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Risk factors for fear of falling in stroke patients: a systematic review and meta-analysis

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ABSTRACT
Objective Even though 32%–83% for fear of falling (FoF) in patients with stroke, very little is known about the predictors of the problems. Therefore, we systematically reviewed the literature on risk factors for FoF in patients with stroke.
Design A systematic review and meta-analysis
Data sources PubMed, Embase, Cochrane Library database, Web of Science, CINAHL, PsycINFO. Grey literature and other relevant databases for related publications were searched (from inception to 17 July 2021).
Results Eight studies involving 1597 participants were selected to analyse risk factors for patients with stroke with FoF. The quality of all included studies was assessed and categorised as medium or high quality. Review Manager V5.3 merged the OR value and 95% CI of the potential risk factors. Meta-regression and Egger’s test were performed by Stata V15.1. The risk factors for FoF in patients with stroke were women (OR=2.13, 95% CI 1.47 to 3.09), impaired balance ability (OR=5.54; 95% CI 3.48 to 8.81), lower mobility (OR=1.12; 95% CI 1.05 to 1.19), history of falls (OR=2.33; 95% CI 1.54 to 3.53) and walking aid (OR=1.98; 95% CI 1.37 to 2.88), anxiety (OR=2.29; 95% CI 1.43 to 3.67), depression (OR=1.80; 95% CI 1.22 to 2.67), poor lower limb motor function (OR=1.14; 95% CI 1.00 to 1.29) and physically inactivity (OR=2.04; 95% CI 1.01 to 4.12). Measurement of heterogeneity between studies was high for all outcomes (I²: 0%–93%), indicating that the substantial interstudy heterogeneity in estimated proportions was not attributed to the sampling error. Sensitivity analysis (leave-one-out method) showed that the pooled estimate was stable.
Conclusion This meta-analysis indicated that female population, impaired balance ability, lower mobility, history of falls and walking aid in patients with stroke might be at greater risk for FoF. Future studies are recommended to determine other risk factors specific to patients with stroke.

INTRODUCTION
Stroke is the second leading cause of death worldwide, creating a serious burden on caregivers. In 2010, an estimated 16.9 million stroke incidents occurred, increasing the number of 33 million stroke survivors all over the world. As a result, there were 5.9 million people who died, whereas 102 million people with disability-adjusted life years were lost because of the stroke.

On the other hand, it is well known that stroke can cause physical damage, such as weakness, paralysis, sensory disturbances, impaired postural control, mental fatigue, depression and impaired cognitive function. According to the WHO, a fall is defined as ‘an event which results in a person coming to rest inadvertently on the ground or floor or other lower level, with or without injury’. Both physical and mental impairments can contribute to a fall, a common complication after a stroke. Among those who survived a stroke, 22%–48% have experienced at least one fall in the hospital or the rehabilitation facility. There is a reported prevalence of 32%–83% for fear of falling (FoF) between the first 6 months and just over 4 years after stroke onset. A high level of FoF psychology that limits the patient’s active rehabilitation exercise behaviour reduces their mobility, flexibility and independence and increases their anxiety and depression. The FoF psychology hinders the recovery of the adults’ physical...
and mental functions, thereby increasing the risk of falling and forming a vicious circle. However, the risk factors identified for evidence during stroke and risk factors for falls in patients promote community reintegration and improve the quality of life. Some previous studies have proposed the correlation between many potential risk factors and FoF, intervention measures to reduce FoF incidence during stroke and risk factors for falls in patients with stroke. However, the risk factors identified for FoF in different studies are inconsistent. These reports have neither comprehensively explored sociodemographic, psychological and physical risk factors, nor included systematic reviews and meta-analyses of risk factors for FoF in patients with stroke. Therefore, we conducted this systematic review and meta-analysis to identify risk factors for FoF in patients with stroke.

**METHODS**

**Search strategy**

We searched PubMed, Embase, Cochrane Library, Web of Science, CINAHL, PsycINFO, Grey literature and other databases (from inception to July 2021) for studies that identified risk factors for FoF in patients with stroke.

Our search strategy used medical subject heading and natural language text words. The first author designed specific search strategies and peer-reviewed electronic search strategies. The specific search strategy for each database is mentioned in online supplemental file 1. References from relevant papers or reviews were hand-searched for additional studies. For missing relevant data from studies, we contacted the study’s authors via email. All studies that were classified as FoF studies were then screened. On 20 July 2021, another search was performed on the previously mentioned database to search the articles published since the initial examination date.

**Inclusion and exclusion criteria**

The inclusion criteria: (1) published case–control studies, cohort studies and cross-sectional studies; (2) all participants 18 years and above and clinically diagnosed with either first stroke or recurrent stroke; (3) studies published in the English or Chinese language; (4) reported risk factors of FoF in patients with stroke using validated screening tools; (5) the data can be extracted, including the spreadsheet of the pretest in the study.

The exclusion criteria: (1) review papers, case reports, meeting abstracts, qualitative studies; (2) duplicate literature or research with the same data; (3) research on quality evaluation results is low.

Endnote X V.9 software was used to remove duplicates and facilitate the screening process. All titles and abstracts were screened for inclusion/exclusion based on the eligibility criteria. The full texts were evaluated if the title and abstract could not accurately identify the possibly eligible studies (online supplemental file 2).

**Data extraction and quality assessment**

The literature extraction was independently conducted based on the search, reviewed and selected according to predefined criteria. The data were collected from studies: first author, year of publication, geographical location, the measured/collected tools, study type, research period, total sample size, sociodemographic data and risk factors. The odds ratio (OR) or the risk ratio (RR) and its 95% CI was directly extracted from the included studies. All the information was recorded in especially standardised forms. For the missing relevant data of studies, we contacted the study’s authors via email; however, if the relevant data could not be obtained, the study was excluded (online supplemental file 3).

The methodologic quality assessment of case–control studies and cohort studies was assessed by the Newcastle Ottawa Scale (NOS) for the study population (four items), comparability (one item) and outcome evaluation (three items). The scale’s total score was kept as 9 points, where 0 to 3 were divided into low-quality research, 4 to 6 were divided into medium-quality research and 7–9 were divided into high-quality research. In addition, the risk of bias in a cross-sectional study was assessed using the instrument Agency for Healthcare Research and Quality (AHRQ). The tool had a total of 11 items as follows: if the answer to an object was ‘no’ or ‘UNCLEAR’, the item’s score was ‘0’; if the answer was ‘yes’, the item score ‘1’, with a total score of 0–11 points, 0–3 points=low quality, 4–7 points=medium quality, 8–11 points=high quality. The process of study selection, data extraction and quality assessment were all conducted in duplicate (Q Xie and JH Pei) with third-party adjudication (XM Dou) for disagreements.

**Statistical analysis**

To assess the risk factors of FoF, we conducted a meta-analysis by the RevMan V.5.3 software to pool the OR/RR value with 95% CI. Meta-regression and Egger’s test were performed by the Stata V.15.1, whereas all other statistical analyses were conducted with the RevMan V.5.3 software. Statistical heterogeneity between studies was quantified by the I² statistics and formally tested by Cochran’s Q statistic. A random-effects model for meta-analysis was an obvious conservative choice based on the heterogeneity of geographic settings and the variability of screening and diagnostic tools. However, when the number of studies was small (n<5), a fixed-effects model was used. The findings were...
illustrated in the form of forest plots. Publication bias was identified using a funnel plot and Egger’s test.\textsuperscript{30} We planned to conduct subgroup and meta-regression analyses based on sample size and proportion of women.\textsuperscript{31} As previous studies have shown that SwePASS scores and age were influencing factors, we performed the post hoc subgroup and meta-regression analyses on these two factors when the number of studies >2.\textsuperscript{31–33} Statistical significance was set at p value <0.05. Sensitivity analyses were performed using the leave-one-out method.

Patient and public involvement
No patient was involved in the study.

RESULTS

Literature selection
Initially, 2731 records were searched from the six databases and other resources (figure 1). After the exclusion of duplicates, the remaining 1646 records were screened. After analysing the title and abstract, ultimately, 92 publications were selected for the full-text assessment. Finally, eight full-text studies with 1597 participants were found eligible and included in this meta-analysis.

Study characteristics and methodologic quality
The included eight studies were conducted in three regions, that is, Asia (n=4), North America (n=1) and Europe (n=3). Among these eight studies, two were cross-sectional, four were case-control and two were prospective cohort studies. A summary of literature characteristics used in the analysis is shown in table 1.

The NOS assessed the quality of the case-control studies and prospective cohort studies. The NOS scores ranged from 7 to 9, indicating a high level of studies quality. In the two cross-sectional studies, the AHRQ scores ranged from 4 to 6, indicating a moderate level of quality. The overall score indicated the relatively high quality of the literature included in this study.
| Author, year, country | Study design | Sample size (N) | Age, years (mean±SD) | Female N (%) | Outcome ascertainment | Research period | Stroke reference period | Adjusted risk factors† | NOS‡/AHRQ scores§ |
|-----------------------|--------------|----------------|----------------------|--------------|-----------------------|----------------|------------------------|-----------------------|----------------------|
| Zhang Qin et al 2020, China | Cross-sectional study | 221 | 6 0.13±8.72† | 88 (39.8)† | The self-made questionnaire, ADL, SAS, SDS, SFES-I | May 2017–January 2019 | The first-onset stroke recovery period | 1. Age 2. Marital status 3. History of falls 4. Anxiety 5. Depression | 4 |
| Li Ying et al 2014, China | Case-control study | 170 | 73.54† Male: 73.0±8.4 Female: 74.2±7.6 | 76 (44.70)† | The self-made questionnaire, MMSE, The single-item question, MFES, BBS, TUGT | March 2013–August 2013 | Medically diagnosed | 1. Berg balance force (min) 2. TUG mobile capability(s) 3. History of falls within six metres | 9 |
| Yadav et al 2020, India | Case-control study | 82 | 51.6±12.13† | 22 (26.8) | TUGT, FM, PHQ-9, the single-item question | 23 August-10 February 2019. | Patients with cerebral stroke for more than 3 months | 1. Fugl-Meyer Scale score 2. Timed Up and Go score | 8 |
| Amanda Larén et al 2018, Sweden | Prospective cohort study | 462 | 74.8±12 | 226 (48.9) | The single-item question, the SwePASS, SGPALS, using a walking aid and/or a wheelchair, NIHSS | 1 October 2014–30 June 2016. | Patients aged 18 years or older with a diagnosis of a first-ever or recurrent clinical stroke, acute stroke | 1. Female 2. SwePASS total score < 24 3. Using a walking aid | 8 |
| Schinkel-Ivy et al 2016, Canada | Case-control study | 208 | FoF: 68.6±11.6 No FoF: 65.3±13.6 | FoF:52 (61.9) No FoF: 43 (34.7) | The single-item question, ABC | October 2009 and September 2012 | In-patient stroke rehabilitation | 1. Grasp reactions 2. Assists | 7 |
| Goh et al 2016, China | Case-control study | 125 | 66.6±6.9 | 26 (35) | FAC, FM, BBS, MoCA, PHQ-9, FES-I, FSS | NR | Aged 60 years or older, had stroke onset more than 3 months ago | 1. FAC ≤4 | 7 |
| Beliz Belgen et al 2006, Sweden | Cross-sectional study | 50 | 59.9±11.9 | 19 (38) | The single-item question, FES-S, STS, FMA, BBS, TUGT, SIS mood and emotion | NR | They had a stroke onset more than 1 month prior | History of falls | 6 |

Continued
| Author, year,* country | Study design | Sample size (N) | Age, years (mean±SD ) | Female N (%) | Outcome ascertainment | Research period | Stroke reference period | Adjusted risk factors† | NOS‡/AHRQ scores§ |
|------------------------|-------------|----------------|-----------------------|--------------|-----------------------|----------------|------------------------|----------------------|---------------------|
| Netha Hussain et al 2021 Sweden† | Prospective cohort study | 279 | 75.83±11.17 | Total: 143 (51.3) FoF: 78.05±11.13 No FoF: 74.22±10.95 | NIHSS, MoCA, the single-item question, SwePASS, SGPALS | Between 1 October 2014 and 30 June 2016 | All the Falls GOT cohort participants were still alive 6 months after a stroke. | 1. Age 2. Female 3. History of falls 4. Use of walking aid 5. SwePASS score (0–24) 6. SGPALS score--Physically inactive | 8 |

*Year of publication of the study. †Data as reported by the authors. ‡The Newcastle-Ottawa Scale. §The instrument Agency for Healthcare Research and Quality.

ABC, The Activities-Specific Balance Confidence Scale; ADL, The modified Barthel Index; BBS, The Berg Balance Scale; FAC, The Functional Ambulation Category; FES-I, Fall Efficacy Scale International; FES-S, Falls Efficacy Scale–Swedish Version; FM/FMA, The Fugl-Meyer Scale; FoF, fear of falling; FSS, The Fatigue Severity Scale; FM/FMA, The Fugl-Meyer Scale; FoF, fear of falling; FSS, The Fatigue Severity Scale; MMSE, The mini-mental state examination; MoCA, The Montreal Cognitive Assessment; NIHSS, The National Institutes of Health Stroke Scale; NR, not reported; PHQ-9, Patient Health Questionnaire–9; SAI, State Anxiety Inventory; SAS, The Self-rating Anxiety Scale; CES-D Scale, Centre for Epidemiologic Studies Depression Scale; SDS, The Self-rating Depression Scale; SFES-I, Short Falls Efficacy Scale International; SGPALS, the Saltin-Grimby Physical Activity Level Scale; SIS, Stroke Impact Scale; SSRS, Social Support Rating Scale; STS, timed sit-to-stand test; The SwePASS, the Swedish modified version of the Postural Assessment Scale for Stroke; TAI, Trait Anxiety Inventory; TUGT, The Timed Up and Go test.
RESULTS OF THE META-ANALYSIS

Sociodemographic factors

Three of the eight studies reported the relationship between sociodemographic factors and FoF, whereas the two reported predictors were age and women. Due to the limited number of studies, the ability to assess the publication bias by the funnel plot and Egger’s test was unsuccessful.30

Age

Two studies with 500 participants reported the relationship between age and FoF in patients with stroke. Meta-analysis using a fixed-effects model showed that there was no statistically significant association ($OR=1.00, 95\% CI 0.98$ to $1.03, p=0.81$, $I^2=82\%$; figure 2A).

Women

Two studies with 741 participants reported the correlation between women and FoF in patients with stroke. A pooled analysis using a fixed-effects model demonstrated that women experienced a significantly higher incidence of FoF than men ($OR=2.13, 95\% CI 1.47$ to $3.09, p<0.0001$, $I^2=0\%$; figure 2B).

Physical factors

Balance ability

Three studies reported the correlation between balance ability and FoF14 34 35 (911 participants). Based on the meta-analysis of the three studies on the risk factors of FoF, the results show large heterogeneity ($p=0.003$, $I^2=97\%$). The sensitivity analysis revealed clinical heterogeneity from different assessment tools. Ying et al34 measured balance ability with the Berg Balance Scale (BBS) score, whereas Larén et al14 and Hussain et al35 defined it by using the SwePASS score (postural control). Subgroup analysis of the SwePASS score showed that patients with stroke with lower balance levels were significantly more susceptible to FoF than higher balance levels (figure 3A). The results showed that the risk of FoF with a SwePASS score $<24$ ($OR=5.54; 95\% CI 3.48$ to $8.81; I^2=86\%$) was higher than a SwePASS score $25–30$ ($OR=2.30; 95\% CI 1.47$ to $3.58; I^2=0\%$). This subgroup difference was statistically significant ($p=0.007$). There was no evidence of publication bias based on the Egger’s test ($p=0.135$).

Mobility

A meta-analysis using a fixed-effects model included three studies on the risk factors of FoF (377 participants) demonstrated a significantly higher incidence of FoF in lower mobility patients with stroke ($OR=1.12; 95\% CI 1.05$ to $1.19$; figure 3B) and revealed a considerable heterogeneity between the studies ($p=0.0003$, $I^2=84\%$). Meta-regression was performed to explore potential sources of heterogeneity based on an a priori list of factors related to clinical prognosis.33 Meta-regression analysis showed subgroup effects for age ($p_{interaction}=0.017$), sample size ($p_{interaction}=0.019$) and proportion of women ($p_{interaction}=0.019$). Sensitivity analysis (leave-one-out method) showed that the pooled estimate was stable. In addition, there was no evidence of publication bias according to a funnel plot (online supplemental file 4) and the Egger’s test ($p=0.619$).

History of falls

Four studies reported the correlation between experience of falls and FoF34–37 (720 participants). Furthermore, Watanabe38 reported that 87.9% of those who have experienced a fall would have a FoF for patients with stroke. Fixed-effects model analysis included four studies that revealed that the risk of FoF in patients with stroke with a history of falls was 2.33 times higher than no falls.

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Figure 2

Meta-analyses for the association between sociodemographic factors and fear of falling: (A) age, (B) female gender. The solid vertical line indicates no effect. The solid squares indicate the mean difference and are proportional to the weights used in the meta-analysis. The diamond indicates the weighted mean difference, and the lateral tips of the diamond indicate the associated confidence intervals (CI). The horizontal lines represent the 95% CI.
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There was no evidence of publication bias according to a funnel plot (online supplemental file 5) and the Egger’s test (p=0.205).

Use of walking aid

Two studies listed the relationship between the walking aid for patients with stroke and FoF\textsuperscript{14,35} (741 participants). Larén et al\textsuperscript{14} reported valuable insight into those involved in stroke rehabilitation during the acute phase after stroke. FoF was associated with the use of a walking aid, whereas Hussain et al\textsuperscript{35} using the multivariable regression model, showed that the walking support for FoF was not statistically significant. A meta-analysis using a fixed-effects model that included two studies revealed that the risk of FoF in patients with stroke who used a walker is 1.98 times that of those who did not use a walker (\(OR=1.98;\) 95\% CI 1.37 to 2.88, \(I^2=93\%\); figure 5).

Other risk factors

Only six factors were assessed in more than one study and found eligible for meta-analysis. All other risk factors estimated are described narratively based on the findings of the associated individual study. Among them, anxiety (\(OR=2.29;\) 95\% CI 1.43 to 3.67), depression (\(OR=1.80;\) 95\% CI 1.22 to 2.67), poor lower limb motor function (\(OR=1.14;\) 95\% CI 1.00 to 1.29) and physically inactive-ness (\(OR=2.04;\) 95\% CI 1.01 to 4.12) increased the risk of FoF in patients with stroke.

Qin et al\textsuperscript{36} and Schmid et al\textsuperscript{39} reported that anxiety, depression and marital status were some of the risk factors for FoF. Specifically, marital status with a spouse was protected against the development of FoF. Yadav et al\textsuperscript{40} identified that every 1 unit increase in lower extremity Fugl-Meyer score had a 1.36 times chance of a person belonging to no FoF group. Thus, improving the

Figure 3 Meta-analyses for the association between physical risk factors and fear of falling:(A) balance ability and (B) mobility.

Figure 4 Meta-analyses for the association between history of falls and fear of falling.
lower extremity motor function can reduce the chances of belonging to no FoF.

Furthermore, Schinkel-Ivy et al.\textsuperscript{41} reported that FoF was positively correlated to the walking velocity in individuals with stroke. This research used a 4.6-meter-long pressure pad system (Gaitrite, CIR Systems, Clifton, New Jersey) to measure gait, where walking velocity and double support time were used as an outcome indicator.\textsuperscript{42} Data on other risk factors are found in table 2.

**DISCUSSION**

This study included observational studies with 1597 stroke participants. Out of the eight studies, two were cross-sectional studies, four were case–control studies, and two were prospective cohort studies with a wide range of patient characteristics. Furthermore, the reliability of the results was confirmed by the sensitivity analysis. This meta-analysis revealed that the female population, impaired balance ability, lower mobility, the experience of falling and walking aid were strongly associated with FoF among stroke individuals. Pooled results of these eight studies and another meta-analysis on fall risk factors in community stroke survivors\textsuperscript{20} were consistent for reduced balance (OR 3.87),\textsuperscript{20} depression (OR 2.11),\textsuperscript{20} and history of falls associated with the falls and FoF. Furthermore, the present study’s balance ability and mobility analysis results were in-concurrence with the study of Cho et al.,\textsuperscript{45} who showed that the FoF and they were positively correlated (respectively, r=0.669; r=0.545). Other studies, such as Akosile et al.,\textsuperscript{46} showed a negative correlation between physical function and fall efficacy (r=−0.66). Kim et al.\textsuperscript{19} revealed that the physical factors, including the functional ambulation category, hip abductor strength, knee extensor and ankle plantar flexor had a negative correlation with FoF (respectively, r=−0.673; r=−0.534; r=−0.478; r=−0.501). Of note, the above results are contrary, which can result from different statistical analyses and research focuses used in these studies. Further, gait speed was related to the ability to maintain balance, where gait disorders limited the independent life of patients with stroke.\textsuperscript{47} Due to reduced weight transfer capacity and stability, many stroke survivors might find it challenging to maintain their balance.\textsuperscript{47} A previous study

| Table 2 | Detailed data on other risk factors for the patient of FoF after stroke |
|----------|---------------------|-----------------|-----------------|-----------------|-----------------|
| Risk factors | OR | RR | LL—95%CI | UL—95%CI | P value |
| Anxiety\textsuperscript{36} | 2.29 | 1.43 | 3.67 | <0.001 |
| Depression\textsuperscript{36} | 1.80 | 1.22 | 2.67 | 0.003 |
| Marital status\textsuperscript{36} | 0.62 | 0.44 | 0.88 | 0.006 |
| Lower limb motor function\textsuperscript{40} | 1.14 | 1.00 | 1.29 | 0.047 |
| SGPALS score—physically inactive\textsuperscript{35} | 2.04 | 1.01 | 4.12 | 0.048 |
| Reactive stepping\textsuperscript{41} | 0.98 | 0.95 | 1.01 | 0.23 |
| Grasp reactions | 0.98 | 0.96 | 1.00 | 0.86 |
| Assists | 0.98 | 0.96 | 1.00 | 0.086 |

LL, lower limit; OR, odds ratio; RR, relative risk; SGPALS, the Saltin-Grimby Physical Activity Level Scale; UL, upper limit.
showed that the stroke patient’s gait patterns were slow and required excessive exertion; however, these patient’s legs were not well coordinated. Thus, increased foot support time and decreased gait speed in these patients with balance disorders were the risk of falls and increased anxiety.\(^\text{19}\) Combined with clinical analysis, stroke mainly occurs in the 60 to 70 years old, where the decline of body function inevitably leads to the FoF. Impaired balance can easily cause patients to fall and, thus, cause them to be aware of the surrounding environment and the safety of their activities, which eventually increases the patient’s psychological tension, worry and FoF.\(^\text{69}\) Therefore, it is vital to explore the relationship between FoF and body function in clinical practice using large-scale prospective studies.

In addition to the factors mentioned in the various studies, elements such as poststroke psychological factors, long-term sitting and quality of life research have been studied for the relationship with the FoF. Anxiety and depression (\(r=0.400\)), energy, mobility, self-care and upper extremity function of quality of life (Pearson’s correlation coefficients were \(r=-0.476\); \(r=-0.615\); \(r=-0.617\); \(r=-0.507\))\(^\text{19}\) were correlated with FoF. A significantly positive correlation was seen between FES-I and sitting time (\(r=0.579\)).\(^\text{50}\) The study on differences in gait and balance measures in patients with chronic stroke with the different levels of attention related to falls showed that patients with chronic strokes and slight concern about falling have better gait and balance capabilities than patients with high levels of concern.\(^\text{51}\) Therefore, these results are potentially clinically relevant and would be useful to study if reducing FoF can improve gait, quality of life, physical function and balance performance in these patients. Furthermore, it would also be useful to measure FoF as the assessment of psychological factors, quality of life and physical function in these patients. Although stroke itself is not a direct factor in causing the FoF, as a long-term chronic disease, it indicates that the patient’s body functions are further declining. Importantly, the treatment of long-term chronic diseases further declines or loses the patient’s self-efficacy and self-confidence in behavioural activities, which eventually leads to FoF. The decreases in self-esteem can directly cause depression, anxiety and limited self-care ability and affect FoF. Additionally, in the recovery stage of the first stroke, the walking function is the main factor affecting the occurrence of falls. Since most stroke patients have limb dysfunction, the need to assist in walking during the initial stage of recovery or within a certain period increases the risk of falls.

Furthermore, there is a particular aspect regarding the causal relationship between falling and FoF. Some studies have confirmed that FoF is an essential predictor of falls in patients with stroke,\(^\text{52-54}\) and several other studies have suggested that people who have experienced a fall were more likely to have FoF.\(^\text{55-56}\) A recent study has confirmed that the history of falls in the recent time was a good predictor for the FoF, but the FoF is a predictor of falls during follow-up only in the unadjusted model.\(^\text{57}\) In the current study, differences were observed among the included studies in terms of evaluation for the fall history. The fall history was defined as whether a fall was occurred in the past 6 months, within the past 1 year, or within 6 metres of walking. During these different periods, the probability of falling in stroke patients was different, which affects the likelihood of occurrence of FoF.\(^\text{58}\)

Considering the global prevalence of stroke-related falls or FoF, this study provided evidence for developing appropriate preventable measures for decreasing the FoF risk in patients with stroke. The risk factors of FoF for stroke patients in Asia included marital status, social support status and payment methods for medical insurance\(^\text{59}\); However, current guidelines for stroke management provide no specific recommendations for psychological monitoring or the FoF management.\(^\text{60}\) Therefore, more studies are required for developing effective evaluation methods and treatment strategies against FoF among patients with stroke to improve their physical function, mental health and quality of life.

This meta-analysis had several significant findings. First, most of the included studies were relatively high quality, with robust evidence. Second, under the premise of a large sample size, the risk factors of falling fear in stroke patients were ensured by qualitative analysis. Hence, our findings may be more convincing compared with the individual studies. Additionally, the research data included in this study were adjusted, and the results of the data analysis were not affected by the patient’s baseline characteristics. We also explored the sources of heterogeneity using meta-regression if the analysis included more than two studies. We prespecified sample size and the proportion of women as the meta-regression variables because we considered that studies with smaller sample size and a larger proportion of women could have a larger impact on FoF.\(^\text{51,33}\) In the post hoc analyses, we also added age and SwePASS score as potential regressors because previous studies showed that older populations and smaller SwePASS scores could lead to a larger impact on FoF.\(^\text{51-33}\)

Despite the above important findings, this study had some limitations. (1) Two of the included reports were cross-sectional studies, and, thus, the ability to hypothesise aetiology was weak, (2) all the included studies were observational studies, and, therefore, the role of confounding factors should be considered. However, due to the limited number of studies, a multivariate meta-analysis could not be performed to assess the robustness of our findings and analyse the effect size of multiple risk factors at the same time,\(^\text{61}\) (3) the effects of the patient’s inner anxiety and depression, as well as the motor function of the lower limbs on the risk of falling fear in stroke patients, have been reported in fewer studies. Therefore, the conclusions may vary for individual studies. (4) this meta-analysis only included English and Chinese studies; thus, it probably missed
the relevant studies in other languages, which leads to biases in estimates in Western countries. However, there is currently no evidence suggesting that the meta-analysis of language limitations can lead to such bias. In the end, the analysis was based on the overall research level and not on personal data.

CONCLUSION
This study is the first systematic analysis for assessing the risk factors for FoF in patients with stroke, including the history of falls, walking aids, sociodemographic factors, physical characteristics and psychological factors. This study results suggest that women, impaired balance, mobility impairment, history of falls, walking aids, anxiety, depression, poor lower limb motor function and physical inactiveness might be associated with FoF in patients with stroke, especially impaired balance. In addition, the collective evidence was primarily consistent, and the effect size of FoF was large. A comprehensive analysis of these risk factors would help screen and differentiate patients at risk for FoF, thereby helping to prevent and optimise timely interventions.

Overall, there is a paucity of empirical data in this area. Many of the factors identified, in general, that population samples have not been studied in patients with stroke. In addition, other risk factors specific to patients with stroke (eg, gait speed and gait-related factors) need to be evaluated to identify patients with stroke at risk for FoF. Finally, researchers should explore how some variables (ie, anxiety and depression) interact with FoF and how to better protect patients with stroke from it. This intervention will reduce the personal and financial burden and promote these patients’ early recovery.

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Competing interests
None declared.

Patient and public involvement
Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication
Not applicable.

Ethics approval
Not applicable.

Provenance and peer review
Not commissioned; externally peer reviewed.

Data availability statement
All data relevant to the study are included in the article or uploaded as supplemental information.

Supplemental material
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Pubmed: from inception to July 20, 2021

| #  | searches                                                                                                                                  | results  |
|----|--------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1  | "Stroke"[MeSH Terms] OR "Carotid Artery Diseases"[MeSH Terms] OR "Basal Ganglia Cerebrovascular Disease"[MeSH Terms] OR "Cerebral Infarction"[MeSH Terms] OR "Brain Ischemia"[MeSH Terms] OR "Cerebral Small Vessel Diseases"[MeSH Terms] OR "Intracranial Arterial Diseases"[MeSH Terms] OR "Intracranial Hemorrhages"[MeSH Terms] OR "Brain Infarction"[MeSH Terms] OR "stroke, lacunar"[MeSH Terms] OR "vasospasm, intracranial"[MeSH Terms] OR "Hemiplegia"[MeSH Terms] OR "Paresis"[MeSH Terms] OR "gait disorders, neurologic"[MeSH Terms] | 405,432  |
| 2  | stroke*[Title/Abstract] OR "Cerebrovascular Accident*[Title/Abstract] OR "Cerebrovascular Apoplexy*[Title/Abstract] OR "Brain Vascular Accident*[Title/Abstract] OR "Cerebrovascular Stroke*[Title/Abstract] OR "Apoplexy*[Title/Abstract] OR "Cerebral Stroke*[Title/Abstract] OR "Acute Stroke*[Title/Abstract] OR "Acute Cerebrovascular Accident*[Title/Abstract] OR "Brain Stem Infarctions*[Title/Abstract] OR "Cerebral | 473,904  |
| Term                                                                 | OR Term                                                                 |
|----------------------------------------------------------------------|------------------------------------------------------------------------|
| Infarction*[Title/Abstract]                                           | "Hemorrhagic Stroke*[Title/Abstract]                                  |
| Stroke*[Title/Abstract]                                              | "Ischemic Stroke*[Title/Abstract]                                      |
| "Embolic Stroke*[Title/Abstract]                                     | "Thrombotic Stroke*[Title/Abstract]                                    |
| Diseases*[Title/Abstract]                                            | "Vascular Diseases*[Title/Abstract]                                    |
| OR "Carotid Artery Disease*[Title/Abstract]                          | OR "Carotid Artery Disorder*[Title/Abstract]                           |
| Disease*[Title/Abstract]                                             | OR "Carotid Arterial Disease*[Title/Abstract]                         |
| OR "Carotid Atheroscleros*[Title/Abstract]                           | OR "Carotid Atherosclerotic Disease*[Title/Abstract]                   |
| Disease*[Title/Abstract]                                             | OR "Internal Carotid Artery Disease*[Title/Abstract]                   |
| Diseases*[Title/Abstract]                                            | OR "Common Carotid Artery Disease*[Title/Abstract]                     |
| Diseases*[Title/Abstract]                                            | OR "External Carotid Artery Disease*[Title/Abstract]                   |
| Diseases*[Title/Abstract]                                            | OR "External Carotid Arterial Disease*[Title/Abstract]                 |
| Diseases*[Title/Abstract]                                            | OR "Carotid Artery Thrombosis*[Title/Abstract]                        |
| Diseases*[Title/Abstract]                                            | OR "Intracranial Vascular Disorder*[Title/Abstract]                   |
| Diseases*[Title/Abstract]                                            | OR "Intracranial Vascular Disease*[Title/Abstract]                    |
| Disorder*[Title/Abstract]                                            | OR "Cerebrovascular Disease*[Title/Abstract]                          |
| Disease*[Title/Abstract]                                             | OR "Brain Vascular Disease*[Title/Abstract]                           |
| Disorder*[Title/Abstract]                                            | OR "Cerebrovascular Disease*[Title/Abstract]                          |
| Occlusion*[Title/Abstract]                                           | OR "Cerebrovascular Disease*[Title/Abstract]                          |
| Insufficiency*[Title/Abstract]                                       | OR "Basal Ganglia Vascular Disease*[Title/Abstract]                   |
Disease*[Title/Abstract] OR "Lenticulostriate Vasculopathy*[Title/Abstract] OR Lenticulostriate Vascular Disease*[Title/Abstract] OR Vascular Lenticulostriate Diseases*[Title/Abstract] OR "Basal Ganglia Hemorrhage*[Title/Abstract] OR "Putaminal Hemorrhage*[Title/Abstract] OR "Cerebral Infarct*[Title/Abstract] OR "Left Hemisphere Cerebral Infarction*[Title/Abstract] OR "Subcortical Infarction*[Title/Abstract] OR "Posterior Choroidal Artery Infarction*[Title/Abstract] OR "Anterior Choroidal Artery Infarction*[Title/Abstract] OR "Right Hemisphere Cerebral Infarction*[Title/Abstract] OR "CADASIL*[Title/Abstract] OR "Multi-Infarct Dementia*[Title/Abstract] OR "Anterior Cerebral Artery Infarction*[Title/Abstract] OR "Middle Cerebral Artery Infarction*[Title/Abstract] OR "Posterior Cerebral Artery Infarction*[Title/Abstract] OR "Brain Ischemia*[Title/Abstract] OR "Ischemic Encephalopathy*[Title/Abstract] OR "Cerebral Ischemia*[Title/Abstract] OR "Brain Hypoxia-Ischemia*[Title/Abstract] OR "Cerebral Small Vessel Disease*[Title/Abstract] OR "Cerebral Microangiopathy*[Title/Abstract] OR "Intracranial Arterial Disease*[Title/Abstract] OR "Intracranial Arterial
| Term                                                                 | Field         | Value       |
|----------------------------------------------------------------------|---------------|-------------|
| Disorder* [Title/Abstract]                                           | OR            | "Arterial" |
| Disease* [Title/Abstract]                                            | OR            | Brain       |
| Disease* [Title/Abstract]                                            | OR            | Arterial    |
| Disorder [Title/Abstract]                                            | OR            | "Intracranial" |
| Hemorrhage* [Title/Abstract]                                        | OR            | "Posterior Fossa" |
| Hemorrhage* [Title/Abstract]                                        | OR            | "Brain"    |
| Hemorrhage* [Title/Abstract]                                        | OR            | "Cerebral" |
| Hemorrhage* [Title/Abstract]                                        | OR            | "Cerebral Intraventricular" |
| Hemorrhage* [Title/Abstract]                                        | OR            | "Hypertensive Intracranial" |
| Hemorrhage* [Title/Abstract]                                        | OR            | "Cranial Epidural" |
| Hematoma* [Title/Abstract]                                          | OR            | "Subdural" |
| Hematoma* [Title/Abstract]                                          | OR            | "Pituitary" |
| Apoplexy* [Title/Abstract]                                          | OR            | "Subarachnoid" |
| Hemorrhage [Title/Abstract]                                         | OR            | "Brain"    |
| Infarction* [Title/Abstract]                                         | OR            | "Brain Infarct* [Title/Abstract] |
| "Anterior Circulation Brain Infarction" [Title/Abstract]             | OR            | "Brain Venous Infarction* [Title/Abstract] |
| "Anterior Circulation Brain Infarction" [Title/Abstract]             | OR            | "Anterior Cerebral Circulation Infarction" [Title/Abstract] |
| Brain Infarction [Title/Abstract]                                    | OR            | "Lacunar Stroke* [Title/Abstract] |
| "Lacunar Syndrome* [Title/Abstract]                                 | OR            | "Lacunar Infarct* [Title/Abstract] |
| OR "Lacunar Infarction* [Title/Abstract]                             | OR            | "Intracranial" |
| Term                        | Operator | Synonym                                |
|-----------------------------|----------|----------------------------------------|
| Vasospasm*                  | OR       | Intracranial                           |
| Angiospasm*                 | OR       | “Intracranial Vascular”                |
| Spasm*                      | OR       | “Cerebral”                             |
| Vasospasm*                  | OR       | “Cerebrovascular”                      |
| Spasm*                      | OR       | “Cerebral”                             |
| Angiospasm*                 | OR       | “Cerebral Artery”                      |
| Spasm*                      | OR       | “Hemiplegia*”                          |
| “Transient Hemiplegia*”     | OR       | [Title/Abstract]                       |
| “Monoplegia*”               | OR       | “Post-Ictal”                           |
| Hemiplegia*                 | OR       | “Crossed”                              |
| Hemiplegia*                 | OR       | “Flaccid”                              |
| Hemiplegia*                 | OR       | “Infantile”                            |
| Hemiplegia*                 | OR       | “Spastic”                              |
| Hemiplegia*                 | OR       | “Pareses*”                             |
| “Paraparesis*[Title/Abstract] | OR     | “Muscular”                             |
| Pares*                      | OR       | “Muscle Pares*”                        |
| “Monopares*”                | OR       | “Lower Extremity”                      |
| Pares*                      | OR       | “Crural Pares*”                        |
| “Upper Extremity Pares*”    | OR       | “Brachial”                             |
| Pares*                      | OR       | “Hemipares*”                           |
| “Spastic Paraparesis*[Title/Abstract] | OR | “Neurologic Gait Disorder*”            |
| Neurologic Locomotion       | OR       |                                        |
|   |   |   |
|---|---|---|
| 3 | #1 OR #2 | 654,634 |
| 4 | "Accidental Falls"[MeSH Terms] OR "Accidents"[MeSH Terms] OR "Accident Prevention"[MeSH Terms] | 198,327 |
| 5 | "Falls"[Title/Abstract] OR "Falling"[Title/Abstract] OR "Accidental Fall*"[Title/Abstract] OR "Slip and Fall"[Title/Abstract] OR "Fall and Slip"[Title/Abstract] OR "Accident | 114,050 |

Disorder*[Title/Abstract] OR Neurologic Ambulation Disorder*[Title/Abstract] OR "Neurologic Gait Dysfunction*"[Title/Abstract] OR "Duck Gait"[Title/Abstract] OR Sensorimotor Gait Disorder*[Title/Abstract] OR Athetotic Gait[Title/Abstract] OR Broadened Gait[Title/Abstract] OR "Drop Foot Gait"[Title/Abstract] OR "Festinating Gait"[Title/Abstract] OR "Frontal Gait"[Title/Abstract] OR "Hemiplegic Gait"[Title/Abstract] OR "Hysterical Gait"[Title/Abstract] OR Reeling Gait[Title/Abstract] OR "Rigid Gait"[Title/Abstract] OR "Scissors Gait"[Title/Abstract] OR "Shuffling Gait*"[Title/Abstract] OR "Spastic Gait"[Title/Abstract] OR "Stumbling Gait"[Title/Abstract] OR "Unsteady Gait"[Title/Abstract] OR Widebased Gait[Title/Abstract] OR "Marche a Petit Pas"[Title/Abstract] OR Rapid Fatigue Gait[Title/Abstract] OR Charcot Gait*[Title/Abstract] OR Charcot* Gait[Title/Abstract] OR "Gait Apraxia"[Title/Abstract] OR "Gait Ataxia"[Title/Abstract]
Prevention*[Title/Abstract] OR "Accidental Falls*[Title/Abstract] OR "Home Accidents*[Title/Abstract] OR "Accident Prevention*[Title/Abstract] OR "Hazard Analysis and Critical Control Points*[Title/Abstract] OR "Patient Harm*[Title/Abstract] OR "Patient Safety*[Title/Abstract] OR "Safety Management*[Title/Abstract] OR "Home Accident*[Title/Abstract]

| #  | searches                                                                                                                                                                                                 | results |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 6  | #4 OR #5                                                                                                                                                                                                 | 278,637 |
| 7  | "Fear*[Mesh]                                                                                                                                                                                            | 35,295  |
| 8  | "fear*[Title/Abstract] OR "Panic*[Title/Abstract]                                                                                                                                                        | 104,099 |
| 9  | #7 OR #8                                                                                                                                                                                                 | 113,388 |
| 10 | #3 AND #6 AND #9                                                                                                                                                                                       | 246     |

Cochrane database Library: from inception to July 20, 2021

| #  | searches                                                                                                                                                                                                 | results |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1  | [mh “Stroke"] OR [mh “Carotid Artery Diseases"] OR [mh “Cerebrovascular Disorders"] OR [mh “Basal Ganglia Cerebrovascular Disease"] OR [mh “Cerebral Infarction"] OR [mh “Brain Ischemia"] OR [mh “Cerebral Small Vessel Diseases"] OR [mh “Intracranial Arterial Diseases"] OR [mh “Intracranial Hemorrhages"] OR [mh “Brain Infarction"] OR [mh “stroke, lacunar"] OR [mh “vasospasm, intracranial"] OR [mh “Hemiplegia"] OR [mh “Paresis"] OR [mh “gait disorders,
| Neurologic Terms                                                                 | BMJ Open ID |
|---------------------------------------------------------------------------------|-------------|
| 2 (stroke* OR Cerebrovascular Accident* OR Cerebrovascular Apoplexy OR Brain Vascular Accident* OR Cerebrovascular Stroke* OR Apoplexy OR Cerebral Stroke* OR Acute Stroke* OR Acute Cerebrovascular Accident* OR Brain Stem Infarctions OR Cerebral Infarction OR Hemorrhagic Stroke OR Ischemic Stroke OR Embolic Stroke OR Thrombotic Stroke OR Cardiovascular Diseases OR Vascular Diseases OR Carotid Artery Disease* OR Carotid Artery Disorder* OR Carotid Arterial Disease* OR Carotid Atherosclerosis* OR Carotid Atherosclerotic Disease* OR Internal Carotid Artery Diseases OR Common Carotid Artery Diseases OR External Carotid Artery Diseases OR Carotid Artery Thrombosis OR Cerebrovascular Disorder* OR Intracranial Vascular Disease* OR Intracranial Vascular Disorder* OR Cerebrovascular Disease* OR Brain Vascular Disease* OR Cerebrovascular Occlusion* OR Cerebrovascular Insufficiency* OR Basal Ganglia Vascular Disease* OR Lenticulostriate Vasculopathy* OR Lenticulostriate Vascular Disease* OR Vascular Lenticulostriate Diseases OR Basal Ganglia Hemorrhage OR Putaminal Hemorrhage OR Cerebral Infarct* OR Left Hemisphere Cerebral Infarction OR Subcortical Infarct* | 99308       |
| Medical Terms |
|--------------|
| Infarction*  OR Posterior Choroidal Artery Infarction OR Anterior Choroidal Artery Infarction OR Right Hemisphere Cerebral Infarction OR CADASIL OR Multi-Infarct Dementia OR Anterior Cerebral Artery Infarction OR Middle Cerebral Artery Infarction OR Posterior Cerebral Artery Infarction OR Brain Ischemia* OR Ischemic Encephalopathy* OR Cerebral Ischemia* OR Brain Hypoxia-Ischemia OR Cerebral Small Vessel Disease* OR Cerebral Microangiopathy* OR Intracranial Arterial Disease* OR Intracranial Arterial Disorder* OR Arterial Brain Disease* OR Arterial Brain Disorder* OR Intracranial Hemorrhage* OR Posterior Fossa Hemorrhage* OR Brain Hemorrhage* OR Cerebral Hemorrhage OR Cerebral Intraventricular Hemorrhage OR Hypertensive Intracranial Hemorrhage OR Cranial Epidural Hematoma OR Subdural Hematoma OR Pituitary Apoplexy OR Subarachnoid Hemorrhage OR Brain Infarction* OR Brain Infarct* OR Anterior Circulation Brain Infarction OR Brain Venous Infarction* OR Anterior Cerebral Circulation Infarction OR Posterior Circulation Brain Infarction OR Lacunar Stroke* OR Lacunar Syndrome* OR Lacunar Infarction* OR Lacunar Infarct* OR Intracranial Vasospasm* OR Intracranial Angiospasm* OR Intracranial Vascular Spasm* OR Cerebral Vasospasm* OR Cerebral Vascular Spasm
| Cerebrovascular Spasm* OR Cerebral Angiospasm* OR Cerebral Artery Spasm* OR Hemiplegia* OR Transient Hemiplegia* OR Monoplegia* OR Post-Ictal Hemiplegia* OR Crossed Hemiplegia* OR Flaccid Hemiplegia* OR Infantile Hemiplegia* OR Spastic Hemiplegia* OR Pareses OR Paraparesis OR Muscular Pares* OR Muscle Pares* OR Monopares* OR Lower Extremity Pares* OR Crural Pares* OR Upper Extremity Pares* OR Brachial Pares* OR Hemipares* OR Spastic Paraparesis OR Neurologic Gait Disorder* OR Neurologic Locomotion Disorder* OR Neurologic Ambulation Disorder* OR Neurologic Gait Dysfunction* OR Duck Gait OR Sensorimotor Gait Disorder* OR Athetotic Gait OR Broadened Gait OR Drop Foot Gait OR Festinating Gait OR Frontal Gait OR Hemiplegic Gait OR Hysterical Gait OR Reeling Gait OR Rigid Gait OR Scissors Gait OR Shuffling Gait* OR Spastic Gait OR Stumbling Gait OR Unsteady Gait OR Widebased Gait OR Marche a Petit Pas OR Rapid Fatigue Gait OR Charcot Gait* OR Charcot+ Gait OR Gait Apraxia OR Gait Ataxia|ti,ab,kw
| #1 OR #2 | 100254 |
| [mh "Accidental Falls"] OR [mh "Accidents"] OR [mh "Accident Prevention"] | 6089 |
| (Falls OR Falling OR Accidental Fall* OR Slip and Fall OR Fall* OR Fall) | 101648 |
and Slip OR Accident Prevention OR Accidental Falls OR Home Accidents OR Accident Prevention* OR Hazard Analysis and Critical Control Points OR Patient Harm OR Patient Safety OR Safety Management OR Home Accident*):ti,ab,kw

| #  | searches                                                                 | results  |
|----|--------------------------------------------------------------------------|----------|
| 6  | #4 OR #5                                                                 | 104168   |
| 7  | [mh “Fear”]                                                              | 1562     |
| 8  | (fear* OR Panic):ti,ab,kw                                               | 12288    |
| 9  | #7 OR #8                                                                 | 12289    |
| 10 | #3 AND #6 AND #9                                                         | 115      |

**Web of science: from inception to July 20, 2021**

| #  | searches                                                                                                                                                                                                 | results     |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1  | TS=(Gait Disorders, Neurologic OR Paresis OR Vasospasm, Intracranial OR Stroke, Lacunar OR Basal Ganglia Cerebrovascular Disease OR stroke* OR Cerebrovascular Accident* OR Cerebrovascular Apoplexy OR Brain Vascular Accident* OR Cerebrovascular Stroke* OR Apoplexy OR Cerebral Stroke* OR Acute Stroke* OR Acute Cerebrovascular Accident* OR Brain Stem Infarctions OR Cerebral Infarction OR Hemorrhagic Stroke OR Ischemic Stroke OR Embolic Stroke OR Thrombotic Stroke OR Cardiovascular Diseases OR Vascular Diseases OR Carotid Artery Disease* OR Carotid Artery Disorder* OR Carotid Arterial Disease* OR Carotid Artery Disorder OR Carotid Artery Disease OR Carotid Artery Disorder):ti,ab,kw | 3,756,024   |
| Terms |
|-------|
| Atherosclerosis* OR Carotid Atherosclerotic Disease* OR Internal Carotid Artery Diseases OR Common Carotid Artery Diseases OR External Carotid Artery Diseases OR Carotid Artery Thrombosis OR Cerebrovascular Disorder* OR Intracranial Vascular Disease* OR Intracranial Vascular Disorder* OR Cerebrovascular Disease* OR Brain Vascular Disorder* OR Cerebrovascular Occlusion* OR Cerebrovascular Insufficiency* OR Basal Ganglia Vascular Disease* OR Lenticulostriate Vasculopathy* OR Lenticulostriate Vascular Disease* OR Vascular Lenticulostriate Diseases OR Basal Ganglia Hemorrhage OR Putaminal Hemorrhage OR Cerebral Infarct* OR Left Hemisphere Cerebral Infarction OR Subcortical Infarction* OR Posterior Choroidal Artery Infarction OR Anterior Choroidal Artery Infarction OR Right Hemisphere Cerebral Infarction OR CADASIL OR Multi-Infarct Dementia OR Anterior Cerebral Artery Infarction OR Middle Cerebral Artery Infarction OR Posterior Cerebral Artery Infarction OR Brain Ischemia* OR Ischemic Encephalopathy* OR Cerebral Ischemia* OR Brain Hypoxia-Ischemia OR Cerebral Small Vessel Disease* OR Cerebral Microangiopathy* OR Intracranial Arterial Disease* OR Intracranial Arterial Disorder* OR Arterial Brain Disease* OR |
| Brain Arterial Disease* OR Arterial Brain Disorder* OR Intracranial Hemorrhage* OR Posterior Fossa Hemorrhage* OR Brain Hemorrhage* OR Cerebral Hemorrhage OR Cerebral Intraventricular Hemorrhage OR Hypertensive Intracranial Hemorrhage OR Cranial Epidural Hematoma OR Subdural Hematoma OR Pituitary Apoplexy OR Subarachnoid Hemorrhage OR Brain Infarction* OR Brain Infarct* OR Anterior Circulation Brain Infarction OR Brain Venous Infarction* OR Anterior Cerebral Circulation Infarction OR Posterior Circulation Brain Infarction OR Lacunar Stroke* OR Lacunar Syndrome* OR Lacunar Infarction* OR Lacunar Infarct* OR Intracranial Vasospasm* OR Intracranial Angiospasm* OR Intracranial Vascular Spasm* OR Cerebral Vasospasm* OR Cerebrovascular Spasm* OR Cerebral Angiospasm* OR Cerebral Artery Spasm* OR Hemiplegia* OR Transient Hemiplegia* OR Monoplegia* OR Post-Ictal Hemiplegia* OR Crossed Hemiplegia* OR Flaccid Hemiplegia* OR Infantile Hemiplegia* OR Spastic Hemiplegia* OR Pareses OR Paraparesis OR Muscular Pares* OR Muscle Pares* OR Monopares* OR Lower Extremity Pares* OR Crural Pares* OR Upper Extremity Pares* OR Brachial Pares* OR Hemipares* OR Spastic Paraparesis OR Neurologic Gait Disorder* OR
| #  | searches                                                                                                                                  | results   |
|----|-------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1  | (MH "stroke patients") OR (MH "stroke units") OR (MH "Stroke+") OR (MH "Carotid Artery Diseases+") OR (MH "Cerebrovascular Disorders+") OR (MH "Basal Ganglia Disor | 19,393    |
|    | ter") OR (MH "Cerebrovascular Diseases+") OR (MH "Cerebrovascular Diseases+") OR (MH "Cerebrovascular Diseases+") |           |
| Cerebrovascular Disease+" OR (MH "Cerebral Infarction") OR (MH "Cerebral Ischemia+" OR (MH "Cerebral Small Vessel Diseases+" OR (MH "Intracranial Arterial Diseases+" OR (MH "Intracranial Hemorrhage+" OR (MH "Hypoxia, Brain+" OR (MH "stroke, lacunar") OR (MH "Hemiplegia") OR (MH "gait disorders, neurologic+"))

| "Hypoxia, Brain" OR stroke* OR "Cerebrovascular Accident*" OR "Cerebrovascular Apoplexy" OR "Brain Vascular Accident*" OR "Cerebrovascular Stroke*" OR "Apoplexy" OR "Cerebral Stroke*" OR "Acute Stroke*" OR "Acute Cerebrovascular Accident*" OR "Brain Stem Infarctions" OR "Cerebral Infarction" OR "Hemorrhagic Stroke" OR "Ischemic Stroke" OR "Emolic Stroke" OR "Thrombotic Stroke" OR "Cardiovascular Diseases" OR "Vascular Diseases" OR "Carotid Artery Disease*" OR "Carotid Artery Disorder*" OR "Carotid Arterial Disease*" OR "Carotid Atherosclerosis*" OR "Carotid Atherosclerotic Disease*" OR "Internal Carotid Artery Diseases" OR "Common Carotid Artery Diseases" OR "External Carotid Artery Diseases" OR "External Carotid Arterial Diseases" OR "Carotid Artery Thrombosis" OR "Cerebrovascular Disorder*" OR "Intracranial Vascular Disease*" OR "Intracranial Vascular Disorder*" OR "Cerebrovascular Disease*" OR "Brain Vascular Disorder*" | 38,873 |
"Cerebrovascular Occlusion*" OR "Cerebrovascular Insufficiency*" OR "Basal Ganglia Vascular Disease*" OR "Lenticulostriate Vasculopathy*" OR "Lenticulostriate Vascular Disease*" OR "Vascular Lenticulostriate Diseases" OR "Basal Ganglia Hemorrhage" OR "Putaminal Hemorrhage" OR "Cerebral Infarct*" OR "Left Hemisphere Cerebral Infarction" OR "Subcortical Infarction*" OR "Posterior Choroidal Artery Infarction" OR "Anterior Choroidal Artery Infarction" OR "Right Hemisphere Cerebral Infarction" OR "CADASIL" OR "Multi-Infarct Dementia" OR "Anterior Cerebral Artery Infarction" OR "Middle Cerebral Artery Infarction" OR "Posterior Cerebral Artery Infarction" OR "Brain Ischemia*" OR "Ischemic Encephalopathy*" OR "Cerebral Ischemia*" OR "Brain Hypoxia-Ischemia" OR "Cerebral Small Vessel Disease*" OR "Cerebral Microangiopathy*" OR "Intracranial Arterial Disease*" OR "Intracranial Arterial Disorder*" OR "Arterial Brain Disease*" OR "Brain Arterial Disease*" OR "Arterial Brain Disorder*" OR "Intracranial Hemorrhage*" OR "Posterior Fossa Hemorrhage*" OR "Brain Hemorrhage*" OR "Cerebral Hemorrhage" OR "Cerebral Intraventricular Hemorrhage" OR "Hypertensive Intracranial Hemorrhage" OR "Cranial Epidural Hematoma" OR "Subdural Hematoma" OR "Pituitary Apoplexy" OR
| "Subarachnoid Hemorrhage" OR "Brain Infarction*" OR "Brain Infarct*" OR "Anterior Circulation Brain Infarction" OR "Brain Venous Infarction*" OR "Anterior Cerebral Circulation Infarction" OR "Posterior Circulation Brain Infarction" OR "Lacunar Stroke*" OR "Lacunar Syndrome*" OR "Lacunar Infarction*" OR "Lacunar Infarct*" OR "Intracranial Vasospasm*" OR "Intracranial Angiospasm*" OR "Intracranial Vascular Spasm*" OR "Intracranial Vasospasm*" OR "Intracranial Artery Spasm*" OR "Intracranial Angiospasm*" OR "Cerebral Vasospasm*" OR "Cerebrovascular Spasm*" OR "Cerebral Angiospasm*" OR "Cerebral Artery Spasm*" OR "Hemiplegia*" OR "Transient Hemiplegia*" OR "Monoplegia*" OR "Post-ictal Hemiplegia*” OR "Crossed Hemiplegia*” OR "Flaccid Hemiplegia*” OR "Infantile Hemiplegia*” OR "Spastic Hemiplegia*” OR "Pareses” OR "Paraparesis” OR "Muscular Pares*” OR "Muscle Pares*” OR "Monopares*” OR "Lower Extremity Pares*” OR "Crural Pares*” OR "Upper Extremity Pares*” OR "Brachial Pares*” OR "Hemipares*” OR "Spastic Paraparesis” OR "Neurologic Gait Disorder*" OR "Neurologic Locomotion Disorder*” OR "Neurologic Ambulation Disorder*” OR "Neurologic Gait Dysfunction*” OR "Duck Gait” OR "Sensorimotor Gait Disorders” OR "Athetotic Gait OR Broadened Gait” OR "Drop Foot Gait” OR "Festinating Gait” OR "Frontal Gait” OR "Hemiplegic Gait” OR "Hysterical Gait” OR Reeling
|   |   |   |
|---|---|---|
| 3 | S1 OR S2 | 40,724 |
| 4 | (MH "Fall Prevention (Iowa NIC)") OR (MH "Fall Risk (Saba CCC)") OR (MH "Fall Risk Assessment Tool") OR (MH "Hendrich Fall Risk Model") OR (MH "Morse Fall Scale") OR (MH "Safety Behavior: Fall Prevention (Iowa NOC)") OR (MH "Accidental Falls") | 5,446 |
| 5 | fall* OR Falling OR "Accident Prevention" OR "Home Accidents" OR "Accident Prevention*" OR "Hazard Analysis and Critical Control Points" OR "Patient Harm" OR "Patient Safety" OR "Safety Management" OR "Home Accident*" OR "near-fall" OR slip* OR trip* OR stumble* or tumble* OR "lose footing" | 46,176 |
| 6 | S4 OR S5 | 51,519 |
| 7 | (MH "Phobic Disorders+") OR (MH "Fear (NANDA)") OR (MH "Fear Control (Iowa NOC)") OR (MH "Fear (Saba CCC)") OR (MH "Fear+") | 4604 |
| 8 | fear* OR Panic OR fright* OR afraid | 12,992 |
| 9 | S7 OR S8 | 13,571 |
| 10 | S3 AND S6 AND S9 | 31 |
PsycINFO (Ovid): from APA PsycInfo1806 to 1966; APA PsycInfo1987 to January Week 3 2021--- from inception to July 20, 2021

| # | searches                                                                 | results   |
|---|--------------------------------------------------------------------------|-----------|
| 1 | exp Ataxia/ or exp Basal Ganglia/ or exp Brain Disorders/ or exp Carotid Arteries/ or exp Cerebral Hemorrhage/ or exp Cerebral Ischemia/ or exp Cerebrovascular Accidents/ or exp Cerebrovascular Disorders/ or exp Gait/ or exp General Paresis/ or exp Hemiplegia/ or exp Movement Disorders/ or exp Paralysis/ or exp Cognitive Rehabilitation/ or exp Risk Factors/ or exp Thromboses/ or exp Vasoconstriction/ | 326126    |
| 2 | exp Accident Prevention/ or exp Aging/ or exp Accidents/ or exp Cerebrovascular Accidents/ or exp Equilibrium/ or exp Falls/ | 109963    |
| 3 | exp Fear/ or exp Conditioned Fear/ or exp Panic Attack/ or exp Panic/ or exp Panic Disorder/ or exp Anxiety | 87289     |
| 4 | 1 and 2 and 3                                                            | 347       |

Embase: from inception to July 20, 2021

| # | searches                                                                 | results   |
|---|--------------------------------------------------------------------------|-----------|
| 1 | ‘cerebrovascular accident’/exp OR ‘basal ganglion hemorrhage’/exp OR ‘brain hematoma’/exp OR ‘brain hemorrhage’/exp OR ‘brain infarction’/exp OR ‘brain ischemia’/exp OR ‘carotid artery disease’/exp OR ‘cerebral artery disease’/exp OR ‘cerebrovascular accident’/exp OR | 788,888    |
| 2 | abnormal gait:ab,ti OR 'acute cerebrovascular lesion':ab,ti OR 'acut... | 551,619 |
|---|---|---|
|  | 'acut... |  |
'carotid arterial disorders':ab,ti OR 'carotid arteriopathy':ab,ti OR 'carotid artery disease':ab,ti OR 'cerebral apoplexia':ab,ti OR 'cerebral artery occlusion':ab,ti OR 'cerebral artery thrombosis':ab,ti OR 'cerebral blood circulation disorder':ab,ti OR 'cerebral blood flow disorder':ab,ti OR 'cerebral circulation disorder':ab,ti OR 'cerebral embolus':ab,ti OR 'cerebral haematoma':ab,ti OR 'cerebral haemorrhage':ab,ti OR 'cerebral infarct*':ab,ti OR 'cerebral insult':ab,ti OR 'cerebral ischaemia':ab,ti OR 'cerebral microbleed':ab,ti OR 'cerebral thrombosis':ab,ti OR 'cerebral vascular accident':ab,ti OR 'cerebral vascular insufficiency':ab,ti OR 'cerebral vasospasm':ab,ti OR 'cerebrovascular accident':ab,ti OR 'cerebrovascular arrest':ab,ti OR 'cerebrovascular circulation disorder':ab,ti OR 'cerebrovascular embolism':ab,ti OR 'cerebrovascular failure':ab,ti OR 'cerebrovascular infarction':ab,ti OR 'cerebrovascular injury':ab,ti OR 'cerebrovascular insufficiency':ab,ti OR 'cerebrovascular ischaemia':ab,ti OR 'cerebrovascular obliteration':ab,ti OR 'cerebrovascular occlusion':ab,ti OR 'cerebrovascular thrombosis':ab,ti OR 'cerebrum embolism':ab,ti OR 'cerebrum vascular accident':ab,ti OR 'corpus callosum
bleeding':ab,ti OR 'corpus callosum haemorrhage':ab,ti OR 'cortical infarction':ab,ti OR 'cva':ab,ti OR encephalorrhagia:ab,ti OR 'gait deviation*':ab,ti OR 'hematencephalon':ab,ti OR hemip*:ab,ti OR 'hemisphere infarct*':ab,ti OR 'interhemispheric hematoma':ab,ti OR 'intracerebral bleeding':ab,ti OR 'intracerebral haematoma':ab,ti OR 'intracerebral haemorrhage':ab,ti OR 'intracortical hemorrhage':ab,ti OR 'intracranial aneurysm':ab,ti OR 'intracranial artery thrombosis':ab,ti OR 'intracranial bleeding':ab,ti OR 'intracranial embolism':ab,ti OR 'intracranial hematoma':ab,ti OR 'intracranial hemorrhage':ab,ti OR 'intracranial thrombosis':ab,ti OR 'intracranial vasospasm':ab,ti OR 'isch*emic cerebral attack':ab,ti OR 'isch*emic seizure':ab,ti OR 'ischemia cerebri':ab,ti OR 'isch*emic brain disease':ab,ti OR 'isch*emic encephalopathy':ab,ti OR 'musc* paresis':ab,ti OR 'neural ischemia':ab,ti OR 'occlusive cerebrovascular disease':ab,ti OR 'paretic muscle':ab,ti OR 'partial paralysis':ab,ti OR stroke:ab,ti OR 'thrombosis cerebri':ab,ti OR 'vertebral basilar insufficiency':ab,ti OR 'vertebrobasilar artery insufficiency':ab,ti OR 'vertebrobasilar disease':ab,ti OR 'vertebrobasilar isch*emic':ab,ti OR 'vertebrobasilar syndrome':ab,ti

| 3 | 1 or 2 | 914,196 |
|   | Query                                                                 |   |  |
|---|-----------------------------------------------------------------------|---|---|
| 4 | 'falling'/exp OR 'accident prevention'/exp OR 'accident proneness'/exp OR 'disaster planning'/exp OR 'medical countermeasure'/exp OR 'home accident'/exp | 76,482 |   |
| 5 | 'accidental falls':ab,ti OR fall*:ab,ti OR 'injury prevention':ab,ti OR 'accident prevention':ab,ti OR 'accident neurosis':ab,ti OR 'accident proneness':ab,ti OR 'medical countermeasure*':ab,ti OR 'domestic accident':ab,ti OR 'home accident*':ab,ti OR 'falls-efficacy scale':ab,ti OR near-fall:ab,ti OR slip*:ab,ti OR trip*:ab,ti OR stumble*:ab,ti OR 'lose footing':ab,ti OR tumble:ab,ti | 644,144 |   |
| 6 | 4 or 5                                                                 | 687,599 |   |
| 7 | 'fear'/exp OR 'anxiety'/exp OR 'anticipatory anxiety'/exp OR 'fear of falling'/exp OR 'fear of missing out'/exp OR 'performance anxiety'/exp OR 'fear conditioning test'/exp OR 'frustration'/exp OR 'patient worry'/exp OR 'grief'/exp OR 'hopelessness'/exp OR 'helplessness'/exp OR 'mental irritation'/exp OR 'panic'/exp | 341,289 |   |
| 8 | Fear:ab,ti OR fright:ab,ti OR afraid:ab,ti OR 'fear of falling':ab,ti OR 'Falls Efficacy Scale':ab,ti OR 'Mobility Efficacy Scale':ab,ti OR 'Survey of Activities and Fear of Falling in the Elderly':ab,ti OR 'University of Illinois at Chicago Fear of Falling Measure':ab,ti OR 'SAFFE':ab,ti OR 'UICFFM':ab,ti OR 'Activities Specific Balance | 129,871 |   |
| Confidence Scale:ab,ti OR 'Confidence in Maintaining Balance Scale':ab,ti OR 'CON-Fbal':ab,ti OR basophobia:ab,ti OR 'fear of walking':ab,ti OR 'fears of missing out':ab,ti OR 'FOMO (fear)':ab,ti OR 'fear conditioning procedure':ab,ti OR worry:ab,ti OR 'worry (patient)':ab,ti OR grieving:ab,ti OR despair:ab,ti OR 'mental irritation':ab,ti OR 'panic attack':ab,ti OR 'panic disorder':ab,ti |
|---|---|---|
| 9 | 7 or 8 | 393,516 |
| 10 | 3 and 6 and 9 | 825 |
| #  | Author            | Year | Title                                                                 | Include (yes)/ Exclude (no) | The cause of excluding                        |
|----|-------------------|------|----------------------------------------------------------------------|------------------------------|-----------------------------------------------|
| 1  | Zhang Qin         | 2020 | Influencing factors of fear of falling in patients with first cerebral infarction in recovery period | yes                          |                                               |
| 2  | Song Na           | 2020 | Influencing factors and nursing countermeasures of falling fear in patients with cerebral apoplexy | no                           | Total quality evaluation score ≤ 3 points     |
| 3  | Luo Li-Lei        | 2020 | Research status of falling fear in patients with cerebral infarction | no                           | Review                                       |
| 4  | Xu Yan-Hua        | 2019 | Correlation of walking gait characteristics and fear of falling in patients with acute ischemic stroke and hemiplegia | no                           | Irrelevant outcome indicators                 |
| 5  | Li Jing           | 2019 | Study on the influence and the risk factors in Chengdu community post—stroke patients | no                           | Irrelevant research object                   |
| 6  | Sun Hong-Yan      | 2017 | Correlation between fear of falling and quality of life in patients with first stroke Study on epidemiology of incidence and risk factors of falls in rural community-dwelling older population in Beijing | no                           | Irrelevant research object                   |
| 7  | Zhang Di          | 2016 | A follow-up study: Fear of Falling among patients with first ever cerebral infarction and its related factors | no                           | Irrelevant outcome indicators                 |
| 8  | Deng Ning         | 2016 | Risk Factors of Falls in Elderly Patients With Stroke and the Experience of Comprehensive Nursing Intervention | no                           | Irrelevant research object                   |
| 9  | Cong Yan          | 2016 | The current status and influencing factors of fear of falling among the stroke older patients | yes                          |                                               |
| 10 | Li Ying           | 2014 | Factors influencing fear of falling in patients with stroke          | no                           | Irrelevant outcome indicators                 |
| 11 | Guan, Q.          | 2013 | Risk factors and nursing intervention of falls with stroke patients  | no                           | Irrelevant                                   |
| 12 | Hu Bei            | 2009 | Risk factors and nursing intervention for falls in the aged          | no                           | Irrelevant research object                   |
| 13 | Li Ming-e         | 2008 | Factors affecting fear of falls in patients with chronic stroke     | yes                          |                                               |
| 14 | Yadav, T.         | 2020 | Ptsd Symptoms and Its Association with Fear of Falling and Subsequent Activity Restriction in Patients with Tia/Stroke | no                           | Conference abstract                          |
| 15 | Duran, A. T.      | 2020 | Perspectives, satisfaction, self-efficacy, and barriers to aerobic exercise reported by individuals with chronic stroke in a developing country | no                           | Irrelevant research object                   |

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| ID  | Author(s)       | Year | Title                                                                 | Status                  |
|-----|-----------------|------|-----------------------------------------------------------------------|-------------------------|
| 17  | Tashiro, H.     | 2019 | Life-Space Mobility and Relevant Factors in Community-dwelling Individuals with Stroke in Japan: A Cross-sectional Study | Irrelevant research object |
| 18  | Persson, C. U.  | 2019 | Prediction of physical activity level after mild stroke: A 6-month followup of 215 patients in the fall study of Gothenburg (FALLSGOT) | Conference abstract     |
| 19  | Liu, Tai-Wa     | 2019 | The reliability and validity of the Survey of Activities and Fear of Falling in the Elderly for assessing fear and activity avoidance among stroke survivors. [References] | Irrelevant research object |
| 20  | Hanna, E.       | 2019 | Participation, Fear of Falling, and Upper Limb Impairment are Associated with High Sitting Time in People with Stroke | Irrelevant outcome indicators |
| 21  | Sertel, M.      | 2018 | Investigation of the relationship between balance and fear of falling and movement in stroke patients | Conference abstract     |
| 22  | Saygili, F.     | 2018 | Relationship between fear of falls, daily living activities, and trunk control in stroke patients | Full text not found      |
| 23  | Rafsten, L.     | 2018 | Perceived and assessed balance in patients with stroke within 24 hours after discharge to home | Conference abstract     |
| 24  | Mansfield, A.   | 2018 | Stroke                                                                 | Handbook                |
| 25  | Larén, A.       | 2018 | Fear of falling in acute stroke: The Fall Study of Gothenburg (FALLSGOT) | yes                     |
| 26  | Janssen, H.     | 2018 | Participation, fear of falling and upper limb impairment is associated with high sitting time in people with stroke | Duplicate data          |
| 27  | Chun, H. Y. Y.  | 2018 | Fear of falling is independently associated with agoraphobia after mild stroke and transient ischaemic attack | Conference abstract     |
| 28  | Chun, H. Y. Y.  | 2018 | Fear of falling is independently associated with agoraphobia after mild stroke and TIA | Conference abstract     |
| 29  | Van Dijk, M. M. | 2017 | A cross-sectional study comparing lateral and diagonal maximum weight shift in people with stroke and healthy controls and the correlation with balance, gait and fear of falling | Irrelevant research object |
| 30  | Stout, R. D.    | 2017 | Fear of falling for older and stroke-involved adults | Full text not found      |
| 31  | Oguz, S.        | 2017 | The relationship between objective balance, perceived sense of balance, and fear of falling in stroke patients | Irrelevant outcome indicators |
| Reference | Year | Title                                                                 | Status |
|-----------|------|----------------------------------------------------------------------|--------|
| Ng, S.    | 2017 | Fear of falling in patients with chronic stroke                       | no     |
| Larén, A. | 2017 | Fear of falling acute after stroke: A part of the fall study in Gothenburg | no     |
| Goz, E.   | 2017 | Relationship between fall frequency and fear of fall, motor function and disability in geriatric and nongeriatric stroke patients | no     |
| Schinkel-Ivy, A. | 2016 | Relationships between fear of falling, balance confidence, and control of balance, gait, and reactive stepping in individuals with sub-acute stroke | yes    |
| Net,      | 2016 | Fear of Falling in Patients With Chronic Stroke                       | no     |
| Kavian, M. | 2016 | The correlation between the standing stability and fear of falling in patients with stroke | no     |
| Goh, H. T. | 2016 | Falls and Fear of Falling After Stroke: A Case-Control Study          | yes    |
| Visschedijk, J. H. M. | 2015 | Longitudinal follow-up study on fear of falling during and after rehabilitation in skilled nursing facilities | no     |
| Schmid, Arlene A. | 2015 | Fear of Falling in People With Chronic Stroke                       | no     |
| Schlick, C. | 2015 | Falls and fear of falling in vertigo and balance disorders: A controlled cross-sectional study | no     |
| Loureiro, A. P. C. | 2015 | Sedentary behaviors in stroke survivors                              | no     |
| Jones, Valerie | 2015 | Fear of Falling Among Persons With Chronic Stroke...AOTA/NBCOT National Student Conclave. Dearborn, Michigan. November 18-19 2016 | no     |
| Guan, Q.  | 2015 | Multifactor analysis for risk factors involved in the fear of falling in patients with chronic stroke from mainland China | no     |
| de Melo Borges, Sheila | 2015 | Fear of falling and falls in older adults with mild cognitive impairment and Alzheimer's disease. | no     |
| Cho, K.   | 2015 | Risk factors related to falling in stroke patients: a cross-sectional study | no     |
| Yatar, G. I. | 2014 | The relationship between falling frequency, fear of falling, balance functions, balance security and hemiparetic side in patients with stroke | no     |
| No. | Author(s)            | Year | Title                                                                 | Outcome | Type                        |
|-----|----------------------|------|----------------------------------------------------------------------|---------|-----------------------------|
| 49  | Phadke, C. P.        | 2014 | Relationship between spasticity and balance confidence in persons post-stroke | no      | Conference abstract         |
| 50  | Park, J.             | 2014 | Relationships of stroke patients' gait parameters with fear of falling | no      | Irrelevant outcome indicators |
| 51  | Lane, R. A.          | 2014 | Fear of Falling in Claudicants and Its Relationship to Physical Ability, Balance, and Quality of Life | no      | Irrelevant outcome indicators |
| 52  | Jalayondej a, C.     | 2014 | Six-month prospective study of fall risk factors identification in patients post-stroke | no      | Irrelevant research object  |
| 53  | Da Silva, Carolyn P. | 2014 | Falling, Balance Confidence, and Fear of Falling After Chronic Stroke | no      | Qualitative research        |
| 54  | Azad, A.             | 2014 | Clinical assessment of fear of falling after stroke: Validity, reliability and responsiveness of the Persian version of the Fall Efficacy Scale-International | no      | Irrelevant                  |
| 55  | Kneebone, I.         | 2013 | Fear of falling: Psychological management after stroke                | no      | Conference abstract         |
| 56  | Vahlberg, B.         | 2012 | Factors related to mobility and physical activity in individuals one to three years after stroke | no      | Conference abstract         |
| 57  | Perez-Jara, Javier   | 2012 | Differences in fear of falling in the elderly with or without dizziness. [References] | no      | Irrelevant research object  |
| 58  | Kim, E. J.           | 2012 | Fear of falling in subacute hemiplegic stroke patients: associating factors and correlations with quality of life | no      | Irrelevant outcome indicators |
| 59  | Batchelor, F. A.     | 2012 | Falls after stroke                                                    | no      | Review                      |
| 60  | Schmid, A. A.        | 2011 | Fear of falling among people who have sustained a stroke: A 6-month longitudinal pilot study | no      | Irrelevant outcome indicators |
| 61  | Matsuda, Patricia    | 2011 | Falls in multiple sclerosis                                           | no      | Irrelevant research object  |
| 62  | Noritake Akosile, C. | 2011 | Relationships between fall indices and physical function of stroke survivors in Nigeria...including commentary by Batchelor F and Bugdayci D | no      | Irrelevant outcome indicators |
| 63  | Zapata, Paloma       | 2010 | Fear of falling in the elderly with recurrent dizziness: A descriptive study. [Spanish]. [References] | no      | Not English/Chinese         |
| 64  | Balash, Y.           | 2010 | Disorders of gait with fear of fall in community dwelling elders       | no      | Conference abstract         |
| 65  | Schmid, Arlene A.    | 2009 | Consequences of Poststroke Falls: Activity Limitation, Increased Dependence, and the Development of Fear of Falling | no      | Qualitative research        |
|   | Author(s) | Year | Title | Full text availability |
|---|-----------|------|-------|-----------------------|
| 66 | Schmid, A. A. McGrath | 2009 | Poststroke Fear of Failing in the Hospital Setting | no |
| 67 | Joanna Collicutt | 2008 | Fear of falling after brain injury. [References] | no |
| 68 | Batchelor, F. | 2008 | Fear of falling and falls after stroke: the chicken or the egg? | no |
| 69 | Andersson, Å G. | 2008 | Fear of falling in stroke patients: Relationship with previous falls and functional characteristics | no |
| 70 | Schmid, A. A. Morley, John E | 2007 | Fear of falling: An emerging issue after stroke | no |
| 71 | Chou, Kee-Lee | 2007 | Falls--where do we stand? | no |
| 72 | Balash, Y. | 2007 | The temporal relationship between falls and fear-of-falling among Chinese older primary-care patients in Hong Kong. | no |
| 73 | Belgen, B. | 2007 | The effects of reducing fear of falling on locomotion in older adults with a higher level gait disorder | no |
| 74 | Andersen, Elena M. | 2006 | The association of balance capacity and falls self-efficacy with history of falling in community-dwelling people with chronic stroke | yes |
| 75 | Watanabe, Y. | 2005 | Cross-Sectional and Longitudinal Risk Factors for Falls, Fear of Falling, and Falls Efficacy in a Cohort of Middle-Aged African Americans. | no |
| 76 | Rosén, E. | 2005 | Fear of falling among stroke survivors after discharge from inpatient rehabilitation | no |
| 77 | Giladi, N. | 2005 | Clinical characteristics of elderly patients with a cautious gait of unknown origin | no |
| 78 | Stolze, H. | 2004 | Falls in frequent neurological diseases - Prevalence, risk factors and aetiology | no |
| 79 | Friedman, S. M. | 2002 | Falls and fear of falling: Which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention | no |
| 80 | Strubel, D. Karin Hellström | 2001 | [Dementia and falls] | no |
| 81 | Mahsa Kaviani | 1999 | Fear of falling in patients with stroke:a reliability study | no |
| 82 | The Correlation between the Standing Stability and Fear of Falling in Patients with Stroke | 2016 | | no |

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| Year | Author(s)             | Title                                                                 | Relevant Indicators |
|------|----------------------|----------------------------------------------------------------------|---------------------|
| 2018 | Hamid Azadeh         | The Correlation Between Rates of Falling, Balance, Quality of Life and Fear of Falling in Patients With Chronic Stroke | Irrelevant outcome indicators |
| 2011 | Thomas Hadjistavr opoulos | The Relationship of Fear of Falling and Balance Confidence With Balance and Dual Tasking Performance | Irrelevant research object |
| 2016 | Mania Sheikh         | Fear of Falling in Patients with Chronic Stroke: Differences of Functional Gait and Balance Measures According to the Level of Concern about Falling | Irrelevant outcome indicators |
| 2015 | Alison Schinkel-Ivy  | Relationships between fear of falling, balance confidence, and control of balance, gait, and reactive stepping in individuals with sub-acute stroke | Irrelevant outcome indicators |
| 2016 | Zhou Min             | Current status and influencing factors of fear of falling among elderly in patients | Irrelevant outcome indicators |
| 2018 | Chen Ping            | Study on the Status and Influencing Factors about Fear of Falling in Community-dwelling Older Adults with Stroke | Irrelevant research object |
| 2016 | Deng Ning            | The status and influencing factors of fear of falling in patients with first ever cerebral infarction | Irrelevant outcome indicators |
| 2016 | Shao Ping            | The relationship between fear of falling and anxiety and depression in elderly patients with stroke | Irrelevant outcome indicators |
| 2009 | Arlene A. Schmid     | Poststroke Fear of Falling in the Hospital Setting                   | Irrelevant outcome indicators |
| 2021 | Netha Hussain        | Prediction of fear of falling at 6 months after stroke based on 279 individuals from the Fall Study of Gothenburg | Yes |
| No. | Including √ or × | Author Year | Measuring tools | Study design | Research period | Country | Total sample size | Sample source of experimental group | Sample source of control group | Age, years (Mean±SD) | Female (N,%) | Stroke reference period | Adjusted risk factors | OR | LL-95%CI | UL-95%CI | Selective Comparability | Quality evaluation of NOS | Quality evaluation of AHRQ |
|-----|------------------|-------------|-----------------|-------------|-----------------|---------|------------------|-------------------------------------|-------------------------------|---------------------|----------------|--------------------------|------------------------|----|----------|----------|-------------------------|------------------|------------------------|
| NO.1 | √ | Zhang Qin 2020 | Self-made questionnaires, ADL, SAS, SOD, SFES-I | cross-sectional study | May 2017–January 2019 | China | 221 | the Medical Department of Neurology, Department of Cardiology, Shandong First Medical University, Shandong, People's Republic of China | NR | 60.13±8.7 | 2 | 88 | 39(82) | first-onset stroke recovery period | Age: 1.355 1.057 1.737 | 4 |
| NO.10 | √ | Li Ying 2014 | Self-made questionnaires, MMSE, MFES, BBS, TUGT | case-control study | March 2013–August 2013 | China | 170 | the Medical Department of Neurology, Huadong Hospital Affiliated to Fudan University, Shanghai, People's Republic of China | NR | 73.54 | Male: 73.0±8.4 | Female: 74.2±7.6 | 67 | Patients in the same period | 73.0±8.4 Male: 74.2±7.6 Female: 44(70) | Medically diagnosed | 1. Berg balance force (min) 0.697 0.609 0.799 | 4 | 2 | 3 | 9 |
| NO.14 | √ | Yadav, T. 2020 | TUG, FM, PHQ-9, The single-item question | case-control study | 23 August–10 February 2019 | India | 82 | the stroke unit of the Sahlgrenska University Hospital SU/Ostra, Gothenburg, Sweden | 237 | 51.6±12.11 | 22(26.8) | Community controls | 74.8±12.22 | 225 | 74.8±12.22 | 462 | 23 Community controls | Gender (Male) 3.254 0.826 12.822 | 4 | 2 | 2 | 8 |
| NO.25 | √ | Amanda Larin 2018 | The single-item question, The SwePASS, SGPALS, using a walking aid and/or a wheelchair, NIHSS | cross-sectional study | between 1 October 2014 and 30 June 2016 | Sweden | 462 | the stroke unit of the Sahlgrenska University Hospital SU/Ostra, Gothenburg, Sweden | 237 | 74.8±12.11 | 226 | 46(40) | similar participant s | 225 | 74.8±12.11 | 226 | 46(40) | patients aged 18 years or older with a diagnosis of a first-ever or recent clinical stroke | Female 2.25 1.46 3.46 | 3 | 2 | 3 | 8 |

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| NO. | Author(s) | Year | Study Design, Country, and Setting | Data From | Participants | Group Differences | *p* Values | Description |
|-----|-----------|------|-----------------------------------|-----------|--------------|------------------|-----------|-------------|
| 36  | Schinkel-Ivy, A. | 2016 | The single-item question, ABC case-control study, Canada October 2009 and September 2012 | 208 | 124 participant | FOF: 68.6 ±11.6, No FOF: 65.3±13.6 | 0.98 | FOF reactions |
| 39  | Goh, H. T. | 2016 | The single-item question, FAC, FM, BBS, MoCA, PipQ-9, FES-I, FSS case-control study, China NR | 125 | 50 | FOF: 66.6±6.9, No FOF: 61.9±5.9 | 0.75 | FAC ≥4 |
| 74  | Belgen | 2006 | The single-item question, FAC-S, STS, FMA, BBS, TUG, SIS cross-sectional study, Sweden NR | 50 | NR | FOF: 59.9±11.9, No FOF: 53.8±10.9 | 0.65 | History of falls |
| 93  | Hussain | 2021 | NIHSS, MoC, The single-item question, Sw ePASS, SGP ALS prospective, longitudinal cohort study, Sweden | 279 | 145 participant | FOF: 75.8 ±11.7, No FOF: 66.2±10.9 | 0.07 | 1.00 | 0.06 | 1.06 | 3 | 2 | 3 | 2 |

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| Score | Category          | Value1 | Value2 | Value3 |
|-------|-------------------|--------|--------|--------|
| 6.5   | SwoPASS score     |        |        |        |
|       | Moderate (23–30)  | 2.32   | 0.98   | 5.52   |
| 7.5   | SGPALS score      |        |        |        |
|       | Physically inactive | 2.04 | 1.01 | 4.12 |
