Canadian Stroke Best Practices

# CANADIAN STROKE BEST PRACTICE RECOMMENDATIONS

## Rehabilitation and Recovery following Stroke Evidence Tables

## *Falls Prevention and Management*

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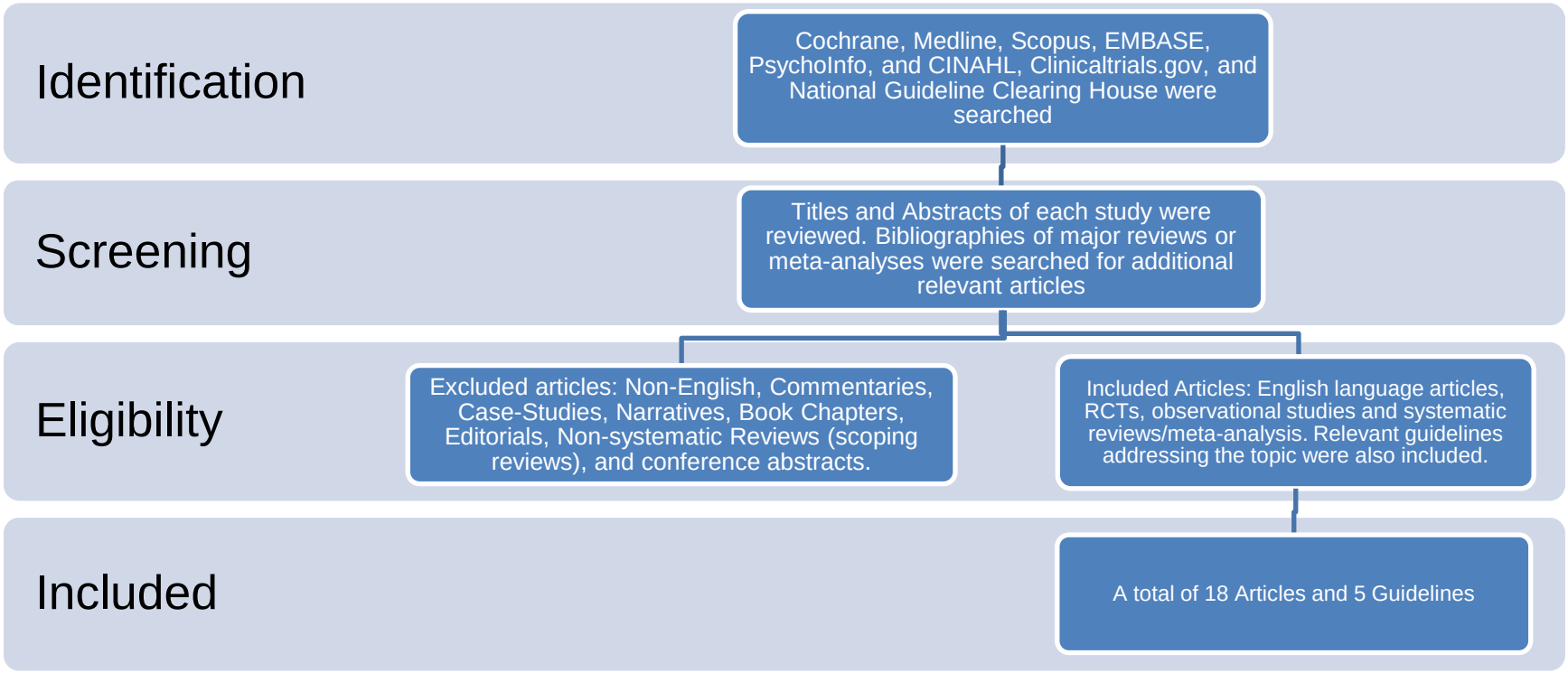
# Search Strategy




Cochrane, Medline, and CINAHL, Clinicaltrials.gov, National Guideline Clearing House, Scopus, EMBASE, and PsycINFO were searched using the keywords: (Stroke OR CVD OR cerebrovascular disease) AND (lower limb OR lower extremity) AND falls. Titles and abstract of each article were reviewed for relevance. Bibliographies were reviewed to find additional relevant articles. Articles were excluded if they were: non-English, commentaries, case-studies, narrative, book chapters, editorials, non-systematic review, or conference abstracts. Additional searches for relevant best practice guidelines were completed and included in a separate section of the review. A total of 18 articles and 5 guidelines were included and were separated into categories designed to answer specific questions.

# Published Guidelines

| Guideline | Recommendations |
|---|---|
| **Clinical Guidelines for Stroke Management 2017. Melbourne (Australia): National Stroke Foundation. Section 5. Rehabilitation** | For stroke patients, a falls risk assessment, including fear of falling, should be undertaken on admission to hospital. A management plan should be initiated for all patients identified as at risk of falls.<br><br>For stroke survivors at high risk of falls, a comprehensive home assessment for the purposes of reducing falling hazards should be carried out by a qualified health professional. Appropriate home modifications (as determined by a health professional) for example installation of grab rails and ramps may further reduce falls risk.<br><br>For stroke survivors who are at risk of falling, multifactorial interventions in the community, including an individually prescribed exercise program and advice on safety, should be provided. (weak recommendation). |
| **Winstein CJ, Stein J, Arena R, Bates B, Cherney LR, Cramer SC, Deruyter F, Eng JJ, Fisher B, Harvey RL, Lang CE, MacKay-Lyons M, Ottenbacher KJ, Pugh S, Reeves MJ, Richards LG, Stiers W, Zorowitz RD; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Quality of Care and Outcomes Research.**<br><br>**Guidelines for adult stroke rehabilitation and recovery: a guideline for healthcare professionals from the American Heart Association/American Stroke Association.**<br><br>***Stroke* 2016;47:e98–e169** | Prevention of falls recommendations:<br><br>It is recommended that individuals with stroke discharged to the community participate in exercise programs with balance training to reduce falls.(B)<br><br>It is recommended that individuals with stroke be provided a formal fall prevention program during hospitalization.(A)<br><br>It is reasonable that individuals with stroke be evaluated for fall risk annually with an established instrument appropriate to the setting. (B)<br><br>It is reasonable that individuals with stroke and their caregivers receive information targeted to home and environmental modifications designed to reduce falls.(B)<br><br>Tai Chi training may be reasonable for fall prevention.(B) |
| **Intercollegiate Stroke Working Party. *National clinical guideline for stroke,* 5th edition. London: Royal College of Physicians, 2016.** | **4.9.3 Falls and Fear of Falling**<br><br>People with stroke should be offered falls risk assessment and management as part of their stroke rehabilitation, including training for them and their family/carers in how to get up after a fall.<br><br>People with stroke should be offered an assessment of fear of falling as part of their falls risk assessment.<br><br>People at high risk of falls after stroke should be offered a standardised assessment of fragility fracture risk as part of their |

| Guideline | Recommendations |
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| | stroke rehabilitation.<br><br>People with stroke with symptoms of vitamin D deficiency, or those who are considered to be at high risk (e.g. housebound) should be offered calcium and vitamin D supplements.<br><br>People at high risk of falls after stroke should be advised to participate in physical activity/exercise which incorporates balance and co-ordination at least twice per week.<br><br>**5.8.1 Physical activity**<br><br>People with stroke or TIA who are at risk of falls should engage in additional physical activity which incorporates balance and co-ordination at least twice per week. |
| **Scottish Intercollegiate Guidelines Network (SIGN). Management of patients with stroke: rehabilitation, prevention and management of complications, and discharge planning. A national clinical guideline. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2010 Jun.** | Falls risk assessment should be undertaken using a valid tool on admission to hospital. A management plan should be initiated for all those identified as at risk of falls. [Grade GPP]<br><br>Multifactorial interventions in the community, including an individually prescribed exercise program, should be provided for people who are at risk of falling. [Grade B] |
| **Management of Stroke Rehabilitation Working Group. VA/DoD clinical practice guideline for the management of stroke rehabilitation. Washington (DC): Veterans Health Administration, Department of Defense; 2010.** | Recommend that all patients be assessed for fall risk during the inpatient phase, using an established tool. [B]<br><br>Recommend that fall prevention precautions be implemented for all patients identified to be at risk for falls while they are in the hospital.<br><br>Refer to the falls prevention toolkit on the National Center for Patient Safety (NCPS) for specific interventions.<br><br>Recommend regular reassessments for risk of falling including at discharge, ideally in the patient's discharge environment. [B]<br><br>Recommend that patient and family/caregiver be provided education on fall prevention both in the hospital setting and in the home environment. [B] |

# Evidence Tables

## Incidence and Risk Factors for Falls Post-Stroke

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
|---|---|---|---|---|---|
| **Xu et al. 2017**<br><br>**Australia**<br><br>**Systematic review & meta-analysis** | N/A | 21 trials evaluating fall risk factors in community stroke survivors | A list of confounders considered important to be controlled in fall studies was also defined before conducting the quality assessment, and they were age, sex, falls before stroke, falls in the hospital, length of stay in the hospital, and rehabilitation before and during the study. The binary outcome variables reporting odds ratios (ORs) with 95% confidence intervals (CIs) for each risk factor were extracted. | Risk factors for fallers. | Risk factors for all fallers:<br>Impaired mobility (n=3): OR=1.36, 95% CI 2.68 to 7.10, p<0.001.<br><br>Reduced balance (n=3): OR=3.87, 95% CI 2.39 to 6.26, p<0.001.<br><br>Use of Sedative & Psychotropic medications (n=3): OR=3.19, 955 CI 1.36 to 7.48, p=0.008.<br><br>Disability in self-care (n=4): OR=2.30, 95% CI 1.51 to 3.49, p<0.001.<br><br>Depression (n=3): OR=2.11, 95% CI 1.18 to 3.75, p=0.011.<br><br>Cognitive impairment (n=3): OR=1.75, 95% CI 1.02 to 2.99, p=0.041.<br><br>History of falls (n=3): OR=1.67, 95% CI 1.03 to 2.72, p=0.038.<br><br>Non-significant factors included age, sex, duration of stroke, visual impairment, multiple strokes, motor impairment, and urinary incontinence.<br><br>Risk factors for recurrent fallers:<br>History of falls (n=4): OR=4.19, 95% CI 2.50 to 7.01, p<0.001 |
| **Pinto et al. 2016**<br><br>**Brazil**<br><br>**Observational study** | N/A | 150 individuals were evaluated, with a final analysis of 131 patients. | This study aimed to determine risk factors related to the occurrence of falls in stroke patients and to propose a new predictive scale for falls. Kaplan-Meier curves were constructed and | Predictors of recurrent falls based on data obtained through demographic and clinical data, Barthel Index, Timed Up and Go Test (TUG), and National Institutes of Health Stroke Scale | Falls occurred in 17% of patients, with a median of 23 months of follow-up (interquartile range = 16-26 months).<br><br>In the multivariable Cox regression model, only TUG quartile (p=0.026), female gender (p=0.035), and posterior circulation territory involvement (p=0.004) remained significant predictors of falls. |

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
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| | | | univariable associations were tested using log-rank test. | (NIHSS).<br><br>Timing of assessment: Subjects were followed prospectively for 2 years for the occurrence of recurrent (≥2) falls. | |
| **Callaly et al. 2015**<br><br>**Ireland**<br><br>**Observational study** | N/A | 567 adults with stroke | The aim of this study was to describe the rate of falls, the rate of fracture and suffering other serious injury up to 2 years post-stroke in a prospective population-based study. | Risk factors for falling within 2 years of stroke<br><br>Timing of assessment: Participants were interviewed at 72 h, 7 days, 28 days, 90 days, 1- and 2-year time points post-stroke. | Total Cohort Significant risk factors:<br>Alpha-blocker medication: OR=8.16, 95% CI 2.03 to 32.78, p=0.003.<br><br>Beta-blocker medication: OR=0.53, 95% CI 0.32 to 0.89, p=0.02.<br><br>Mobility impaired: OR=2.30, 95% Ci 1.3 to 4.00, p=0.003.<br><br>Functionally dependent (mRS 4-5): OR=2.02, 95% CI 1.09 to 3.76, p=0.03.<br><br>Age and gender were not significant factors.<br><br>2 Year Cohort significant risk factors:<br>Alpha-blocker medication: OR=6.11, 95% CI 91.52 to 24.73, p=0.01.<br><br>Beta-blocker medication: OR=0.56, 95% Ci 0.33 to 0.95, p=0.03.<br><br>Mobility impaired (mRS 2-3): OR=1.99, 95% CI 1.14 to 24.73, p=0.02.<br><br>Functionally dependent (mRS 4-5): OR=2.70, 95% CI 1.40 to 5.22, p=0.003<br><br>Age and gender were not significant factors.<br><br>>1 fall between year 1 and 2:<br>Previous stroke at baseline: OR=3.02, 95% CI 1.32 to 6.94, p=0.009.<br><br>Fall within 1yr period: OR=4.23, 95% CI 2.15 to 8.33, p<0.001. |

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
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| | | | | | Bisphosphonate prescribed: OR=3.84, 95% CI 3.84, 1.45 to 10.18, p=0.007.<br><br>Non-significant predictors included age, gender, mRS>2 at 90d follow-up. |
| **Minet et al. 2015**<br><br>**Denmark**<br><br>**Observational study** | N/A | 349 participants were recruited and evaluated over the course of 6 years (n=121). | The study investigated the occurrence of self-reported falls at 3, 6, and 12 months and 6 years after stroke; and explored the predictive value of baseline functioning/disability and personal factors on self reported falls during 6 years. | Incidence of falls, independent predictors for falls.<br><br>Timing of assessment: 3, 6, 12mo, and 6 years. | The proportion of fallers constituted of 35%, 26%, 33%, and 35% of the sample at the 3-month, 6-month, 12-month, and 6-year follow-ups.<br><br>Stroke impact scale ADL (15pt decrease): OR=1.37, 95% CI 1.04 to 1.80, p=0.025<br>Fall at 3mo: OR=1.00, 95% CI 1.01 to 3.94, p=0.046<br><br>Among participants with gait/balance disability at baseline, the odds for a fall were lower at 6 years compared with that at 3 and 12 months, whereas among participants with no gait/balance disability at baseline, the odds for a fall were higher at 6 years compared with that at 6 and 12 months. |
| **Breisinger et al. 2014**<br><br>**USA**<br><br>**Retrospective study** | N/A | 419 patients with acute ischemic or hemorrhagic stroke admitted for inpatient rehabilitation. Mean age was 67.5 years, 48% were women. | The accuracy of the Stroke Assessment of Fall Risk (SAFR) for classifying fallers and non-fallers was compared with a more generic, local health system fall risk screening tool, the Fall Harm Risk Screen.<br><br>SAFR is composed of 4 impairment items (impulsivity, hemi-neglect, static, and dynamic sitting balance) and 3 functional limitations items (lowest score on three FIM: transfers, problem solving, and memory). Possible scores range from 0 (low risk) to 49 (high risk). | Sensitivity, specificity, positive predictive value, negative predictive value and area under ROC | 68 patients (16%) experienced at least one fall during their inpatient rehabilitation stay, 10 people fell more than once.<br><br>The area under the curve for Fall Harm Risk Screen was 0.56 (95% CI (0.50, 0.62), and 0.73 (95% CI (0.67, 0.79) for SAFR, which was significantly more accurate.<br><br>Area under the curve values ranged from 0.55–0.69 for individual items of SAFR.<br><br>At a cut-point of 27, the sensitivity and specificity of SAFR were 0.78 and 0.63, respectively, compared with 0.57 and 0.48 for the Fall Harm Risk Screen (cut-point of 2). The positive predictive value for the SAFR was 0.29 and the negative predictive value was 0.94, compared with 0.19 (PPV) and 0.86 (NPV), for the Fall Harm Risk Screen |

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
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| | | | The Fall Harm Risk Screen is a 3-item scale that assesses 3 levels of fall risk (low, medium, and high) based on functional ability, history of falls, and the nurse's clinical judgement of fall risk | | |
| **Pinto et al. 2014**<br><br>**Brazil**<br><br>**Retrospective study** | N/A | 150 Stroke patients (mean 13.5 months post stroke) living in the community and able to walk independently (with or without aids). | Patient demographic information was collected, as well as history of falls in past year. Medications were reviewed and assessments were completed. | Fall rates, Modified Barthel Index, National Institutes of Health Stroke Scale, Timed Up & Go (TUG) | History of falls was reported by 37% (median 2 falls). Falls occurred most often in the morning and at home.<br><br>Predictors of falls were the TUG (OR=1.035, 95% CI =1.003-1.069, p=0.034); right hemisphere lesions (OR=2.621, 95% CI= 1.196-5.740, p=0.016); and months since stroke (OR=1.012, 95% CI=1.002-1.021, p=0.015). |
| **Mansfield et al. 2013**<br><br>**Canada**<br><br>**Retrospective Study** | N/A | 136 patients were included in the review based on their ability to stand independently and complete perturbation-evoked step reactions. | Retrospective chart review at an inpatient rehabilitation institute. Patient's length of stay, type of stroke, sex, age and time post stroke was recorded. Incident reports and patient interviews at discharge were reviewed for fall information. | National Institutes of Health Stroke Scale (NIHSS), Clinical Outcome Variables Scale (COVS) scores, and STRATIFY fall risk assessment. | 14.7% (n=20) of patients had a fall – total of 29 falls (5 had more than 1, 1 had 6 falls).<br><br>On admission, those who fell had lower functional mobility (COVS, p=0.0006) than non-fallers. Fallers also had a longer length of stay by 9 days (p=0.0035).<br><br>51.7% of falls happened in the patient's home/ hospital bedroom. 10.3% of falls resulted in minor injuries (e.g., bruises).<br><br>Increased fall rates, Relative Risk (RR): Frequency of assists (RR= 2.9; p=0.014), no-step responses (RR = 6.2; p =0.0012), slide steps (RR = 5.9; p=0 .008), and increased unloading onset times (RR = 7.2; p=0.044). |
| **Nystrom & Hellstrom 2013**<br><br>**Sweden**<br><br>**Prospective study** | N/A | 68 participants recruited between 1-4 days post stroke. | An assessment was completed at baseline using the Modified Motor Assessment Scale and Predict FIRST. All falls occurring on the acute stroke unit were recorded and a call was placed | Fall rates, Predict FIRST scores, Modified Motor Assessment Scale (M-MAS) – version 99.<br><br>Predict FIRST scores correlation with risk of falling (e.g., 0=2%, 1=4%, 2=9%, | 21% of participants had ≥1 fall. A total of 36 falls occurred, with 72% of those falls occurring for a male patient. Majority (63.9%) of falls occurred on the unit.<br><br>Predict FIRST scores were as follows: 0 points, n=3; 1 point, n=19; 2 points, n=21; 3 points, n=18; and 4 points, n=7. |

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
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| | | | after discharge to obtain if any falls occurred at home. | 3=18%, 4=33%, and 5=52%) | For predicting falls, the significant variables were the Predict FIRST score (OR=5.21, 95% CI = 1.10 to 24.78, p=0.038) and the M-MAS section C-E (OR=0.65, 95% CI = 0.44 to 0.95, p=0.026). |
| **Maeda et al. 2009**<br><br>**Japan**<br><br>**Observational Study** | N/A | 72 hemiplegic stroke patients consecutively admitted to a rehabilitation center. Patients with major musculoskeletal problems or neurological disorders in addition to stroke were excluded. | Falls were documented by medical staff on a dedicated falls incident form. Additional information regarding demographics and scores on assessment measures were extracted from hospital records.<br><br>Study Duration: April 2006 to March 2008. | Fall occurrence, the Berg Balance Scale (BBS) the Functional Independence Measure (FIM), and the Mini Mental State Examination (MMSE).<br><br>Timing of Assessment: Admission to and discharge form rehabilitation. | 38% of patients experienced a fall during the study period. As compared to non-fallers, fallers were significantly older and had a shorter time from stroke onset to admission, a longer hospital stay, a lower BBS and MMSE score at admission, and a lower FIM score at both admission and discharge (all at p<0.05). However, the two groups did not differ in terms of gender, stroke type, or side affected.<br><br>In a logistic regression analysis, BBS score at admission was found to be a significant predictor of fall occurrence (OR=0.94, 95% CI 0.89 to 0.98, p<0.01), controlling for age, time from stroke onset to admission, length of stay, admission and discharge cognitive FIM subscore, and MMSE at admission. Results of a receiver operating characteristic (ROC) curve suggested a threshold BBS score of 29 (sensitivity=80%, specificity=78%; area under the curve=0.81, p<0.001) to identify patients at risk of falling. |
| **Czernuszenko & Czlonkowska 2009**<br><br>**Poland**<br><br>**Retrospective study** | N/A | 1,155 stroke patients consecutively admitted to a neurological rehabilitation unit. | Documented fall incident reports, as reported by a witness of the faller, were identified. The site, circumstances, and consequences of the fall were noted.<br><br>Study Duration: June 2002 to January 2006. | Fall occurrence, Scandinavian Stroke Scale (SSS), Barthel Index.<br><br>Timing of Assessment: Admission to and discharge form rehabilitation. | 253 falls involving 189 (16%) patients were reported during the study period. The incident rate for a first fall was 6.5/1000 patient days (95% CI 5.6 to 7.4) and 14.5/1000 patient days (95% CI 11.0 to 18.1) for a subsequent fall. The majority of falls took place during the day (82%) in the patient's room (59%). 28% of falls resulted in injuries.<br><br>Significant associations were found between the occurrence of a fall and admission Barthel Index<15 (HR=8.9), SSS<46 (HR=5.0), time from onset to admission<12 weeks (HR=3.0), presence of neglect (HR=2.1), left-sided motor deficit (HR=1.4), and age over 65 (HR=1.7), all at p<0.001 (except left-sided motor deficit, p<0.05). Patients who experienced greater gain in Barthel Index score and greater rehabilitation efficiency (Barthel Index gain/weeks in |

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
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| | | | | | rehabilitation) were significantly more likely to experience a fall. |
| **Aizen et al. 2007**<br><br>**Israel**<br><br>**Prospective study** | N/A | 82 stroke patients in inpatient rehabilitation, 41 of whom experienced a fall during hospitalization.<br><br>During the study period, 263 stroke patients were admitted. | Falls recorded in an incident book were identified, as were the details and consequences associated with each fall. Each faller was matched by age, gender and functional disability to a control patient who had not experienced a fall during hospitalization. Additional information relating to falling risk factors were obtained from the patient's medical records.<br><br>Study Duration: 6-months. | Occurrence of falls, the Timed Up and Go (TUG), the Functional Independence Measure (FIM), the Clinical Dementia Rating Scale (CDR), and the Geriatric Depression Scale (GDS). | The fall rate was 0.16 per patient during the study period, with the majority of falls occurring from a wheelchair (61%) and/or during a risk-taking activity (85%).<br><br>Of the variables examined, only presence of vertigo was identified as a significant predictor of falling (19.5% vs. 2.4%; OR=9.67, 95% CI 1.15 to 81.85). Risk of falling was not found to be associated with older age (59% vs. 42%), use of anti-depressives (54% vs. 46%), or use of anti-hypertensives (27% vs. 15%). |
| **Teasell et al. 2002**<br><br>**Canada**<br><br>**Retrospective study** | N/A | 238 stroke patients consecutively admitted to an inpatient stroke rehabilitation unit. | Documented fall incident reports, as reported by a witness or the faller, were identified. Only falls that occurred in inpatient rehabilitation were recorded. Fall-related injuries were also identified and categorized as contusions, abrasions, lacerations, or fractures.<br><br>Study Duration: January 1992 to December 1996. | Fall occurrence, Berg Balance Scale (BBS), Functional Independence Measure (FIM), and the Chedoke McMaster Stroke Impairment Scale (CM).<br><br>Timing of Assessment: Admission to rehabilitation | 37% of patients experienced at least one fall, with the majority occurring from a wheelchair (33%) or bed (25%). 22% of falls resulted in injuries (contusions=49%, abrasions=41%). 31% of injuries involved the upper extremity, 26% the lower extremity, 21% the head and face, and 23% the hip or torso.<br><br>Although fallers and non-fallers did not differ significantly in terms of stroke type, stroke location, or gender, fallers obtained significantly lower admission scores on the BBS ($p<0.001$), the FIM ($p<0.001$), and the CM arm, leg and foot subscales (all at $p<0.05$), but not the CM hand subscale. Fallers were also significantly more likely to have cognitive deficits or apraxia (both at $p<0.05$). |

## Falls Prevention and Management

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
|---|---|---|---|---|---|
| **Taylor-Piliae et al. 2014**<br><br>**USA**<br><br>**RCT** | CA: ☑<br><br>Blinding:<br>Patient ☒<br>Assessor☑<br><br>ITT: ☑ | 145 subjects who sustained a stroke and live in the community. | Participants were randomized into the Yang style 24-posture short-form Tai Chi (TC) group, strength and range of movement exercises (SS) group, or the usual care (UC) group (written material/ resources) for 12 weeks | **Primary Outcomes**:<br>Short Physical Performance Battery (SPPB), fall rates, 2-minute step test, Medical outcomes study 36-item short-form health survey (SF-36), Centre for Epidemiologic Studies Depression Scale, and Pittsburgh Sleep Quality Index. | 123 fall related events occurred during the study. TC participants had two thirds fewer falls (5) than the SS (14) and UC (15) groups (p= 0.06).<br>TC group had significantly fewer falls than the UC group (p= 0.04). There were no significant differences found for falls between the other groups (TC vs. SS, p=0.11; UC vs. SS, p=0.59)<br>After the intervention, all groups had significant improvement in SPPB score (p< 0.01).<br><br>There was a significant group by time interaction for the 2-minute step test (p< 0.01).<br><br>The TC (p= 0.02) and SS (p< 0.01) groups had significantly better aerobic endurance over time, this was not seen in the UC group.<br><br>All groups reported better perceived physical (SF-36 physical composite score, p= 0.04) and mental health (SF-36 mental composite score, p< 0.01).<br><br>No significant change in perceived physical heath for any of the groups, all groups had significant improvements in perceived mental health after 12-week intervention (p< 0.05). |
| **Verheyden et al. 2013**<br><br>**Belgium**<br><br>**Cochrane Review** | N/A | 10 RCTs (n=1,004), including persons with stroke | Studies evaluating the effectiveness of interventions for preventing falls post stroke. 5 studies evaluated the effect of exercise on falls and 2 studies had multifaceted interventions. | **Primary Outcomes:**<br>Rate of falls and number of fallers.<br><br>**Secondary Outcomes:**<br>number of fall related fractures and hospital admissions, near-fall events, quality of life and adverse events. | Exercise on Falls: in terms of number of falls, there were no significant differences between the two groups in the acute (risk ratio 1.19, 95% CI 0.83 to 1.71) or chronic (risk ratio 1.02, 95% CI 0.83 to 1.24) stages post stroke.<br><br>Medication: one study revealed that patients prescribed alendronate resulted in a 55% reduction of falls (95% CI 25% to 72%, p=0.0021). Another study reported that Vitamin D supplements accounted for a 59% reduction in falls (95% CI 28% to 82%, p=0.003). |
| **Batchelor et al. 2012**<br><br>**Australia** | CA: ☑<br><br>Blinding:<br>Patient ☒ | 156 stroke patients at high risk of falls (in-hospital fall, Berg<50, or Step Test<7) within 2- | Participants were randomized to a tailored multifactorial falls prevention program plus | **Primary Outcomes:**<br>Rate of falls and proportion of fallers. | No significant between group differences were reported for any of the outcomes, including fall rate (1.9 vs. 1.8), injurious fall rate (0.7 vs. 0.5), and proportion of fallers (RR=0.83, 95% CI 0.60 to |

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
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| **RCT** | Assessor☑<br><br>ITT: ☑ | weeks of discharge home from inpatient rehabilitation.<br><br>11% of those assessed were randomized. | usual care (71) or usual care alone (n=85) for 12 months. The intervention involved an individualized home exercise program (based on the Otago Exercise Program), falls risk and injury risk minimization strategies, and education. | **Secondary Outcomes**: Injurious falls, falls risk, participation, activity, leg strength, gait speed, balance, functional independence, and fear of falling.<br><br>Baseline and 12-month follow-up. | 1.14), all at p>0.05.<br><br>Lost to follow-up: intervention group=12%; control=20%. |
| **Dean et al. 2012**<br><br>**Australia**<br><br>**RCT** | CA: ☑<br><br>Blinding:<br>Patient ☒<br>Assessor☑<br><br>ITT: ☑ | 151 community-dwelling stroke survivors with an average of 5.9 years post-stroke. Individuals who could not walk 10 meters (independent or with aid) and those with a medical condition precluding exercise were excluded.<br><br>49% of those assessed were randomized | Participants were randomized to receive either an experimental exercise program (lower limb exercises designed to improve walking, physical activity and reduce falls; n=76) or a control exercise program (designed to improve upper limb and cognitive functions; n=75). Both groups completed at least 3, 45-60-minute sessions per week in addition to receiving advice and a home program.<br><br>Duration of Intervention: 40-weeks over 1-year, | **Primary Outcomes:**<br>Walking capacity (6-minute walk test), walking speed (10-meter walk test), and fall rate.<br><br>**Secondary Outcomes:**<br>Falls risk, quality of life, community participation, and physical inactivity.<br><br>Baseline and at the end of the 12-month program, with falls reported monthly over the study period. | At the end of the 12-month program, participants in the intervention group improved significantly more than those in the control group in terms of walking capacity (mean difference=34 meters, 95% CI 19 to 50; p<0.001) and walking speed (mean difference=0.07 m/s, 95% CI 0.01 to 0.14; p<0.5). However, no difference was found between the two groups with respect to proportion of fallers (62% vs. 51%; RR=1.22, 95% CI 0.91 to 1.62) or fall rate (1.7 vs. 1.8; IRR=0.96, 95% CI 0.59 to 1.51). The two groups also demonstrated non-significant differences in falls risk, physical activity, and quality of life.<br><br>Lost to follow-up: intervention group=14%; control group=9%. |
| **Batchelor et al. 2010**<br><br>**Australia**<br><br>**Systematic Review & Meta-analysis** | N/A | 13 RCTs investigating an intervention designed to impact fall-related outcomes.<br><br>Studies included stroke survivors' ≥18 years of age at any stage of stroke recovery in any setting. Studies investigating a mixed sample (<20% with | RCTs evaluated physical activity interventions (4 trials), modification of environment/knowledge (1 trial), models of care (4 trials including the same sample), and pharmacological interventions (4 trials). | All primary and secondary falls related outcomes were included. | Examining unpooled effect estimates, only one trial investigating vitamin D vs. placebo in a sample of women was associated with a significant reduction in fall rate (RR=0.16, 95% CI 0.10 to 0.25) and/or proportion of fallers (RR=0.33, 95% CI 0.19 to 0.56).<br><br>Pooled analyses were possible for two intervention types: exercise vs. usual care (3 trails) and bisphosphonate vs. placebo (2 trials).<br><br>Exercise: |

| Study/Type | Quality Rating | Sample Description | Method | Outcomes | Key Findings and Recommendations |
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| | | conditions other than stroke) were excluded unless subgroup analyses were presented. | | | Fall rate: RR=1.22, 95% CI 0.76 to 1.98; p>0.05<br>Proportion of fallers: RR=0.77, 95% CI 0.24 to 2.43; p>0.05<br><br>Bisphosphonate:<br>Proportion of fallers: RR=0.95, 95% CI 0.73 to 1.22, p>0.05 |

**Abbreviations**

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| CA = Concealed Allocation | CI = Confidence Interval |
| FAC = Functional Ambulation Categories | IQR = Interquartile Range |
| ITT = Intention to treat | N/A = Not Applicable |
| OR = Odds Ratio | RCT= Randomized Controlled Trial |
| SMD = Standardized Mean Difference | |

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