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| **Author, Year, Journal, Title** | **Purpose,**  **Design** | **Subjects** | **Outcome Measures** | | **Results** | **Conclusions** | **Clinical Application** |
| Tsur A, Segal Z. 2010. IMAJ. *Falls in Stroke Patients: Risk Factors and Risk Management.* | To assess risk factors for falls among patients in inpatient rehab after acute stroke; retrospective study-survey | 56 falls over period of 5 years in 41 patients with stroke | Nurse’s safety risk assessment of fall | Most falls occurred among males with reduced muscle tone (70%), paralysis (54%), and hypoesthesia of involved side; Additionally 89% of falls patients used hypoglycemic, hypertensive, or neuroleptic drugs. 29% had communication disorders, hemianopia or blindness in 21%, and visuospatial agnosia in 18%. | | Overall, the largest issues leading to falls were weakness, paralysis or decreased sensation on involved side, cognitive, visuospatial, or drug-induced physiological changes.  Some non-clinical factors for falls included time of day, falls near bed, leisure time, and extrinsic mechanisms (improper family transfer, wet floor, and wheelchair instability) | -There was a notable difference in number of falls between individuals taking medication and those not taking medication (increased incidence in those taking medication)  -Time of day was an important consideration as a non-clinical factor involving falls. |
| Schmid et al. 2010. JRRD. *Prevalence, predictors, and outcomes of poststroke falls in acute hospital setting.* | To review literature regarding falls in acute hospital stay for individuals post-stroke; review/secondary analysis | Any hospital fall in the VA hospital or non-VA hospital between 1998 and 2003 | Functional Status per chart (ADLS and mobility), NIHSS | Significant findings associated with NIHSS scores >8 (p=.03), NIHSS scores of 8-17 (p=.03), history of anxiety (p<.0001), and history of UTI (p<.05).  Functional status changes were also associated with hospital falls (p=.01) with factors such as ataxia, aphasia, and gait abnormalities as significant changes between individuals with and without functional status loss (p<.001) | | Functional status changes were a leading cause of risk for falls. This relates to ability to perform ADLs and mobility tasks independently versus dependently.  History of anxiety and UTI are two interesting findings since these factors can lead to falls in the elderly without stroke as well. | A patient’s functional mobility plays a large part in determining risk for falls. With co-morbidities of anxiety and UTI, risk for falls increased. It is important to remember that stroke is typically not the only disease process occurring and co-morbidities should be considered on a individual basis |
| Baetens et al. 2011. J Rehabil Med. *PREDICTION OF FALLING AMONG STROKE PATIENTS IN REHABILITATION* | To identify risk factors and predict falls in stroke patients; Prospective study. | 65 patients in the first 6 months post-stroke | MMSE, Geriatric Depression Scale, Falls Efficacy Scale, Star Cancellation Task, Stroop Test, BBS, Functional Ambulation Categories, Ashworth Scale, Katz Scale, 6-month fall followup | Risk factors included: being single (OR 4.7), SCT-time (OR 1.2), grip strength on unaffected side (OR 0.1), walking aid versus none (OR 5.1) | | When determining the cause behind a fall in an individual with stroke, several different assessments are useful. Once the causes are determined, they can be addressed in rehabilitation to best prepare the patient for home and community reintegration. | Weakness, use of an assistive device and social support all play a role in risk for falls. For individuals with weakness, balance and sensation can be affected increasing risk for postural sway and loss of balance. Assistive devices, when used appropriately can help increase base of support and increase stability during gait and mobility tasks. |
| Forrest et al. 2012. Rehabilitation Nursing. *Falls on an Inpatient Rehabilitation Unit: Risk Assessment and Prevention* | To determine the relationship between diagnosis at admission and FIM scores an risk for inpatient falls; Retrospective study | All patients admitted to an inpatient rehabilitation from January 2006 to December 2009 | FIM score at admission, incidence of falls, diagnosis at admission | FIM scores and falls were inversely related. Falls were seen most often in the neurological diagnoses (stroke, TBI, Guillan-Barre, SCI., etc.) as compared to patients with orthopedic or cardiopulmonary diagnoses (amputees, heart disease, etc.) | | Inpatient falls are much more common in the neurological diagnosis group as compared to the cardiopulmonary or orthopedic diagnoses. | Focus in this article is more on falls in all patients rather than solely patients with stroke. However, it points out that special care should be taken with those individuals who do have neurological insult, as their incidence of falls is much higher than those with different diagnoses. |
| Weerdesteyn et al. 2008. JRRD. *Falls in Individuals with Stroke.* | To review the literature on epidemiology of falls in persons with stroke; review | n/a | n/a | The following epidemiologies were found throughout literature  Acute Care: Nurse to patient ratio  IPR: Patient’s acting against rehab team’s recommendations often due to cognitive impairments  Community-Dwelling: decreased mobility (about 4,000 steps less daily on average) leading to deconditioning | | Difficulty with ADLS and\* balance and gait deficits are large contributors to falls in individuals with stroke  Overall, it was found that dual tasking with a cognitive task and walking were a especially risk for falls  Disease-related mental factors and sensory deficits are also large contributors | Those deficits which lead to falls that are stroke specific are often identifiable in the clinic, especially during the administration of gait and balance measures and observation of mobility, gait and balance. The deficits to be aware of include weakness, decreased sensation, fear of falling, cognitive impairments and visual problems |
| Simpson, Miller, Eng. 2011. PlosOne. *Effect of Stroke on Fall Rate, Location and Predictors: A Prospective Comparison of Older Adults with and without Stroke.* | To compare older adults with and without stroke and the rates, locations, and predictors of falls; Prospective controlled | 80 individuals with stroke (recently discharged from rehabilitation) and 90 control subjects | Baseline assessment of balance, mobility and balance confidence:  -Cognitive Capacity Screening Examination, BBS, TUG, 6MWT, and ABC scale.  Falls were monitored over 13 month period (via monthly fall diaries) | Significant differences in falls between the groups in the following areas, with persons with stroke having more falls:  Mean CCSE score (p<.001)  Mean BBS Score (p<.001)  Mean TUG (p<.001)  Mean 6MWT (p<.001)  Mean ABC Score (p<.001) | | Following a stroke, most falls occur in the home. This is likely because of precautions taken by both the patient and family to keep the patient at home in a controlled environment. Balance deficits were the largest contributor to falls in the home environment.  Study liimitations were noted that a larger sample size may have given better detection of unique balance and gait deficits leading to falls | Home assessment is extremely for individuals with stroke, to determine external risks for falls and ways that these factors can be better controlled to reduce the individual’s risk. |
| Mansfield et al. 2012. Neurorehabilitation and Neural Repair. *Clinical Correlates of Between-Limb Synchronization of Standing Balance Control and Falls During Inpatient Stroke Rehabilitation.* | .To determine relationships between clinical measures of sensorimotor control, functional balance, and falls risk and between-limb synchronization of balance control; Cross-sectional study | 100 persons with stroke who were admitted to inpatient rehabilitation, divided into patients with fall history and those without fall history | NIHSS, BBS, Chedoke-McMaster Stroke Assessment leg and foot scores, and plantar cutaneous sensory thresholds (from patient chart)  -Quiet standing balance was assessed with two force plates detecting COP (mediolateral and anteroposterior) under each LE | Anterior posterior sway was significantly less correlated in fallers versus non-fallers (p-.0012)  Decreased correlation of COP sway in individuals with stroke was directly related to:  -BBS (ML p=.0023) (AP p=.0003)  -Chedoke-McMaster Stroke Assess: leg score (ML p=.0001) (AP p=.0001) and foot score (ML p<.0001) (AP <.0001) | | Reduced between-limb sychronization of COP fluctuations under the feet during quiet standing were related to increased motor limb impairment and prospective risk for falls | Sensorimotor changes which are observed between a paretic and non-paretic lower extremity will contribute significantly to balance deficits in quiet standing. Without symmetrical strength, an individual’s overall center of gravity will be offset, raising risk for falls. This is an important area to address in therapy because it affects a patient’s ability to perform ADLs at home, and can affect gait as well. |
| Bonan et al, 2004, Arch Phys Med Rehabil, *Reliance on visual information after stroke. Part I: Balance on dynamic posturography* | To test the hypothesis that postural imbalance after stroke is a result of the inability to integrate somatosensory, visual, or vestibular information; cross sectional study | N=40 gathered via convenience sample (27 men, 13 women)  IC=hemiplegia after first and only stroke, >12mos since stroke, moderate degree of impairment, amb without supervision and keep balance on EquiTest without help | Sensory organization test conducted on each participant to determine which are is affecting postural balance problems. Scores were also taken from “normal” persons to compare samples to.  Sway angle center of gravity, equilibrium score (100 means no sway and 0 means sway beyond limits of stability), displacement of COG  Tested only one time | Normal scores for conditions 1-3 (fixed platform eyes open, fixed platform eyes closed, sway-referenced vision). SOT5 scores significantly lower than normal for R-hemisphere lesions (p=.003), Median SOT6 scores lower than normal (p=.0007) and sig lower in r-hemi lesions (p=.002) but not in L-hemi regions | | This information gives us the information that is linked to postural imbalance, which in turn leads to falls. The dynamic nature of the SOT testing shows our use in therapy of DBT as intervention. By knowing which area of sensory org is lacking we can train that area or come up with a compensation strategy. | Supports presence of sensory integration difficulty as a factor in impairments in postural stability and balance.  Study indicates resolve of these issues could improve stability, but needs further study to confirm. |
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Exploring the multifactorial causes that lead to falls in older adults with stroke.

Random side notes:

* Schmid et al: falls are most common medical complication after stroke; the more risk factors you have for falls, the more at risk you are.
* Weerdesteyn discusses consequences of falls in individauls with stroke (for the patient education materials): higher risk for hip fracture on paretic side due to loss of bone mineral density (27 percent in stroke population as compared to 2-10 percent in general elderly population), fear of falling leading to less mobility, secondary complications, and loss of independence (i.e. cardiopulmonary), higher mortality rate after hip fracture repair (~10%), caretaker stress, social deprivation and depression
* Weerdesteyn discusses pathophysiology of stroke-related deficits leading to falls:
  + For ADL completion, patient needs to be able to achieve quiet stance, and maintain stability despite internal (reaching and weight shifting) and external pertubrations (bumping into items)
  + For gait, patient needs to have coordinated and sufficient muscle movement to progress gait forward, have enough foot clearance during swing to avoid toe drag or tripping, and have stability of the stance leg to allow swing with the opposite leg and weight acceptance of the stance leg. In more complex walking situations, obstacles are presented and the patient is required to problem solve to safely maneuver. With the added cognitive challenge, like in the community-dwelling persons with stroke, falls are more likely to happen due to difficulty with dual-tasking.

Impaired postural reactions