by relative risk measurement[17].

In a study conducted in Mexico, the stroke risk of 300 patients attending a single neurology outpatient clinic was evaluated after measuring vital signs and anthropometric parameters. Five- and ten-year absolute stroke risks were reported 3.6% and 6.3%, respectively, which are comparable to those observed in our study [16]. In another open-label randomized controlled study, females comprised approximately two-thirds of participants. They were generally younger than those in our study, which may partly explain the higher overall absolute stroke risk calculated in our study. Furthermore, the five- and ten-year relative stroke risks in both groups were approximately 1% higher than those in our study, which may be attributable to healthier lifestyle characteristics among our participants, including higher levels of physical activity and greater fruit and vegetable intake [15].

Stroke risk assessment revealed a significant difference between participants aged <65 years and those aged ≥ 65 years in both five- and ten-year risk projections, primarily highlighting age as a substantial risk factor for stroke [17]. In a recent cohort study conducted in Iran, hypertension and physical activity were identified as two major modifiable risk factors for stroke among patients with no prior history of stroke events [18] .

Significantly higher systolic blood pressure in participants aged ≥65 years compared with those aged <65 years might partly explain the measured differences in stroke risk across age groups in this investigation. Furthermore, male participants, who constituted the majority of the ≥ 65-year age group, exhibited a significantly higher absolute stroke risk compared with females. However, despite previous evidence suggesting a higher incidence of stroke among males across most age

Accepted Manuscript (Uncorrected Proof)

groups [17,19], the association between stroke risk and sex was insignificant in either age group. This finding may be attributed to the relatively small sample size and the subsequent reduction in statistical power in subgroup analyses.

Nevertheless, the five- and ten-year relative risks, which are not influenced by age, race, or sex, indicated a higher likelihood of future stroke among females compared with males in the overall population, as well as within both <65-year and ≥ 65-year age groups. This difference may be attributed to the higher prevalence of modifiable risk factors, such as elevated BMI and psychological stress, among female participants compared with their male counterparts.

The second part of the study demonstrated poor accuracy among participants in estimating their SBP, weight, and height; however, the majority were accurately informed about their medical history and medication use. The literature indicates that even patients diagnosed with hypertension do not adequately monitor their blood pressure at home [20,21]. In addition, an analysis of hypertensive patients and their caregivers in North India reported that only 18% engaged in home blood pressure monitoring [22]. Therefore, insufficient awareness about blood pressure levels is perceptible in our study.

Limitation and Strength

For the first time, this study evaluates discrepancies between participants' and physicians' responses across the items of the Stroke Riskometer™ questionnaire. Furthermore, the dual-response approach provided a more precise estimate of the absolute and relative five- and ten-year stroke risk among adult Azari residents of Tabriz city, East Azerbaijan Province, northwestern Iran. Nonetheless, the limited sample size and the selection of participants exclusively from primary care facilities in one city represent important limitations of this study and may restrict the generalizability of the findings to other demographics. Moreover, socioeconomic status indicators

Accepted Manuscript (Uncorrected Proof)

for participants, such as the wealth score index (WSI) and education level, which may introduce bias, were not reported. Differences between calculated stroke risks derived from participants' and physicians' responses were not addressed in this study. Moreover, this investigation findings should be interpreted cautiously, as this study evaluated estimated stroke risk rather than actual future cerebrovascular events.

4.2. *Clinical Implication*

The general acceptability, reliability, and remarkable improvement in stroke risk control may significantly impact the implementation of the Stroke Riskometer™ application.

In a survey examining Nigerian individuals' perspectives on stroke risk assessment, approximately two-thirds of participants were willing to be informed of their stroke risk through mobile health applications. However, stroke risk assessment conducted in health facilities or at home under the guidance of a healthcare professional was preferred over self-assessment using a mobile application [23].

Multiple high-quality studies have evaluated the impact of mobile health applications on primary and secondary stroke prevention by managing modifiable stroke risk factors [24–30]. Overall, the findings favored lifestyle improvements and the mitigation of stroke risk factors; nevertheless, the clinical significance of implementing mobile applications should be further addressed in future studies [24–30]. In particular, the Stroke Riskometer™ application demonstrated superiority in stroke risk control compared with conventional methods in a clinical trial study [15]. In another open-label randomized controlled study, Malaysian caregivers of stroke patients were allocated to two groups: receiving the Stroke Riskometer™ application in addition to standard education on stroke risk factors in a primary care clinic, or receiving only a conventional educational approach [12,15]. A licensed physician provided education to all participants. Comparison of the five- and ten-year

Accepted Manuscript (Uncorrected Proof)

absolute and relative stroke risks at baseline and after three months revealed a significant reduction in stroke risk within both groups; however, the differences were not statistically significant in the between-group analysis [15].

Furthermore, discrepancies between physicians' and patients' responses could affect the interpretation of the reliability of self-reported data. They may consequently suggest that the tool is intended for use only by individuals with adequate medical literacy or by physicians.

Conclusion

The Persian version of the Stroke Riskometer™ application provided an accessible approach for estimating five- and ten-year stroke risk in this study population, particularly when used by a physician. Females demonstrated a higher relative risk of stroke compared with males, which may highlight the importance of reducing modifiable risk factors in this group. Future multicenter investigations with longitudinal follow-up are warranted to further evaluate the clinical efficacy and predictive capabilities of the Stroke Riskometer™ application and to determine its correlation with subsequent cerebrovascular events across diverse populations.

Authors' Contribution

Methodology [Mehdi Farhoudi, Mohammad Yazdchi Marandi]; Investigation [Amir Ahmad Khandaghi, Mahasti Alizadeh Mizani]; Writing – Original Draft [Mahta ZareDini, Amir Ahmad Khandaghi]; Writing – Review & Editing [All authors]; Funding Acquisition [Mehdi Farhoudi]; Resources [Mehdi Farhoudi, Mahasti Alizadeh Mizani]; Supervision [Mehdi Farhoudi, Mahasti Alizadeh Mizani, Mohammad Yazdchi Marandi]

Ethical Approval

The study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.978). All methods were carried out in accordance with the

Accepted Manuscript (Uncorrected Proof)

Declaration of Helsinki. Informed consent was obtained from all subjects. At the time of enrollment, written informed consent to participate in the study was obtained from participants. The study's aim and steps were fully explained to participants, and anyone who provided informed consent was included.

Competing Interests

The authors declare that they have no competing interests.

Acknowledgments

We would like to express our sincere appreciation to all staff at the Neuroscience Research Center and the Department of Community Medicine, and to all other participants for translating and launching the Stroke Riskometer™ application. We also extend our gratitude to all other participants who contributed to the translation and implementation of the Stroke Riskometer™ application. The authors are deeply indebted to all subjects who participated in this study.

Funding

This study was supported by the Vice Chancellor for Research and Technology of Tabriz University of Medical Science, Tabriz, Iran.

Accepted Manuscript (Uncorrected Proof)

References

1. Feigin VL, Stark BA, Johnson CO, et al. Global, regional, and national burden of stroke and its risk factors, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Neurol*. 2021;20(10):795-820.

2. Fallahzadeh A, Esfahani Z, Sheikhy A, et al. National and subnational burden of stroke in Iran from 1990 to 2019. *Ann Clin Transl Neurol*. 2022;9(5):669-683. doi:10.1002/acn3.51547

3. Owen NG, Fotheringham MJ, Marcus BH. Communication technology and health behavior change. Published online 2002.

4. Šendelj R. Information technology and information management in healthcare. In: *Health Information Management: Empowering Public Health*. SAGE Publications 1 Oliver's Yard, 55 City Road, London, EC1Y 1SP; 2020:139-158.

5. Wang Y, Min J, Khuri J, et al. Effectiveness of mobile health interventions on diabetes and obesity treatment and management: systematic review of systematic reviews. *JMIR MHealth UHealth*. 2020;8(4):e15400.

6. Mao Y, Lin W, Wen J, Chen G. Impact and efficacy of mobile health intervention in the management of diabetes and hypertension: a systematic review and meta-analysis. *BMJ Open Diabetes Res Care*. 2020;8(1).

7. Liu K, Xie Z, Or CK. Effectiveness of mobile app-assisted self-care interventions for improving patient outcomes in type 2 diabetes and/or hypertension: systematic review and meta-analysis of randomized controlled trials. *JMIR MHealth UHealth*. 2020;8(8):e15779.

Accepted Manuscript (Uncorrected Proof)

8. de Souza Ferreira E, de Aguiar Franco F, dos Santos Lara MM, et al. The effectiveness of mobile application for monitoring diabetes mellitus and hypertension in the adult and elderly population: systematic review and meta-analysis. *BMC Health Serv Res*. 2023;23(1):855.

9. Kim SK, Jo HS, Hwang YS. Effectiveness of web-and app-based health management interventions for patients at high risk of stroke: A systematic review and meta-analysis. *Digit Health*. 2026;12:20552076261444240.

10. Wolf PA, D'Agostino RB, Belanger AJ, Kannel WB. Probability of stroke: a risk profile from the Framingham Study. *Stroke*. 1991;22(3):312-318. doi:10.1161/01.str.22.3.312

11. Feigin VL, Norrving B. A new paradigm for primary prevention strategy in people with elevated risk of stroke. *Int J Stroke Off J Int Stroke Soc*. 2014;9(5):624-626. doi:10.1111/ijs.12300

12. Krishnamurthi R, Hale L, Barker-Collo S, et al. Mobile technology for primary stroke prevention: A proof-of-concept pilot randomized controlled trial. *Stroke*. 2019;50(1):196-198.

13. Parmar P, Krishnamurthi R, Ikram MA, et al. The Stroke Riskometer^{TM} app: validation of a data collection tool and stroke risk predictor. *Int J Stroke*. 2015;10(2):231-244.

14. Medvedev O, Truong QC, Merkin A, Borotkanics R, Krishnamurthi R, Feigin V. Cross-cultural validation of the stroke riskometer using generalizability theory. *Sci Rep*. 2021;11(1):19064. doi:10.1038/s41598-021-98591-8

15. Hussin R, Aziz AFA, Ali MF, et al. Stroke Riskometer Application (SRA^{TM}) influence on lifestyle changes of home bound familial Malaysian stroke caregivers: a randomised controlled trial in a primary care based longer term stroke care facility. *BMC Prim Care*. 2023;24(1):181. doi:10.1186/s12875-023-02138-x

Accepted Manuscript (Uncorrected Proof)

16. Ortega-Moreno DA, Tienda-López F, Sánchez-Peralta ES, et al. The Stroke Riskometer™ in the Outpatient Clinic as an Educational Campaign for Acute Ischemic Stroke. *Rev Neurol*. 2025;80(5):44277. doi:10.31083/RN44277

17. Tsai CF, Wang YH, Teng NC, Yip PK, Chen LK. Incidence, subtypes, sex differences and trends of stroke in Taiwan. *PloS One*. 2022;17(11):e0277296. doi:10.1371/journal.pone.0277296

18. Motamed-Gorji N, Hariri S, Masoudi S, et al. Incidence, early case fatality and determinants of stroke in Iran: Golestan Cohort Study. *J Stroke Cerebrovasc Dis Off J Natl Stroke Assoc*. 2022;31(10):106658. doi:10.1016/j.jstrokecerebrovasdis.2022.106658

19. Appelros P, Åsberg S. Sex differences in stroke. *Handb Clin Neurol*. 2020;175:299-312. doi:10.1016/B978-0-444-64123-6.00021-7

20. Wang TD, Ohkubo T, Bunyi ML, et al. Current realities of home blood pressure monitoring from physicians' perspectives: results from Asia HBPM survey 2020. *Hypertens Res*. 2023;46(7):1638-1649.

21. Cepeda M, Pham P, Shimbo D. Status of ambulatory blood pressure monitoring and home blood pressure monitoring for the diagnosis and management of hypertension in the US: an up-to-date review. *Hypertens Res*. 2023;46(3):620-629.

22. Batta A, Singhania A, Sharma S, et al. Current practices and knowledge of home blood pressure monitoring among people with hypertension: Insights from a Multicentric study from North India. *Indian Heart J*. 2024;76(6):398-404. doi:10.1016/j.ihj.2024.11.249

23. Sarfo FS, Obiako R, Nichols M, et al. Knowledge and perspectives of community members on risk assessment for stroke prevention using mobile health approaches in Nigeria. *J Stroke*

Accepted Manuscript (Uncorrected Proof)

Cerebrovasc Dis Off J Natl Stroke Assoc. 2023;32(9):107265. doi:10.1016/j.jstrokecerebrovasdis.2023.107265

24. Liu S, Feng W, Chhatbar PY, Liu Y, Ji X, Ovbiagele B. Mobile health as a viable strategy to enhance stroke risk factor control: a systematic review and meta-analysis. *J Neurol Sci*. 2017;378:140-145.

25. Chen X, Gong E, Tan J, et al. Long-term mortality outcome of a primary care-based mobile health intervention for stroke management: six-year follow-up of a cluster-randomized controlled trial. *PLoS Med*. 2025;22(3):e1004564.

26. Dharma KK. Use of mobile-stroke risk scale and lifestyle guidance promote healthy lifestyles and decrease stroke risk factors. *Int J Nurs Sci*. 2020;7(4):401-407.

27. Cao W, Kadir AA, Tang W, Wang J, Yuan J, Hassan II. Effectiveness of mobile application interventions for stroke survivors: systematic review and meta-analysis. *BMC Med Inform Decis Mak*. 2024;24(1):6. doi:10.1186/s12911-023-02391-1

28. Kang YN, Shen HN, Lin CY, et al. Does a Mobile app improve patients' knowledge of stroke risk factors and health-related quality of life in patients with stroke? A randomized controlled trial. *BMC Med Inform Decis Mak*. 2019;19(1):282.

29. Ungerer MN, Reichel K, Feisst M, Tunkl C, Quenzer B, Gumbinger C. Mobile Health Application for the Prevention of Stroke (MAPS): a pilot, single-arm study on an innovative health application designed for primary stroke prevention. *BMC Neurol*. Published online 2026.

30. O'Connor SR, Kee F, Thompson DR, Cupples ME, Donnelly M, Heron N. A review of the quality and content of mobile apps to support lifestyle modifications following a transient

Accepted Manuscript (Uncorrected Proof)

ischaemic attack or “minor” stroke. *Digit Health*. 2021;7:20552076211065271. doi:10.1177/20552076211065271

Accepted Manuscript (Uncorrected Proof)

Table 1: Demographics of participants

Character	Total (N=150)
Gender, No. (%)	
Male	88 (58.7)
Female	62 (41.3)
Age group, No. (%)	
< 65 years	82 (54.7)
≥ 65 years	68 (45.3)
Smoking status, No. (%)	
No Smoker	119 (79.3)
Smoker (current, within last year)	31 (20.7)
Drinking, No. (%)	
No	145 (96.7)
Yes	5 (3.33)
BMI classification, No. (%), kg/m2	
Underweight (< 18.5)	14 (9.3)
Normal (18.5 – 24.9)	47 (31.3)
Overweight (25 – 29.9)	58 (38.7)
Obese class I (30 – 34.9)	21 (14.0)
Obese class II (35 – 39.9)	6 (4.0)
Obese class III (≥ 40)	4 (2.7)
Daily physical activity ≥ 2.5 h, No. (%)	
No	27 (18.0)
Yes	123 (82.0)
Daily consumption of vegetables and fruits > servings, No. (%)	
No	35 (23.3)
Yes	115 (76.7)
Mental stress during last year, No. (%)	
No	65 (43.3)
Yes	85 (56.7)
Age, Mean (SD), year	63.36 (12.66)

Note: BMI; Body Mass Index, h; hour, No; number, SD; Standard Deviation

Accepted Manuscript (Uncorrected Proof)

Table 2: Absolute five and ten-year stroke risk

	Total	**< 65 years**	**≥ 65 years**	***P value****
Five-year risk, Median (IQR)	2.99 (3.59)	1.54 (1.63)	4.69 (3.06)	< 0.01
Ten-year risk, Median (IQR)	6.97 (9.27)	3.63 (4.24)	11.67 (7.21)	< 0.01

**Note: ***P value: Mann-Whitney U test, IQR; Inter Quartile Range

Table 3. Relative five and ten-year stroke risk

	Total	**Male**	**Female**	***P value**
Five-year risk, Median (IQR)	2.90 (2.8)	2.37 (1.5)	4.36 (3.18)	< 0.01
Ten-year risk, Median (IQR)	2.26 (2.15)	1.89 (1.18)	3.5 (2.56)	< 0.01

**Note: ***P value: Mann-Whitney U test, IQR; Inter Quartile Range

Accepted Manuscript (Uncorrected Proof)