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A systematic review of falls in hospital for patients with communication disability: Highlighting an invisible population

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ABSTRACT

Background: Patients with communication disability, associated with impairments of speech, language, or voice, have a three-fold increased risk of adverse events in hospital. However, little research yet examines the causal relationship between communication disability and risk for specific adverse events in hospital. *Objective*: To examine the impact of a patient's communication disability on their falls risk in hospital. *Methods*: This systematic review examined 61 studies on falls of adult hospital patients with communication disability, and patients at high risk of communication disability, to determine whether or not communication disability increased risk for falls, and the nature of and reasons for any increased risk. *Results*: In total, 46 of the included studies (75%) reported on participants with communication disability, and the remainder included patients with health conditions placing them at high risk for communication disability. Two thirds of the studies examining falls risk identified communication disability as contributing to falls. Commonly, patients with communication disability were actively excluded from participation; measures of communication or cognition were not reported; and reasons for any increased risk of falls were not discussed. *Conclusions*: There is some evidence that communication disability is associated with increased risk of falls. However, the role of communication disability in falls is under-researched, and reasons for the increased risk remain unclear. *Practical applications:* Including patients with communication disability in falls research is necessary to determine reasons for their increased risk of adverse events in hospital. Their inclusion might be helped by the involvement of speech-language pathologists in falls research teams.

1. Introduction

Patient falls are the most frequently reported adverse event in hospitals, accounting for up to 41% of patient safety incidents in the United Kingdom, and 38% in Australia (Healey et al., 2008; Rigby, Clark, & Runciman, 1999; Shaw, Drever, Hughes, Osborn, & Williams, 2005). Falls place increased strain on the hospital system, resulting in an average of eight days of increased length of stay at an additional cost of $6669 (AUD) per fall in resources and medical care (Morello et al., 2015). There is a large body of research aimed at identifying patients who are at risk of falls, and ways to prevent them from falling. Individuals known to have an increased risk of falls include the frail elderly (Chang et al., 2004) and adults after stroke (Evans, Hodgkinson, Lambert, & Wood, 2001). There is also a significant body of research on hearing impairment as a falls risk factor, particularly for older adults (e.g., Jiam, Li, & Agrawal, 2016), often with 'hearing and vision impairment' combined in relation to falls (Lin & Ferrucci, 2012). Furthermore, the prevention and management of patient falls features in the quality standards against which a hospital or health service is judged (Australian Commission on Safety and Quality in Health Care, 2012).

The term 'communication disability' refers to "the impairments, activity limitations and participation restrictions that affect an individual's ability to interact and engage with the world in ways that are meaningful to them and those they communicate with" (The University of

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Queensland, n.d.). This may be lifelong or acquired later in life, stemming from difficulties with sending, receiving, processing messages, and understanding concepts and symbol systems (American Speech-Language-Hearing Association, 1993). Patients with communication disability (i.e., having conditions associated with impairments of speech, language, hearing, or voice) have a three-fold increased risk of experiencing adverse events in hospitals (Bartlett, Blais, Tamblyn, Clermont, & MacGibbon, 2008). The incidence and prevalence of communication disability in patients in hospital is not known, but on stroke wards it is high, with as many as 88% of stroke patients affected (O'Halloran, Worrall, & Hickson, 2009). Several other health conditions impacting on communication (e.g., dementia, stroke, Parkinson's disease (PD)) are also associated with cognitive and/or mobility impairments (Flowers, Silver, Fang, Rochon, & Martino, 2013). It is estimated that more than a third of stroke survivors have aphasia (i.e., language difficulties after stroke; Kauhanen et al., 2000) and between 50% and 90% of those with right hemisphere stroke exhibit other communication difficulties (Blake, Duffy, Myers, & Tompkins, 2002; Joanette & Goulet, 1994). Approximately one in six people with Alzheimer's disease have a cognitive impairment affecting communication (Seshadri et al., 2006). Cognitive communication is frequently impaired in hospitalized patients who experience a traumatic brain injury (TBI) (Steel, Ferguson, Spencer, & Togher, 2015). Patients with neurodegenerative conditions (e.g., PD, multiple sclerosis (MS), motor neuron disease (MND)) have high rates of impaired speech motor control affecting their speech intelligibility (Hartelius & Svensson, 1994). People with lifelong disability (e.g., cerebral palsy, intellectual disability, or autism), who enter hospital more frequently than their peers without a disability (Young et al., 2007) and with increasing frequency as they age (Strauss, Ojdana, Shavelle, & Rosenbloom, 2004), also have high rates of communication disability (e.g., 25% of people with cerebral palsy are non-verbal; Access Economics, 2008).

Currently, hospital safety research illustrates that the nature and frequency of falls varies greatly depending on environmental factors, person-specific intrinsic factors, staff factors (e.g., attitude, skills, and availability of staff), and the patient's risk behaviors (Oliver, Healey, & Haines, 2010). For example, more falls occur in geriatric, neurological, and rehabilitation settings, and the number of falls is affected by chronicity of the patient's health condition, level of activity, and types of physical and/or cognitive impairment (Oliver et al., 2010). Patient-specific factors most commonly identified in previous systematic reviews and meta-analyses include: a previous history of falls, motor impairment (e.g., gait instability, amputation), behavioral disruption (e.g., confusion, agitation, mental state disturbance), urinary incontinence or frequency, selected medications, and postural hypotension or vertigo (Campbell & Matthews, 2010; Evans et al., 2001; Oliver, Daly, Martin, & McMurdo, 2004; Vieira, Freund-Heritage, & da Costa, 2011). Other intrinsic factors reported include visual/auditory impairment, older age, comorbidity, and cognitive impairment (Spoelstra, Given, & Given, 2012). The type and severity of dementia, behavioral disturbances (Härlein, Dassen, Halfens, & Heinze, 2009), clinical complexity, and severity of illness (Long, Brown, Ames, & Vincent, 2013) may further increase falls risk for older people with dementia or cognitive impairment.

Falls risk screening and falls prediction tools (e.g., the Downton Falls Risk Assessment Scale [Downton, 1994], STRATIFY [Oliver, Britton, Seed, Martin, & Hopper, 1997], and the Morse Falls Scale) are important in predicting and preventing hospital-based falls. The psychometric properties of these tools have been examined in prior systematic reviews and meta-analyses (Aranda-Gallardo et al., 2013; Callis, 2016; Chang et al., 2004; Haines, Hill, Walsh, & Osborne, 2007; Matarese, Ivziku, Bartolozzi, Piredda, & De Marinis, 2015; Oliver et al., 2004; Oliver et al., 2008; Oliver et al., 2010). Falls risk screening tools can be used by staff to identify and modify those factors that may be reversible (Oliver et al., 2010). Falls prediction tools aim to identify patients at high risk or low risk of falling (Oliver et al., 2010). Such instruments are usually administered by nursing staff and include factors that are known to increase risk of falls; including mental status, vision, mobility and toileting function, history or falls, and medications taken. Typically, these instruments do not include features of communication, and have various psychometric and practical limitations. For example, falls prediction or prevention tools may lack predictive validity, only be valid in specific environments or contexts (Oliver et al., 2004), and may not enhance nursing clinical judgment despite the time invested (Haines et al., 2007).

Reflecting the high clinical and research priority surrounding falls risk management in hospital, numerous studies have reported on the efficacy of various multifactorial and single intervention falls prevention programs (Cameron et al., 2012; Chang et al., 2004; Coussement et al., 2008; Dibardino, Cohen, & Didwania, 2012; Miake-Lye, Hempel, Ganz, & Shekelle, 2013; Oliver et al., 2007). Multifactorial falls risk programs commonly include a comprehensive framework of risk assessment, visual alerts, patient/family education, bed alarms, evaluation after falls, and patient rounding (Hempel et al., 2013). Patient rounding, also known as intentional or hourly rounding, refers to the practice of scheduling regular nursing visits to provide non-urgent, basic care, proactively (Deitrick, Baker, Paxton, Flores, & Swavely, 2012). Many aspects of these programs may be problematic for people with communication disability. For example, patients with aphasia after stroke may not understand instructional education programs or be able to indicate their needs during rounding due to difficulties with expressing and understanding information. Hospital falls risk prevention has included research on the "call bell" (Tzeng & Yin, 2009a, 2009b, 2010) acknowledging that a patient having problems gaining attention is a risk factor in falls. It is estimated that on any one day, as many as 15% of hospital patients are not able to gain attention using the call bell to alert nurses to their need for assistance (Hurtig & Downey, 2009). Other than aiming to increase appropriate use of the call bell (Tzeng, Titler, Ronis, & Yin, 2012) or reduce nurse response times (Digby, Bloomer, & Howard, 2011; Meade, Bursell, & Ketelsen, 2006), there are few interventions aimed at improving patient-provider communication or addressing patients' communication disability as a way to reduce their risk of falls.

In the UK, a retrospective analysis of almost 20,000 fall-related hospital patient incident reports identified "failure to ask for help" – either because the patient was unwilling or unable to do so – as a contributing factor in almost 2% of reported inpatient falls (Hignett, Sands, & Griffiths, 2013, p. 529). While falls risk instruments may capture information on a patient's mental status or cognition (Oliver et al., 2004; i.e., not necessarily language comprehension) there is little information in the literature on how patients' communication impacts on their risk of falling (see Hemsley et al., 2016). In a review of 27 studies relating to hospital patient safety incidents for patients with communication disability, Hemsley et al. (2016) reported that researchers to date have examined the circumstances of incidents, including falls, but provided little information on what leads to the incidents or the impacts of these on the patient or service providers/organizations involved.

Considering the high incidence of co-occurring mobility and communication impairments in patients at high risk of falls (e.g., stroke, cerebral palsy, motor neurone disease, Down syndrome, multiple sclerosis), it is possible that research including hospital patients with such conditions who are at risk of falls report findings that include factors contributing to falls in patients with communication disability. Therefore, the aim of this review was to examine the appearance of communication disability in research on falls in adult hospital patients to identify any potential factors contributing to falls in this group. This information could be used to increase awareness of those patients who may have additional risk for falling, inform hospital policies on measures needed to reduce patient falls, and guide future research on falls in adult patients with communication disability.

2. Method

A systematic review was conducted to identify peer-reviewed original research on falls in hospital for patients at risk of communication disability. To date, there has been no review of research that includes patients at risk of communication disability not related to impaired hearing, to determine if their communication difficulties are having any impact on risk of falls or what interventions might help to prevent them falling in hospital. This influenced the scope of the search for literature. The review focused on patients with lifelong or acquired health conditions and a communication disability stemming from primary impairments of speech, language, and voice; and not to patients with a primary impairment of hearing. Falls risk has already been examined for patients with hearing impairment (Jiam et al., 2016), and the relationship of hearing and balance is well-documented (Campbell & Matthews, 2010). In recognition of their communication rights, and equity of access of all patients, those with hearing impairments have long been recognized as needing accommodations (Middleton, Niruban, Girling, & Myint, 2010). Interventions to improve hospital care for patients who are not able to hear (e.g., amplification, provision of sign language interpreters, hearing loops, support for patients using hearing aids, and information in written formats) are likely to be very different to interventions for patients with communication disability who can hear but have difficulty understanding spoken or written information presented in their own language.

2.1. Search strategy

In June 2016, six scientific databases (EBSCO, EMBASE, CINAHL, Medline, PsycINFO, and Web of Science) were searched using various combinations of search terms relating to: (a) Populations at risk of communication disability: aphasia, stroke, autism/ASD/Autism Spectrum Disorder, Motor Neurone Disease/MND, Amyotrophic Lateral Sclerosis/ALS, Alzheimer's, dementia, delirium, traumatic/acquired brain injury/TBI/ABI, brain injury, Multiple Sclerosis/MS, Cerebral Palsy, Parkinson's/Parkinson's disease/PD, and combinations and variants of intellectual, cognitive, and developmental disability; (b) Falls: fall/falls/falling; (c) Safety: patient safety, adverse event, safety, incident; and (d) Setting: hospital, inpatient, acute, rehabilitation, secondary, care. All studies located in the search were imported into Endnote X7. Owing to the relationship between call bell use and falls, studies relating to falls risk or falls prevention located in a previous search of the same databases for research on hospital call bells were also added. The library was then used to apply the inclusion and exclusion criteria, first by reading of titles and abstracts, and then by reading the full texts, if needed, to reach a decision on whether to include or not.

2.2. Inclusion/exclusion criteria

This review was limited to studies written in English and published in peer-reviewed scholarly journals, with no limits on the year of publication up to June 6, 2016. We specifically sought studies that: (a) reported results related to physical falls occurring in any hospital setting; and (b) included at least one adult participant with a health condition associated with communication disability not primarily related to hearing impairment. Studies excluded from the review were: (a) not relating to physical falls (e.g., drop in blood pressure); (b) not original research (i.e., not systematic or literature reviews, discussion papers, editorials, reports); (c) not published in English in a peer-reviewed journal; (d) not falls in hospital (i.e., reports on falls in other settings including nursing homes, the community, long-term care or psychiatric hospitals); or (e) not including adult participants with health conditions with a high prevalence of communication disability; or (f) relating solely to patients with a primary disability of hearing.

2.3. Screening process

Once imported into the Endnote X7 library, duplicate references were removed and the titles and abstracts of each paper were screened by two raters to exclude those not meeting the inclusion criteria. The full texts of all remaining studies were retrieved for review and judged by the first and fifth authors separately to determine which studies to include in the review. Any disagreements on inclusion were resolved by consensus in discussion with the first author. The search and assessment process for the review is illustrated in Fig. 1.

2.4. Data extraction

The first author and a research associate extracted the following data from each included study and this was checked for accuracy by the second author: (a) the aim(s) of the study; (b) the methodological design (i.e., quantitative, qualitative, or mixed methods); (c) the type of data collected (i.e., record or chart review, interview, questionnaire); (d) the total number of participants; (e) the included population/s at risk of communication disability and the number of participants within each population; (f) any results relating to falls, including contributing factors, location, time, and activity being performed when the fall occurred; (g) any results relating to communication disability; and (h) any discussion, conclusions, or recommendations made by the study authors in relation to falls risk for patients with communication disability in hospital. Following data extraction, and on reading full texts, studies were removed if they: (a) only reported on a population with delirium or confused state ($n = 11$) (i.e., not specifically dementia); (b) focused on restraint use rather than falls ($n = 6$); (c) other reason (e.g., reported on environmental factors with no patient characteristics; quality improvement project; falls occurring outside the hospital; stroke patients who did not fall or were not included in the study analysis) ($n = 21$). This process resulted in a total of 61 studies being included in the review.

2.5. Analysis

A descriptive analysis was performed across the studies according to the inclusion of participants with, or at risk of, communication disability; whether communication appeared as a falls risk or not a falls risk; and cognition as a falls risk. Levels of evidence according to the National Health and Medical Research Council (NHMRC) (Merlin, Weston, & Tooher, 2009) were determined by the first and second authors. A meta-analysis of falls risk for people with communication disability across studies was not possible owing to methodological differences in: (a) the inclusion or exclusion of participants with communication disability from the studies, (b) measurement of communication disability in the studies, and (c) reporting of outcomes of participants at with or at risk of communication disability.

3. Results

3.1. Characteristics of included studies

The 61 included studies were published from 1986 to 2016. The majority of papers (42/61) included stroke patients with 24 of these focused solely on stroke patients, and 18 related to patients with stroke and other neurological conditions or patients located on specific wards (e.g., adult inpatient neurology, rehabilitation, traumatic brain injury, MS, PD, ALS, dementia). In the other 19 studies, participants had a variety of health conditions associated with communication disability including: cognitive impairment and/or dementia ($n = 12$), TBI ($n = 3$), unspecified population on acute care/neurological rehabilitation patients ($n = 2$), Multi-Systems Atrophy (MSA) ($n = 1$), or intellectual disability ($n = 1$). The included studies reflected a justifiable

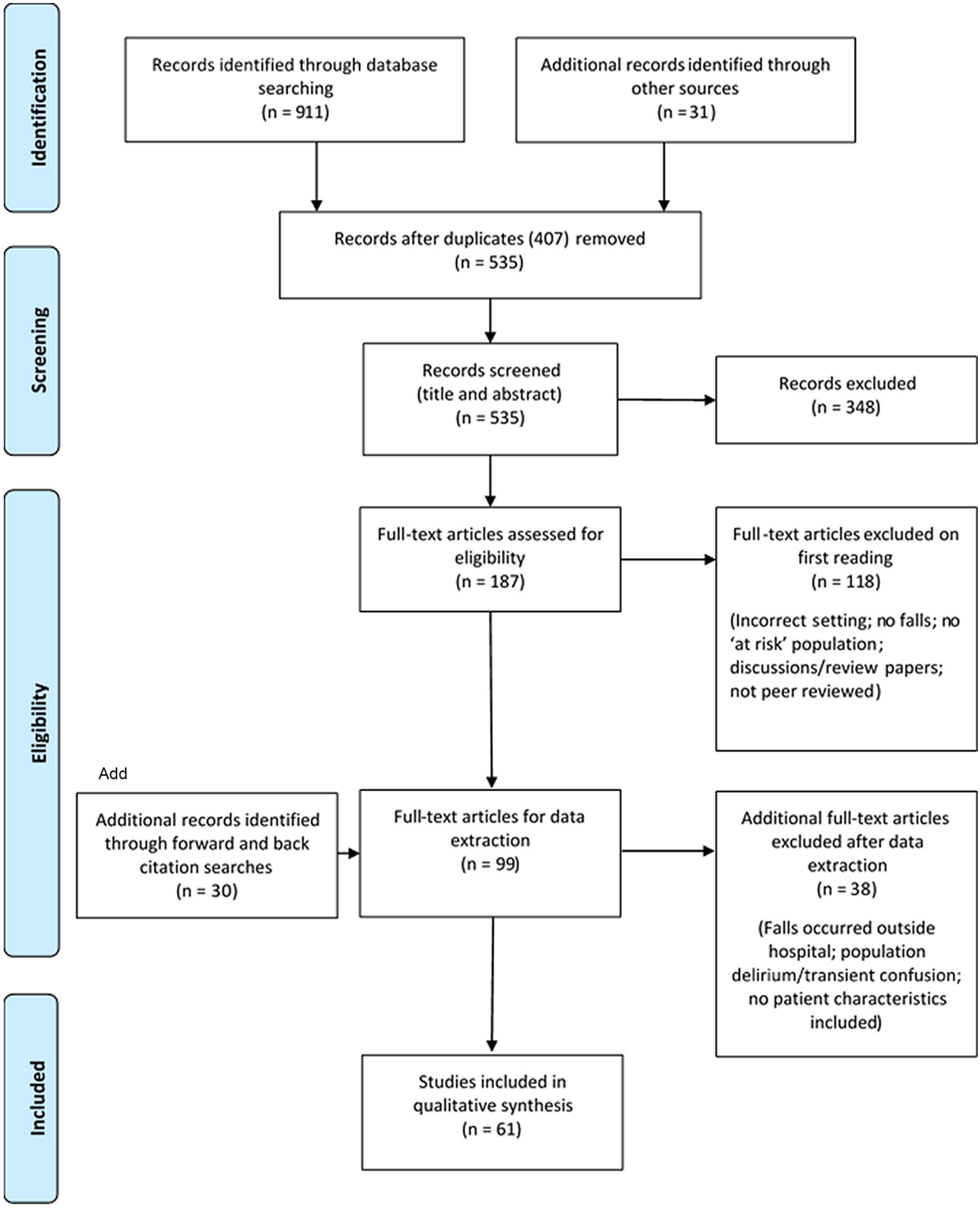

Fig. 1. Systematic search process for literature identification, review and exclusion (adapted from Prisma diagram).

multi-disciplinary interest in falls, but not one that was inclusive of speech-language pathology; with studies originating from the disciplines of nursing ($n = 19$), medicine, including rehabilitation medicine and stroke medicine, ($n = 30$), physiotherapy ($n = 3$), psychiatry ($n = 2$), psychology ($n = 2$), occupational therapy ($n = 1$) and multiple disciplines ($n = 3$).

3.2. Communication disability: terminology, descriptions, and falls risk factors

The included studies reflected diversity in the terminology used to refer to communication, as appearing in descriptions of participants' diagnosis, impairment, functions, strategies, or communication

activities. The terms used to refer to or describe communication are presented in Table 1, and the role of communication is shown in Table 2.

Table 1
Term or descriptor used to describe communication.

Descriptive domain	Term(s) used	References
Diagnostic term	Aphasia/ dysphasia	Baetens, De Kegel, Calders, Vanderstraeten, and Cambier (2011); Bugdayci, Paker, Dere, Ozdemir, and Ince (2011); Czernuszenko and Czlonkowska (2009); Mion et al. (1989); Nyberg and Gustafson (1996, 1997); Saverino et al. (2016); Schmid et al. (2010); Sinanovic et al. (2012); Smith, Forster, and Young (2006); Suzuki et al. (2005); Sze, Wong, Leung, and Woo (2001); Teasell, McRae, Foley, and Bhardwaj (2002); Tsur and Segal (2010); Tutuarima, de Haan, and Limburg (1993).
	Dysarthria	Byers, Arrington, and Finstuen (1990)
Impairment	Communication disorder/ communication difficulties	Nyberg and Gustafson (1995); Saverino, Benevolo, Ottonello, Zsirai, and Sessarego (2006); Tsur and Segal (2010); Tuffrey-Wijne et al. (2014).
	COWAT verbal fluency, Verbal Memory	Rapport, Hanks, Millis, and Deshpande (1998); Saverino et al. (2016).
	Difficulty speaking, impaired speech. Impaired verbal communication	Janken, Reynolds, and Swiech (1986); Park, Delaney, Maas, and Reed (2004).
	Delineated FIM cognitive subscales of Comprehension and Expression	Kwan, Kaplan, Hudson-McKinney, Redman-Bentley, and Rosario (2012); Lee and Stokic (2008); McKechnie, Fisher, and Pryor (2016b); Rosario, Kaplan, Khonsari, and Patterson (2014); Salamon, Victory, and Bobay (2012); Zdobysz, Boradia, Ennis, and Miller (2005).
Function	Impaired understanding or comprehension	Bernhardt, Dewey, Thrift, Collier, and Donnan (2008); Higaonna (2015); Nyberg and Gustafson (1995).
	Patient had difficulty understanding or following instructions, ability to understand instructions	Castner, Sudyn, and Hughes (2014); Mion et al. (1989); Lawrence and Maher (1992); Nyberg and Gustafson (1995); Tzeng and Yin (2013); Watkin, Blanchard, Tookman, and Sampson (2012); Zdobysz et al. (2005).
	Verbal aggression	Eastwood and Schechtman (1999).
	Providing information patient cannot understand	Tuffrey-Wijne et al. (2014).
	Difficulty expressing needs	Sze et al. (2001)
Strategies	Communication strategies to prevent falls e.g., verbal reminders, written safety information, use of call bell, visual reminders	Carroll, Dykes, and Hurley (2010); Castner et al. (2014); Eastwood and Schechtman (1999); Gilewski, Roberts, Hirata, and Riggs (2007); Hill et al. (2015); Tzeng and Yin (2014).
Activities	Communication between health professionals or health professionals and the carer	Castner et al. (2014); Luxford et al. (2015).
	Engaging in conversation at time of fall	Mansfield, Inness, Wong, Fraser, and McIlroy (2013)

COWAT = Controlled Oral Word Association Test; FIM = Functional Independence Measure.

Table 2
Categories of the ways communication disability was described and example quotes.

Category	Example quote (First author, year, page number)
As a barrier to participation in research	"Patients with severe aphasia were unable to perform this test and were clinically observed and judged. To our knowledge there is no standardized brief cognitive test for aphasic patients" (Baetens et al., 2011, p. 880). "Almost one third of the accidents could not be classified, in almost all cases because they concerned patients with memory or communication disorders and there were no witnesses" (Nyberg & Gustafson, 1995, p. 3). "Patients were excluded if they were unable to give informed consent because of severe cognitive or communication difficulties or if they were non-native English speakers. In the instance of mild to moderate communication difficulties, the neuropsychologists or speech and language therapists assisted patients with consent, involving relatives or caregivers when needed" (Saverino et al., 2015, p. 356). "20 patients were unable to complete at least 1 assessment of perceived exertion after intervention because of comprehension, consciousness, or language difficulties" (Bernhardt et al., 2008, p. 394).
Falls risk factor	"Patients who fell had significantly lower expression FIM scores (M = 4.65, SD = 1.1) on day one compared to those who did not fall" (Salamon et al., 2012, p. 295). "When compared with one-time fallers, multiple fallers had higher rates of infection (71% vs. 38%…), antibiotic therapy (76% vs. 45% … inability to follow commands (59% vs. 25%,…), and presence of receptive aphasia (47% vs. 14%, …)." (Mion et al., 1989, pp. 18–19). "Regarding the localization of brain lesions (right or left hemisphere) and the prevalence of dysphasia, no significant differences were found between fallers and nonfallers" (Nyberg & Gustafson, 1996, p. 4). "The degree of neurological deficit, impairments of spatial orientation as well as presents of aphasia were highly correlated with falls ($p < .001$)." (Sinanovic et al., 2012, pp. 33–34) "The group with the lower cognitive subscore in our population included those with aphasia, dementia, neglect, and confusion. Same cognitive subscore did not necessarily mean same mental conditions in our study." (Suzuki et al., 2005, p. 467).
Discussed as a direct safety issue	"It seems inadequate that patients with serious cognitive impairments are expected to understand and remember verbal instructions and recommendations regarding ambulation and physical activity" (Nyberg & Gustafson, 1995, p. 4). "In 89 cases (58%) the patient acted against the instructions given by the rehabilitation team, e.g., he or she transferred or walked without the recommended supervision or aids. A significantly larger proportion of the patients involved in such incidents were cognitively impaired (MMSE score < 24) compared with other patients who fell ($P < .01$)" (Nyberg & Gustafson, 1995, p. 4). "A transfer may result in a fall because the patient does not understand or remember verbal instructions and recommendations regarding ambulation and physical activity" (Zdobysz et al., 2005, p. 70). "Patients with aphasia may have difficulty expressing their needs in the wards and tend to do such things as reaching out for the urinal or transfer from bed to chair by themselves. These actions may increase the risk of falls. We suggest that more attention be paid to patients with dysphasia to reduce fall incidence" (Sze et al., 2001, p. 1224).
As part of falls prevention activity	"'The simple act of discussing all health issues in a professional tone, as if he was 'at work', was identified as a TOP 5 strategy as well as letting him know that the 'emergency' was being responded to. This strategy helped a lot. The patient settled well, and trusted us'" (Luxford et al., 2015, p. 1790). "Most participants mentioned that they were not aware of their risk of falling, and those who were told of their risk received inconsistent messages regarding

Table 2 (*continued*)

Category	Example quote (First author, year, page number)
As a contributing factor to fall	their risk from different nurses. Participants wanted to be informed and told of why they were at risk and what specific activities the nurse wanted them to do to reduce their risk and the role of the health care team in their fall prevention" (Carroll et al., 2010, p. 240). "Each nurse at the time of admission discussed with the patient and available family members the importance of patient safety and the need to ask for help with transfers and ambulation" (Forrest et al., 2012, p. 57). "Difficulties in communicating with the patient about symptoms and medical history were described as being crucial in contributing to misdiagnosis or diagnostic overshadowing" (Tuffrey-Wijne et al., 2014, p. 9). "There was a high proportion of recurrent falls (65%) in this group, which may reflect this poor judgment, poor self-assessment of postural stability or limits, retention of previous instructions and not learning from 'mistakes'" (Hanger, Wills, & Wilkinson, 2014, p. 193). "One participant was provided her call light but on the side where she had weakness, so she was unable to put her call light on when she needed assistance. Another participant stated, 'Luckily, I was close enough to the bed to reach my call light…it [call light] didn't slip away as it usually does in the night, it slips down, you know, and then I can't reach it'" (Carroll et al., 2010, p. 240). "Communication difficulties between staff and patients with intellectual disabilities were a particular concern. For example, a number of participants suggested that recognizing and appropriately treating pain had been problematic" (Tuffrey-Wijne et al., 2014, p. 9). "In addition to being familiar with the FIM, they are also the staff members who assist with dressing, feeding, and transfers and communication with patients throughout the day. This study suggests that it may be more important to evaluate the patient's physical and mental functioning as a predictor of fall risk than age or co-existing medical conditions" (Kwan et al., 2012, p. 35). In 89% of the falls, the patient was alone. Only 17% had called out or used the call signal. An additional six patients claimed they had called for help, but this was disputed by the nursing staff. Of those who could state why they had not requested assistance, 59% said they had believed they could manage the activity alone" (Mion et al., 1989, p. 19).
As an activity	"Cognitive activity at the time of the fall: None 11, Focused on performing a task 7, Engaged in conversation 2" (Mansfield et al., 2013, p. 530).

In almost two-thirds of the studies ($n = 38$) communication was reported in the results section (see Table 3) as either a variable in falls risk or as a factor in falls prevention studies. Communication was either (a) directly measured or reported (e.g. Sinanovic et al., 2012; Sze et al., 2001), or (b) indirectly included as a variable (e.g., Gilewski et al., 2007; Rabadi, Rabadi, & Peterson, 2008; Uniform Data Systems for Medical Rehabilitation, 2009), for example with use of the Cognitive subtest of the Functional Independence Measure (FIM) (Uniform Data System for Medical Rehabilitation, 2009). The other 23 studies either did not include measures of communication or variables from the FIM that explore communication, or else made no mention of the patient's communication in reporting results (e.g., the patient's method of communication, communication needs, or assistance provided).

Six studies reported on specific communication accommodations that could be made to support the inclusion of patients with communication disability (Baetens et al., 2011; Lawrence & Maher, 1992; Saverino et al., 2015; Smith et al., 2006; Tuffrey-Wijne et al., 2014). Accommodations made included arranging for a family member, speech language pathologist, or neuropsychologist to explain consent issues and details of the study to participants with "mild to moderate communication difficulties" (Saverino et al., 2015, p. 356) or providing alternatives to telephone calls for follow-up for patients with aphasia (Smith et al., 2006). For example, Lawrence and Maher (1992) anticipated participants having communication disability and collected data on this accordingly: "The patient's ability to understand instructions and use the information was evaluated through interview and summarized on the form" (p. 23). Several authors referred to alternative means for gaining consent (e.g., by proxy of a third party) if participants lacked capacity to consent (Bernhardt et al., 2008; Harlein, Halfens, Dassen, & Lahmann, 2011; Hill et al., 2010; Nyberg & Gustafson, 1995, 1997; Smith et al., 2006; Tuffrey-Wijne et al., 2014; Watkin et al., 2012). However, 14 (or 23%) of the 61 included studies made no reference to the participants' communication skills, methods, or needs; and while three other studies included the FIM cognitive subscale, authors of these studies did not refer to communication (Gilewski et al., 2007; Hill et al., 2015; Rabadi et al., 2008). Data collection methods in a small number of studies ($n = 5$) ruled out some patients with communication disability as follows: potential participants were excluded if they (a) were not "cognitively intact" (Carroll et al., 2010, p. 239) and not able to communicate details of the fall in English (Carroll et al., 2010), (b) were unable to respond to verbal commands (Bernhardt et al., 2008), or (c) were unable to complete tests or provide details about their fall because of communication disability (Bernhardt et al., 2008; Saverino et al., 2016).

3.3. Communication function as a risk factor for falls

In the 42 studies that examined falls risk factors or characteristics, 26 (62%) included participants' communication diagnosis or skill as a falls risk factor, either in terms of diagnosis, or as a variable using the FIM cognitive subscale (Uniform Data System for Medical Rehabilitation, 2009). In total, four studies discussed the potential contribution of patients' communication skills to falls, in the absence of any results directly related to communication (Chen, Liu, Chan, Shen, & van Nguyen, 2010; Frisina, Guellnitz, & Alverzo, 2010; Hanger et al., 2014; Hitcho et al., 2004). Conversely, 45% ($n = 17$) of the 38 studies reporting aspects of communication in results made no direct reference to communication in the discussion section. For example, several authors did not explain their communication-relevant findings: (a) Saverino et al. (2006) reported that "communication disturbance" (p. 182) was present in 76% of people who fell; (b) Rapport et al. (1998) included communicative aspects in tests of executive function (e.g., word fluency); and (c) 5 of 13 studies reported that aphasia or communication disability was associated with falls (Lee & Stokic, 2008; Rapport et al., 1998; Saverino et al., 2006; Sinanovic et al., 2012; Tzeng & Yin, 2013).

In the 26 studies that included communication disability as a falls risk variable, there were mixed findings. Of these, 'aphasia,' 'FIM expression,' 'FIM comprehension,' 'impaired speech,' or 'communication disturbance' was associated with falls in 15 (58%) studies, and not associated with falls in 11 (42%) studies (see Table 3). Although we did not seek studies about hearing loss and falls risk in hospital, owing to a significant body of literature on this already being reviewed, many of the included papers ($n = 14$) made brief mention of hearing, or else hearing and vision was a feature on a falls risk screener used in prior the research.

Four studies finding that communication disability *was* a falls risk factor went on to make recommendations relating to this in the discussion. For example, Sze et al. (2001) reported that:

…patients with dysphasia may have difficulty expressing their needs in the wards and tend to do such things as reaching out for the urinal or transfer from bed to chair by themselves. These actions may increase the risk of falls. We suggest that more attention be paid to patients with dysphasia to reduce fall incidence (Sze et al., 2001, p. 1224).

Rapport et al. (1998) examined the relationship of executive function to falls risk in hospital inpatients, and reported that "the impulsivity, difficulties in problem solving, and inability to benefit from feedback

Table 3
The appearance of communication disability in the 38 studies including mention of communication disability (using a variety of terms).

First author (year)	Level of Evidence (Merlin et al. 2009)	Study type	Participant group	Method	Results	Communication disability contributes to falls	Communication disability in the discussion section
Forrest (2012)	Level III-2	Retrospective cohort	Rehab	FIM cognitive items	Score on the cognitive subscale of the FIM was significantly related to falls	Yes	Importance of communication between patients and staff was discussed.
Higaonna (2015)	Level III-2	Retrospective cohort	Cognitive impairment	Included as part of falls risk assessment tool.	8.4% of patients were forgetful, 5% had impaired judgment or understanding and 2.4% were unable to use call bell.	Yes (impaired judgment/understanding)	Not discussed.
Janken (1986)	Level III-2	Retrospective cohort	Impaired speech	Speech impairment at admission (day one).	Impaired speech was not significantly related to the fall event on the day of fall.	Yes (impaired speech at hospital admission)	Not discussed.
Kwan (2012)	Level III-2	Retrospective cohort	Stroke, brain injury and neurologic impairments	Comprehension, expression, social cognition and problem solving were fall risk factors.	Significant difference between fallers and non-fallers on FIM scores for: comprehension, expression, social cognition, problem solving.	Yes (FIM cognitive scale)	FIM cognitive components of comprehension, expression, social interaction, problem solving and memory were discussed. There was a significant difference between fallers and non-fallers on all of the above subtests. Patients with communication and social impairments can be at increased risk of falls.
McKechnie (2016b)	Level III-3	Case control	TBI	FIM items.	There was a strong correlation between all individual FIM items and falls however there was not a correlation between comprehension and expression and use of stairs. FIM items were associated with falls (stairs and communication less than others) and behaviors were associated with falls – e.g., aggression, impulsivity.	Yes (FIM cognitive scale)	Communication not directly discussed. Total FIM cognitive subscale score was not related to falls: "Clinically, this indicates that patients displaying cognitive impairments and no motor impairments are significantly less likely to fall." (p. E64)
Mion (1989)	Level II	Prospective cohort	Stroke, Cognitive impairment, dementia	Ability to understand or follow directions. Aphasia.	Reduced ability to follow instructions and presence of receptive aphasia was significantly increased in fallers than non-fallers. Fallers were also more likely to have memory or judgment issues, and to have cognitive and perceptual motor skills impairment. Recurrent fallers had greater rates of infection, inability to follow instructions, and a higher rate of receptive aphasia.	Yes (ability to understand instructions)	Communication disability was discussed as a falls risks, particularly the impact of receptive aphasia and ability to understand instructions for multiple fallers. Authors recommended evaluating patient ability to understand and follow directions as part of falls preventions procedure.
Nyberg (1995)	Level II	Prospective cohort	Stroke	Patient not able to follow instructions. Ability to gain attention, follow instructions.	58% of patients did not follow instructions from rehabilitation team, e.g., mobilizing without supervision. There was a significant correlation between patient involvement in incidents and cognitive impairment (MMSE score < 24). There were concerns regarding the patient's memory or communication and there were no witnesses in almost all cases.	Yes	A number of patients were judged to be fall-prone as they required special instructions about their mobility, but over half ignored these instructions and fell. Authors highlight issues regarding managing patients who are confused or have a cognitive impairment or are unable to understand and follow safety instructions.

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Table 3 (*continued*)

First author (year)	Level of Evidence (Merlin et al. 2009)	Study type	Participant group	Method	Results	Communication disability contributes to falls	Communication disability in the discussion section
Rapport (1998)	Level II	Prospective cohort study	TBI	Verbal fluency and verbal memory retention.	All executive functioning assessments were significantly correlated with falls. The strongest correlation to falls existed with the WCST followed by COWAT Fluency then Letter-Number Span. Verbal memory was also associated with falls.	Yes (verbal fluency, verbal memory retention COWAT).	Not discussed.
Lee (2008)	Level III-2	Retrospective cohort	Stroke, brain dysfunction, and neurologic condition	Comprehension, expression, social cognition and problem solving were fall risk factors.	A significant difference existed in the comprehension and social cognition domains of the FIM between fallers and non-fallers. Patients with lower FIM cognitive scores had a higher falls risk.	Yes (FIM cognitive scale).	Patients with poor FIM cognitive scores have an increased risk of falls, however the authors did not provide analysis of how these contribute to the increased risk.
Salamon (2012)	Level III-2	Retrospective cohort	Stroke, encephalopathy, PD	FIM expression scores on day one of admission.	There was a significant association between falls and Morse Fall Scale scores. There was a significant correlation between FIM expression scores on day one of admission and falls however there was no correlation between this FIM score on day two or three of admission and falls. There was no significant difference in FIM expression, memory or problem-solving skills in those who fell once or multiple times.	Yes (FIM cognitive scores on day one of admission).	FIM expressive scores are one of the most significant falls risk factors, however only on day one of admission. Reasons for this were not discussed.
Saverino (2006)	Level II	Prospective cohort	Stroke and other neurological disorders	Communication disorder, as diagnosed at admission interview.	76% of fallers had communication disorders.	Yes (communication disorder)	Not discussed.
Sinanovic (2012)	Level IV	Case series	Stroke	Aphasia.	77.1% of patients who fell had aphasia. The severity of neurological impairment and presence of aphasia were significantly associated with falls.	Yes (aphasia)	Communication not directly discussed. Reiterated finding that aphasia was related to falls but this was not discussed.
Sze (2001)	Level III-2	Retrospective cohort	Stroke	Dysphasia.	Fall risk was significantly correlated with dysphasia, 23.5% of fallers had expressive dysphasia and 7.8% had global dysphasia.	Yes (dysphasia)	Dysphasia, particularly expressive dysphasia was one of the two main fall risk factors for falls.
Tsur (2010)	Level III-2	Retrospective cohort	Stroke	Communication disorder included subtypes of aphasia.	29% of patients who fell had communication difficulties on admission. Communication difficulties and cognitive factors were associated with an increased falls risk.	Yes (communication disorder)	Communication, visual disorders, and visuospatial difficulties were all fall risk factors.
Tzeng (2013)	Level IV	Descriptive cross-sectional survey	Dementia Alzheimer's Disease	Patient inability to follow safety instructions is in the top five of falls risk.	Cognitive impairment/confusion was the highest frequency falls risk, reduced ability to follow instructions was the 5th most frequent risk factor while memory loss was the 18th most frequent risk factor.	Yes (following instructions)	The call light should always be within reach.
Baetens (2011)	Level II	Prospective cohort	Stroke	Communication disability was a barrier to data collection.	Aphasia was included as a patient characteristic (present/not present). Four patients could not provide a fall history due	No	Communication affected the patient's ability to provide data on their falls. Patients with severe aphasia could not perform

Table 3 (*continued*)

First author (year)	Level of Evidence (Merlin et al. 2009)	Study type	Participant group	Method	Results	Communication disability contributes to falls	Communication disability in the discussion section
					to communication disability.		tests required thus they were observed instead. Authors stated: "To our knowledge there is no standardized brief cognitive test for aphasic patients (p. 880)".
Bugdayczi (2011)	Level II	Prospective cohort	Stroke	Patient characteristics examined included aphasia and cognition.	Aphasia and cognition were not related to falls.	No	Authors noted previous studies where decreased understanding increased risk of falls, and where aphasia acted as a barrier to "appropriate evaluation" (e218) of cognition.
Byers (1990)	Level III-2	Retrospective cohort	Stroke	Falls group had less communication difficulty than non-fallers.	Stroke patients who fell were more likely to have impaired decision-making skills, however fall group demonstrated less difficulties with speech and dysarthria than control group.	No	Patients with impaired motor skills who can follow commands should be encouraged for ask for help when ambulating. Patients with a right-side stroke were more likely to fall. Authors questioned why and suggested further investigation was needed. The finding that patients with speech difficulties/dysarthria were less likely to fall than controls was not discussed.
Czernuszenko (2009)	Level II	Prospective cohort	Stroke	Aphasia included as risk factor.	Patient diagnoses: 38% had aphasia, 11% had neglect, 16% had sensory deficit and 9% had visual deficit.	No	No significant association was found between aphasia and falls in the study population, though aphasia was recognized as a previously reported risk factor for falls.
Nyberg 1996	Level II	Prospective cohort	Stroke	Dysphasia	A significant number of fallers had visuospatial hemi-neglect in comparison to non-fallers. There was no significant difference between fallers and non-fallers regarding location of lesion or prevalence of dysphasia.	No	Not discussed.
Nyberg (1997)	Level II	Prospective cohort	Stroke	Dysphasia, dyspraxia, and cognitive impairment.	Dysphasia, dyspraxia and cognitive impairment were not significant fall risk factors.	No	Communication was not directly discussed. Cognitive impairment and dyspraxia were associated with the fall risk in the univariate analyses, but did not add to the contribution of the other items of the multifactorial model.
Rosario (2014)	Level III-2	Retrospective cohort	Anoxic ABI, Stroke (left and right hemisphere), TBI	Comprehension and expression (FIM).	FIM Cognitive scores for comprehension, expression and social interaction were not significantly different between fallers and non-fallers.	No	FIM Cognitive scores are lower in fallers than non-fallers. Faller also have lower comprehension skills than non-fallers.
Schmid (2010)	Level III-2	Retrospective cohort	Stroke, co-morbidities included PD	Aphasia not a predictor of falls.	65/1269 acute stroke patients fell: fallers were more likely to have a moderate to severe stroke, past medical history of anxiety and a history of UTI than non-fallers (p. 556). Aphasia status: 34% of fallers had aphasia, and 35% of non-fallers had aphasia - no difference	No	Not discussed.

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Table 3 (*continued*)

First author (year)	Level of Evidence (Merlin et al. 2009)	Study type	Participant group	Method	Results	Communication disability contributes to falls	Communication disability in the discussion section
Teasell (2002)	Level III-2	Retrospective cohort	Stroke	Dyspraxia. Aphasia.	Fallers had a higher risk of having apraxia and cognitive impairments. There was no significant difference in the rate of aphasia, hemianopia, depression, neglect or seizures between fallers and non-fallers.	No	Authors noted that cognition was associated with falls by linking this with previous works on understanding instructions and following commands.
Wong (2016)	Level III-2	Retrospective cohort	Stroke	FIM cognitive items included	FIM cognitive scores were not related to falls.	No	Not discussed.
Zdobysz (2005)	Level II	Prospective cohort	Stroke (left, right and bilateral)	FIM comprehension, expression and social cognition.	No significant difference between motor or cognitive FIM in patients with left or right brain stroke. There was no significant difference between fallers and non-fallers on the individual domains of the FIM Cognitive subscale.	No	Falls may occur if the patient does not understand or remember verbal commands regarding physical activity and ambulation.
Bernhardt (2008)	Level II	RCT	Stroke	Communication disability was a barrier to data collection.	20 patients were unable to complete one or more assessment items due to language, comprehension or consciousness difficulties.	NA	Not discussed.
Carroll (2010)	n/a	Descriptive, interviews analyzed by content themes.	Stroke	Patient ability to gain assistance.	One participant tried to use the bathroom by himself when no one answered his call, another did not want to use his call light as he did not want to bother the nurses. Another patient could not reach her call light as it was placed on her weak side and another patient's call light fell out of reach.	NA	Patient's ability to call for help was directly related to fall.
Castner (2014)	n/a	Descriptive, case study.	MSA/Shy Drager Syndrome	Patient ability to gain assistance.	The woman was instructed to use the call light in the event of dizziness and before returning to the stretcher. The patient arose from the toilet unassisted, and then fell to floor.	NA	Patient did not follow instructions which was directly associated with her fall.
Eastwood (1999)	Level II	Prospective cohort	MS, Stroke, TBI	NA	Patients demonstrated confusion, verbal aggression.	NA	Verbal aggression discussed.
Hill (2015)	Level II	Prospective observational	Cognitive impairment	Patient ability to gain assistance.	Patient feedback on staff actions included: provide more accurate mobility instructions to patients and ensure patient can always reach call bell. Patient goals included using call bell for assistance.	NA	Not discussed.
Luxford (2015)	Level IV	Case series	Dementia	Implementation of a communication strategy.	Examples of 'TOP 5' communication strategies included discussing health issues in a professional manner and informing patient that emergencies were being responded to. Implementation of the communication strategy resulted in decreased patient falls.	NA	Authors discussed the indication that their defined communication strategy (i.e., the TOP 5) was associated with improved satisfaction, and had potential patient safety benefits (where safety was measured in falls events). Improved communication reduced patient agitation, lessening the need for restraint and anti-psychotic medication - due to a link between

Table 3 (*continued*)

First author (year)	Level of Evidence (Merlin et al. 2009)	Study type	Participant group	Method	Results	Communication disability contributes to falls	Communication disability in the discussion section
							these medications and falls, this may also have contributed to improved patient safety.
Mansfield (2013)	Level III-2	Retrospective cohort	Stroke	Listed as an activity at time of the fall.	At time of fall patient was engaging in conversation and was distracted.	NA	Not discussed.
Park (2004)	Level IV	Study of diagnostic yield	Dementia	Verbal communication as a common nursing diagnosis for patients with dementia. Falls as a co-diagnosis with dementia.	Co-occurring diagnosis with dementia: knowledge deficits (71%), impaired verbal communication (11%).	NA	Impaired verbal communication was a co-diagnosis with dementia.
Saverino (2015)	Level II	Prospective cohort	MS, stroke, spinal cord injury	Excluded patients with severe communication disorder.	Delineated FIM expression and comprehension items to indicate patients were "cognitively intact", but otherwise used FIM cognitive total.	NA	Notes that patients with severe communication disorder were excluded, and that patients classified as having cognitive disorder may have had communication disorder instead.
Smith (2006)	Level II	Prospective cohort	Stroke	Aphasia is noted in study design regarding consent to study, as a barrier to participation.	Consent was obtained from the carer if the patient could not give consent due to aphasia or cognitive impairment.	NA	Not discussed.
Suzuki (2005)	Level III-2	Retrospective cohort	Stroke	Not addressed.	Not addressed	NA	Included in the low cognitive score group were patients with aphasia, dementia, neglect, and confusion, but these populations were not delineated elsewhere in the study. The authors noted in the discussion that presence of aphasia may have influenced cognitive scores.
Tuffrey-Wijne (2014)	n/a	Mixed methods design. Involved surveys, interviews, expert panel, incident report data.	Intellectual disabilities	Patient-provider communication.	Reduced ability to communicate with patients about medical symptoms and history were linked to misdiagnosis. Incidents were reported where the patient did not understand what she was being told, and patient calling out before being found on the floor by staff. Difficulties communicating between patients with intellectual disabilities and staff were of particular concern as it could result in inappropriate treatment.	NA (not directly linked to falls, but identified as a safety concern)	Patients with intellectual disabilities have difficulties understanding information, learning new skills and they also have impaired social skills. Results section notes communication difficulties led to issues regarding consent, delayed treatment and misdiagnosis. Falls may have resulted from reduced patient understanding of information provided by staff.

ABI: Acquired brain injury; COWAT: Controlled Oral Word Association Test (Spreen & Strauss, 1991); FIM: Functional Independence Measure;(Uniform Data System for Medical Rehabilitation, 2009) WAIS: Wechsler Adult Intelligence Scale (Wiens, Bryan, & Crossen, 1993) Wisconsin Card Sorting Test (WCST)(Heaton, 1982); TBI: traumatic brain injury; MS: Multiple sclerosis; MSA: Multi-systems atrophy; PD: Parkinson's disease.

Note: Levels of Evidence from The National Health and Medical Research Council hierarchy of evidence (Merlin et al., 2009):

Level I Evidence obtained from a systematic review of all relevant randomized controlled trials; Level II Evidence obtained from at least one properly designed randomized controlled trial; Level III-1 Evidence obtained from well-designed pseudo-randomized controlled trials (alternate allocation or some other method); Level III-2 Evidence obtained from comparative studies with concurrent controls and allocation not randomized (cohort studies), case control studies, or interrupted time series with a control group; Level III-3 Evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group; Level IV Evidence obtained from case series, either post-test or pre-test and post-test.

observed among patients with executive function impairment place them at high risk for accident" (p. 632). Similarly, Mion et al. (1989) reported that cognitive impairment "in terms of inability to understand or follow directions and impaired memory or judgment" is "easily identified by the nursing staff, and importantly, identified early in the hospitalization" (p. 20). The importance of nurses attending to these cognitive functions has also been highlighted by Kwan et al. (2012), who identified that nurses – who spend time interacting with patients and therefore are well-placed to observe patient safety – need to observe more closely the patient's "physical and mental functioning" (p. 35).

Overall, most studies in this review that find communication disability to be related to falls (in either direction, to increase or decrease risk) do not elaborate upon the finding, and miss an important opportunity for adding to the knowledge base on *how* communication disability might impact on falls risk. For example, Byers et al. (1990) compared two groups (patients who fell and patients who did not fall) during hospital admission. In the study, four domains of communication were included in the "mental status" section of 101 variables in the authors' falls assessment tool – "cannot follow commands," "speech difficulty," "slurred speech," and "dysarthria" (p. 120). Only "speech difficulty" and "dysarthria" (p. 152) were significant for decreased risk of falls, and the authors did not explore reasons for this finding. However, these categories relating to speech difficulty are problematic as they are not mutually exclusive; dysarthria is a speech difficulty and can also present as slurred speech, leaving open the possibility that the judgements made about speech difficulty were split across categories, thereby reducing confidence in the finding that patients who fell had *less* difficulty speaking and *less* dysarthria than the control group of patients who did not fall. A contrasting finding was reported by Saverino et al. (2006) in that 76% of people who fell had a "communication disturbance" (p. 182), yet still with no discussion of how communication contributed to the falls. Hill et al. (2010) collected data directly from patients with stroke or PD about their falls, and Higaonna (2015) examined the predictive validity of a falls assessment tool containing 35 physical, behavioral, sensory, and cognitive factors, but neither group of authors discussed communication. Moreover, despite the prevalence of communication disability in people with dementia, cognitive impairments, or left hemisphere stroke, researchers investigating falls prevention intervention programs in these groups did not discuss participants' ability to understand instructions (Gilewski et al., 2007; Hill et al., 2010; Hill et al., 2015; Rabadi et al., 2008; Vieira et al., 2013).

Although Zdobysz et al. (2005) did not find communication disability to be a contributing factor to falls, the authors noted the importance of the mental functions of language related to falls:

A transfer may result in a fall because the patient does not understand or remember verbal instructions and recommendations regarding ambulation and physical activity. A patient may also demonstrate impulsive behavior and initiate an unplanned transfer. The care for this patient is centered on decreasing unassisted transfers (Zdobysz et al., 2005, p. 70).

Overall, patient communication was highlighted in the 14 studies focusing on falls prevention programs in a variety of ways: (a) as an item in the falls screening stage (Higaonna, 2015); (b) in the patient's ability to retain and/or understand information (Hanger et al., 2014); (c) in staff providing information that patients cannot understand (Tuffrey-Wijne et al., 2014); (d) in the patient being unable to participate in a falls prevention program due to their communication disability (Bernhardt et al., 2008); (e) in the patient's ability to call for help (Carroll et al., 2010); (f) in discussing health issues with patients improved patient safety (Bernhardt et al., 2008); (g) as a strategy for patient safety (Tzeng & Yin, 2014); and (h) as occurring at the time of fall (Mansfield et al., 2013).

3.4. Cognition as a falls risk

Cognitive function was reported in 72% (or 44) of included studies, in participants with stroke, TBI, hypoxia, PD, encephalopathy, neurologic injury, MS, "other geriatric impairment" (Morrison et al., 2011, p. 902), multiple trauma, complex conditions, elderly patients with dementia/cognitive impairment, brain tumor, subarachnoid hemorrhage, subdural hemorrhage, Alzheimer's disease, and intellectual disability. Measures used for cognition included the FIM (Uniform Data System for Medical Rehabilitation, 2009) cognitive scale total ($n = 18$), the Mini Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975) ($n = 12$), the Falls Risk Assessment Inventory (Byers et al., 1990) ($n = 1$) which includes cognitive functions and communication, the Short Portable Mental Status (Pfeiffer, 1975) ($n = 1$), National Institute of Health Stroke Scale Questionnaire (Goldstein, Bertels, & Davis, 1989) ($n = 2$), Abbreviated Mental Test (AMT) (Qureshi & Hodkinson, 1974) ($n = 4$), other assorted tests of executive function (e.g., the Stoop test (Trenerry, Crosson, Deboe, & Leber, 1989), the WAIS similarities subtest (Weschler, 1987)) ($n = 4$) and staff or medical note of cognitive impairment ($n = 5$). In studies including cognition as a falls risk factor ($n = 31$), the majority (22/31 or 71%) found that low cognitive scores were associated with a higher risk of falls, or that falls rates were lowest in groups with higher cognitive scores. Several studies investigated and reported on the FIM cognitive subscale and its association with fall risk, without reference to communication; even though the FIM cognition subscale items include comprehension, expression, social interaction, problem solving, and memory – all affecting communication functions (e.g., following directions, understanding complex information). Indeed, the test selected for cognitive-communication function could greatly influence the results obtained (Campbell, 2013) when examining the impact of communication disability on falls. Campbell (2013) reported that studies finding no relationship between cognition and falls used cognitive screening tests of *memory* (e.g., the MMSE or AMT), but studies finding a positive link between cognitive impairment and falls used the *cognitive FIM*, a more detailed cognitive-communication rating scale. In the present review, nine of the 44 studies (i.e., 20%) reported cognitive factors being associated with falls without any reference to communication skills or impairments in the tools used to measure cognition (see Table 4).

3.5. Left or right hemisphere stroke patients and falls risk factors

In the 42 studies that reported on patients with stroke, there was only limited reporting on the impact of aphasia, dysarthria, apraxia, right hemisphere communication disorder, or cognitive communication disorder. Brain lesion side was noted in 18 studies, either by reference to the hemisphere injured by stroke (i.e., left, right or bilateral), or to the side of the patient's hemiplegia or hemiparesis. Of these, four studies found that right hemisphere lesion was associated with an increased falls risk (Byers et al., 1990; Rosario et al., 2014; Ugur, Gucuyener, Uzuner, Ozkan, & Ozdemir, 2000; Zdobysz et al., 2005), and four found that left hemisphere stroke, or presence of aphasia, was associated with increased risk of falls (Mion et al., 1989; Saverino et al., 2006; Sinanovic et al., 2012; Sze et al., 2001; Tsur & Segal, 2010). Indeed, two studies (Saverino et al., 2006; Sinanovic et al., 2012) found that aphasia or communication disturbance was one of three falls risk factors, but the authors did not explain this finding or its implications any further. Although Bugdayci et al. (2011) reported that aphasia and lesion side were *not* significantly associated with falls, the study excluded patients with TBI, patients with other neurological disorders or major orthopedic disorders, and patients "who were unable to communicate" (p. e216). Ugur et al. (2000) reported that patients with right hemisphere stroke had twice the risk of falling as other patients, but did not refer to or measure communication as a factor despite the high incidence of communication disability after stroke (Flowers et al., 2013). Increased falls risk after right hemisphere stroke has been attributed variously to "behavioral impulsivity and visual-spatial impairments" (Rosario et al., 2014, p. 90), "neglect phenomena, and attention deficit" (Ugur et al., 2000, p. 50), "mental status," (Byers et al., 1990, p. 148) and "failure to inhibit" (Rapport et al., 1998, p. 622).

Table 4
Studies that examined falls risk and cognition without reference to communication (n = 9).

First author (Year)	Level of evidence (NHMRC)(Merlin et al., 2009)	Study type	Participant group	Cognition assessment	Contributing factor	Findings related to cognition and falls
Gilewski (2007)	Level III-3	Case control	Stroke/neuro rehabilitation	FIM total (+ problem solving item)	Yes	Mobility and problem-solving scores on the FIM were best predictors of falls.
Harlein (2011)	Level III-3	Case control	Cognitive impairment	Staff assessed	Yes	Only 4.2% of patients without a cognitive impairment suffered a fall in comparison to 12.9% of patients with a cognitive impairment. Fall risk was tripled if patient was confused or disorientated. Cognitive impairment was a significant fall risk factor.
Higaonna (2015)	Level III-2	Retrospective cohort	Medical patients including neurosurgical patients	Modified Japanese Nursing Association Fall Risk Assessment Tool	Yes	Poor scores on cognitive items including "forgetful, impaired judgment were associated with increased fall risk.
Hitcho (2004)	Level II	Prospective cohort	Cognitive impairment/dementia	Cognitive status obtained from patient's chart, or through information from family.	Yes	44% fallers were confused at time of event and 32% of fallers had impaired memory. Poor cognition was a fall risk factor.
McKechnie, Fisher, and Pryor (2016a)	Level III-2	Retrospective cohort	TBI	GCS, PTA	Yes	80% of fallers had a GCS of 3–8 (severe brain injury). 92% of fallers had a PTA period greater than four weeks (extremely severe TBI).
Morrison (2011)	Level II	Prospective cohort	Stoke, TBI, other neurological conditions	MMSE	Yes	Neurological impairment was a significant falls risk factor, low MMSE scores were significantly related to falls risk.
Rabadi (2008)	Level III-2	Retrospective cohort	Stroke	FIM, MMSE	Yes	Total FIM and MMSE scores on admission were significantly different, fallers were more likely to demonstrate cognitive impairments. Low MMSE scores were a predictor of falls risk. It was suggested that patients with cognitive impairments had reduced awareness of their impairments and functional skills.
Vassallo et al. (2009)	Level II	Prospective cohort	Cognitive impairment	AMT (Abbreviated Mental Test)		Patients with a cognitive impairment were more likely to fall, experience multiple falls and more likely to be injured from fall. They were also more likely to be older, have a longer hospital length of stay, be discharged to a nursing home and they also had a higher mortality rate. Fallers with cognitive impairment were more likely to have an unsafe gait.
Vlahov (1990)	Level III-2	Retrospective cohort	Stroke and other neurological disorders	Not specified- level of alertness, orientation and mental state collected from incident report.	Yes	Patients who fell within first 60 days after stroke and repeated fallers were more likely to be disorientated. Fallers who were disorientated were also more likely to be injured from fall. Authors suggest the patient's cognition recognition of physical limits is a falls risk factor.

AMT: Abbreviated Mental Test(Qureshi & Hodkinson, 1974); FIM: Functional Independence Measure(Uniform Data System for Medical Rehabilitation, 2009); GCS: Glasgow Coma Scale; MMSE: Mini Mental State Examination (Folstein et al., 1975); PTA: post-traumatic amnesia; TBI: traumatic brain injury.

In total, 14 of the 42 (33%) studies on stroke and falls risk and falls prevention did not refer to patients' communication skills in reporting results (Chen et al., 2010; Forrest et al., 2012; Frisina et al., 2010; Hanger et al., 2014; Hill et al., 2010; Holloway, Tuttle, Baird, & Skelton, 2007; Morrison et al., 2011; Rabadi et al., 2008; Rapport et al., 1993; Saverino et al., 2016; Tutuarima et al., 1993; Ugur et al., 2000; Vlahov, Myers, & Al-Ibrahim, 1990; Wong, Brooks, & Mansfield, 2016), either in presence or absence of aphasia, right hemisphere communication disorder, or cognitive-communication disability (Mion et al., 1989; Saverino et al., 2006; Sinanovic et al., 2012; Sze et al., 2001; Tsur & Segal, 2010).

4. Discussion

This review highlights several problematic issues about the way communication is measured, reported, and discussed in research on falls in hospital. Falls of patients with stroke, or falls on stroke wards, yield important insights into the influence of communication disability on falls, owing to prevalence of communication disability related to aphasia. Given their expertise in the assessment of communication impairment, function, participation, and disability, the inclusion of speech language pathologists in falls research teams could help to ensure that research designs appropriately capture communication disability (Ali, Bath, Lyden, Bernhardt, & Brady, 2014) including the selection of tools used to measure cognitive-communication function. Both direct (e.g., aphasia measures, intelligibility scores, tests of communication function) and indirect measures (e.g., FIM cognitive scales) of communication may be needed to capture the subtleties of communication disability that impact on falls or fall prevention interventions for patients at high risk of communication disability, either through lifelong or acquired health conditions. The research reviewed shows that specific accommodations can be made to include participants with communication disability, such as providing alternative formats for information sheets and supporting participation in interviews about falls (Saverino et al., 2015). As retrospective chart reviews could be used to investigate falls, hospital staff should appropriately document the patient's everyday cognitive and communicative function in the medical record. Providing more detail in the medical record on both the patient's *diagnosis* (e.g., aphasia, dysarthria, apraxia, speech impairment, right hemisphere communication disorder, or cognitive communication disorder) and its *impact* in functional terms (e.g., difficulty following instructions, needs gestures to understand) could inform both clinical and research efforts to reduce falls risk for patients with communication disability Steel et al., 2019.

The results of this review show that despite communication disability being associated with a three-fold increased risk for adverse events in hospital (Bartlett et al., 2008), it is not universally recognized as a relevant patient characteristic to measure, report, take into account, or act upon in falls risk or falls prevention research. In 61 studies with a focus on falls with populations including stroke, TBI, dementia, and other neurological disorders, nearly 23% ($n = 14$) made no reference to communication in either the results or discussion. Terminology used to refer to communication (e.g., disturbance, difficulty, problem) is also not well-defined, making comparison across studies difficult. This means that communication disability could be present in the patient but be 'invisible' or overlooked in the research. There is also lack of consistency in either conflating or separating communication and cognition inappropriately (e.g., in patients who have "cognitive-communication impairments" (American Speech-Language-Hearing Association, 1997, p. 63) related to TBI or dementia). In general, there is a lack of recognition in the reports that cognition can affect communication, and measures of cognition are affected by a patient's communication skills. Finally, patients with communication disability are often excluded from falls risk research or falls prevention research because of their communication, affecting consenting rights or data collection procedures. Their omission from participant groups leads to gaps in knowledge and evidence underpinning strategies to reduce the risk of falls for people with communication disability. Unfortunately, individuals with communication disability are commonly excluded from patient safety education programs as they are unable to follow directions (Choi, Lawler, Boenecke, Ponatoski, & Zimring, 2011; Haines, Hill, Bennell, & Osborne, 2006; Ryu, Roche, & Brunton, 2009). The terminological confusion evident across studies in this review could be resolved through the adoption of a universal set of terminology such as the WHO International Classification of Functioning Disability and Health (World Health Organization, 2001) both in documentation of communication disability in hospital medical records (Steel et al., 2019) and in future falls research. The ICF classifies impairments and distinguishes between terms such as communication, cognition, speech, and language: communication is classified as an Activity; Impairments that contribute to a Communication Activity Limitation include mental functions of language (b167), hearing functions (b230) or voice and speech functions (b3). Mental functions (also known as cognitive functions) such as attention, memory and perceptual functions, are considered separate to language functions.

5. Conclusions

It is vital that falls risk and falls prevention research includes patients with communication disability (particularly difficulty understanding instructions, not primarily related to hearing), to determine any increased risk relating to communication disability and ways to ameliorate this risk through interventions designed to reduce the risk of falls. This review has identified limitations common to many studies involving patients with health conditions associated with a high risk of cognitive and communication impairments. Commonly, patients with communication disability are excluded from falls research; when they are included, the 'invisible' impairments or functions of communication are either not measured at all, or conflated with cognitive functions; and terminology describing patients' communication impairments and functions is not systematic, making comparisons across studies difficult. Lack of attention to problems in understanding language is problematic in falls risk research that includes patients with left hemisphere stroke and aphasia. To date, falls tend to be studied through a restricted frame of analysis preferencing physical functions over communicative functions. A consensus on terminology relating to communication disability, impairments, and functions is now required; as well as a concerted effort by falls researchers to include people with communication disability in their studies. Including speech–language pathologists in falls research teams would help to ensure that measures of communication appropriately identify and detail relevant features of the person's communication disability. Such research might help to explain why one-quarter of the studies in this review examining falls risk reflected patients with communication disability having significantly increased falls risk compared to other patients.

5.1. Practical applications

Clinicians working with patients with communication disability in hospital could advocate for the inclusion of these patients in hospital safety research, and endeavor to provide communication supports that enable such participation. Given that hospital documents are one form of participation in medical chart review research, hospital staff whose scope of practice relates to patient communication (e.g., speech–language pathologists, occupational therapists, social workers, nurses, doctors) need to increase specificity in their reporting of communication diagnosis and function. Describing the patient's communication status as 'non-verbal' or 'speaks' for example, is not sufficient in detailing how the person manages understanding or expression of messages using other forms of communication. Improved documentation of the patient's communication disability in clinical notes (Steel et al., 2019) could include detailing performance information related to everyday communication situations, the categories and codes presented in the ICF (WHO, 2001), and any relevant test instruments (e.g., of language, discourse, or speech). Providing details on the patient's communication function in hospital records might support all staff to be aware of the patient's ability to gain the attention of the nurse, follow instructions, and explain their healthcare needs. Communication function, and not only mental status or cognitive impairment, should also be included on falls risk assessment checklists and falls prevention tools. This is particularly relevant for falls prevention after stroke, where there now tends to be a focus on the physical sequelae of stroke and an increased attention to the presence of aphasia and dysarthria is indicated.

A small number of studies included in this review indicated that falls research about patients with a primary disability of hearing loss might provide additional insights relevant to patients with a secondary disability related to hearing. Further research is needed to determine how adults with communication disability fare in relation to falls prevention programs, and any additional communication supports needs related to their difficulties in both cognitive and communicative demands of these programs. This could help to ensure these patients are not disadvantaged in hospital policies or procedures aiming to reduce the incidence of falls.

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References

Access Economics (2008). *The Economic Impact of Cerebral Palsy in Australia in 2007.* Retrieved from Canberra.

Ali, M., Bath, P. M., Lyden, P. D., Bernhardt, J., & Brady, M. (2014). Representation of people with aphasia in randomized controlled trials of acute stroke interventions. *International Journal of Stroke*, *9*(2), 174–182. https://doi.org/10.1111/ijs.12043.

American Speech-Language-Hearing Association (1993). Definitions of communication disorders and variations. Available from www.asha.org/policy.

American Speech-Language-Hearing Association (1997). *Preferred practice patterns for the profession of speech-language pathology.* Rockville, MD: ASHA.

Aranda-Gallardo, M., Morales-Asencio, J. M., Canca-Sanchez, J. C., Barrero-Sojo, S., Perez-Jimenez, C., Morales-Fernandez, A., & Mora-Banderas, A. M. (2013). Instruments for assessing the risk of falls in acute hospitalized patients: A systematic review and

meta-analysis. *BMC Health Services Research*, *13*, 122. https://doi.org/10.1186/1472-6963-13-122.
Australian Commission on Safety and Quality in Health Care (2012). *National Safety and Quality Health Service Standards (September 2012)*. Sydney: ACSQHC.
Baetens, T., De Kegel, A., Calders, P., Vanderstraeten, G., & Cambier, D. (2011). Prediction of falling among stroke patients in rehabilitation. *Journal of Rehabilitation Medicine*, *43*(10), 876–883. https://doi.org/10.2340/16501977-0873.
Bartlett, G., Blais, R., Tamblyn, R., Clermont, R. J., & MacGibbon, B. (2008). Impact of patient communication problems on the risk of preventable adverse events in acute care settings. *Canadian Medical Association Journal*, *178*(12), 1555–1562. https://doi.org/10.1503/cmaj.070690.
Bernhardt, J., Dewey, H., Thrift, A., Collier, J., & Donnan, G. (2008). A very early rehabilitation trial for stroke (AVERT): Phase II safety and feasibility. *Stroke*, *39*(2), 390–396. https://doi.org/10.1161/STROKEAHA.107.492363.
Blake, M. L., Duffy, J. R., Myers, P. S., & Tompkins, C. A. (2002). Prevalence and patterns of right hemisphere cognitive/communicative deficits: Retrospective data from an inpatient rehabilitation unit. *Aphasiology*, *16*(4–6), 537–547. https://doi.org/10.1080/02687030244000194.
Bugdayci, D., Paker, N., Dere, D., Ozdemir, E., & Ince, N. (2011). Frequency, features, and factors for falls in a group of subacute stroke patients hospitalized for rehabilitation in Istanbul. *Archives of Gerontology and Geriatrics*, *52*(3), e215–e219. https://doi.org/10.1016/j.archger.2010.11.014.
Byers, V., Arrington, M. E., & Finstuen, K. (1990). Predictive risk factors associated with stroke patient falls in acute care settings. *Journal of Neuroscience Nursing*, *22*(3), 147–154 148p https://doi.org/10.1016/j.jcgg.2013.01.001.
Callis, N. (2016). Falls prevention: Identification of predictive fall risk factors. *Applied Nursing Research*, *29*, 53–58. https://doi.org/10.1016/j.apnr.2015.05.007.
Cameron, I. D., Gillespie, L. D., Robertson, M. C., Murray, G. R., Hill, K. D., Cumming, R. G., & Kerse, N. (2012). Interventions for preventing falls in older people in care facilities and hospitals. *Cochrane Database of Systematic Reviews*(12). https://doi.org/10.1002/14651858.CD005465.pub3.
Campbell, G. B. (2013). *Post-stroke cognition as a fall predictor during inpatient rehabilitation*. Pittsburgh: University of Pittsburgh.
Campbell, G. B., & Matthews, J. T. (2010). An integrative review of factors associated with falls during post-stroke rehabilitation. *Journal of Nursing Scholarship*, *42*(4), 395–404. https://doi.org/10.1111/j.1547-5069.2010.01369.x.
Carroll, D., Dykes, P. C., & Hurley, A. C. (2010). Patients' perspectives of falling while in an acute care hospital and suggestions for prevention. *Applied Nursing Research*, *23*, 238–241. https://doi.org/10.1016/j.apnr.2008.10.003.
Castner, J., Sudyn, C., & Hughes, J. (2014). A middle-aged woman falls in the Emergency Department. *Journal of Emergency Nursing*, *40*(6), 613–615. https://doi.org/10.1016/j.jen.2014.08.009.
Chang, J. T., Morton, S. C., Rubenstein, L. Z., Mojica, W. A., Maglione, M., Suttorp, M. J., & Shekelle, P. G. (2004). Interventions for the prevention of falls in older adults: Systematic review and meta-analysis of randomised clinical trials. *BMJ*, *328*(7441), 680.
Chen, X. L., Liu, Y. H., Chan, D. K. Y., Shen, Q., & van Nguyen, H. (2010). Characteristics associated with falls among the elderly within aged care wards in a tertiary hospital: A retrospective case-control study. *Chinese Medical Journal*, *123*(13), 1668–1672. https://doi.org/10.3760/cma.j.issn.0366-6999.2010.13.010.
Choi, Y. S., Lawler, E., Boenecke, C. A., Ponatoski, E. R., & Zimring, C. M. (2011). Developing a multi-systemic fall prevention model, incorporating the physical environment, the care process and technology: A systematic review. *Journal of Advanced Nursing*, *67*(12), 2501–2524. https://doi.org/10.1111/j.1365-2648.2011.05672.x.
Coussement, J., De Paepe, L., Schwendimann, R., Denhaerynck, K., Dejaeger, E., & Milisen, K. (2008). Interventions for preventing falls in acute- and chronic-care hospitals: A systematic review and meta-analysis. *Journal of the American Geriatric Society*, *56*(1), 29–36. https://doi.org/10.1111/j.1532-5415.2007.01508.x.
Czernuszenko, A., & Czlonkowska, A. (2009). Risk factors for falls in stroke patients during inpatient rehabilitation. *Clinical Rehabilitation*, *23*(2), 176–188. https://doi.org/10.1177/0269215508098894.
Deitrick, L. M., Baker, K., Paxton, H., Flores, M., & Swavely, D. (2012). Hourly rounding challenges with implementation of an evidence-based process. *Journal of Nursing Care Quality*, *27*(1), 13–19. https://doi.org/10.1097/NCQ.0b013e318227d7dd.
Dibardino, D., Cohen, E. R., & Didwania, A. (2012). Meta-analysis: Multidisciplinary fall prevention strategies in the acute care inpatient population. *Journal of Hospital Medicine*, *7*(6), 497–503. https://doi.org/10.1002/jhm.1917.
Digby, R., Bloomer, M., & Howard, T. (2011). Improving call bell response times. *Nursing Older People*, *23*(6), 22–27 26p https://doi.org/10.7748/nop2011.07.23.6.22.c8586.
Downton, J. H. (1994). Falls in the elderly. *Nursing Standard*, *8*(19), 54. https://doi.org/10.7748/ns.8.19.54.s62.
Eastwood, E. A., & Schechtman, J. (1999). Direct observation nursing: Adverse patient behaviors and functional outcomes. *Nursing Economics*, *17*(2), 96–102 107p.
Evans, D., Hodgkinson, B., Lambert, L., & Wood, J. (2001). Falls risk factors in the hospital setting: A systematic review. *International Journal of Nursing Practice*, *7*(1), 38–45. https://doi.org/10.1046/j.1440-172x.2001.00269.x.
Flowers, H. L., Silver, F. L., Fang, J., Rochon, E., & Martino, R. (2013). The incidence, co-occurrence, and predictors of dysphagia, dysarthria, and aphasia after first-ever acute ischemic stroke. *Journal of Communication Disorders*, *46*(3), 238–248. https://doi.org/10.1016/j.jcomdis.2013.04.001.
Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal Psychiatric Reseach*, *12*(3), 189–198. https://doi.org/10.1016/0022-3956(75)90026-6.
Forrest, G., Huss, S., Patel, V., Jeffries, J., Myers, D., Barber, C., & Kosier, M. (2012). Falls on an inpatient rehabilitation unit: risk assessment and prevention. *Rehabilitation Nursing*, *37*(2), 56–61 56p https://doi.org/10.1002/RNJ.00010.
Frisina, P. G., Guellnitz, R., & Alverzo, J. (2010). A time series analysis of falls and injury in the inpatient rehabilitation setting. *Rehabilitation Nursing : The Official Journal of the Association of Rehabilitation Nurses*, *35*(4), 141–146 166 https://doi.org/10.1002/j.2048-7940.2010.tb00039.x.
Gilewski, M. J., Roberts, P., Hirata, J., & Riggs, R. (2007). Discriminating high fall risk on an inpatient rehabilitation unit. *Rehabilitation Nursing*, *32*(6), 234–240. https://doi.org/10.1002/j.2048-7940.2007.tb00180.x.
Goldstein, L. B., Bertels, C., & Davis, J. N. (1989). Interrater reliability of the NIH stroke scale. *Archives of Neurology*, *46*(6), 660–662. https://doi.org/10.1001/archneur.1989.00520420080026.
Haines, T. P., Hill, K., Walsh, W., & Osborne, R. (2007). Design-related bias in hospital fall risk screening tool predictive accuracy evaluations: Systematic review and meta-analysis. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *62*(6), 664–672.
Haines, T. P., Hill, K. D., Bennell, K. L., & Osborne, R. H. (2006). Patient education to prevent falls in subacute care. *Clinical Rehabilitation*, *20*(11), 970–979. https://doi.org/10.1177/0269215506070694.
Hanger, H. C., Wills, K. L., & Wilkinson, T. (2014). Classification of falls in stroke rehabilitation – Not all falls are the same. *Clinical Rehabilitation*, *28*(2), 183–195. https://doi.org/10.1177/0269215513496801.
Härlein, J., Dassen, T., Halfens, R. J. G., & Heinze, C. (2009). Fall risk factors in older people with dementia or cognitive impairment: A systematic review. *Journal of Advanced Nursing*, *65*(5), 922–933. https://doi.org/10.1111/j.1365-2648.2008.04950.x.
Harlein, J., Halfens, R. J., Dassen, T., & Lahmann, N. A. (2011). Falls in older hospital inpatients and the effect of cognitive impairment: A secondary analysis of prevalence studies. *Journal of Clinical Nursing*, *20*(1–2), 175–183. https://doi.org/10.1111/j.1365-2702.2010.03460.x.
Hartelius, L., & Svensson, P. (1994). Speech and swallowing symptoms associated with Parkinson's Disease and Multiple Sclerosis: A survey. *Folia Phoniatrica et Logopaedica*, *46*(1), 9–17. https://doi.org/10.1159/000266286.
Healey, F., Scobie, S., Oliver, D., Pryce, A., Thomson, R., & Glampson, B. (2008). Falls in English and Welsh hospitals: A national observational study based on retrospective analysis of 12 months of patient safety incident reports. *Quality and Safety in Health Care*, *17*(6), 424–430. https://doi.org/10.1136/qshc.2007.024695.
Heaton, R. K. (1982). A manual for the card sorting test. Odessa, FL: Psychological Assessment Resources.
Hempel, S., Newberry, S., Wang, Z., Booth, M., Shanman, R., Johnsen, B., & Ganz, D. A. (2013). Hospital fall prevention: A systematic review of implementation, components, adherence, and effectiveness. *Journal of the American Geriatric Society*, *61*(4), 483–494. https://doi.org/10.1111/jgs.12169.
Hemsley, B., Georgiou, A., Hill, S., Rollo, M., Steel, J., & Balandin, S. (2016). An integrative review of patient safety in studies on the care and safety of patients with communication disabilities in hospital. *Patient Education and Counseling*, *99*(4), 501–511. https://doi.org/10.1016/j.pec.2015.10.022.
Higaonna, M. (2015). The predictive validity of a modified Japanese Nursing Association fall risk assessment tool: A retrospective cohort study. *International Journal of Nursing Studies*, *52*(9), 1484–1494. https://doi.org/10.1016/j.ijnurstu.2015.05.009.
Hignett, S., Sands, G., & Griffiths, P. (2013). In-patient falls: What can we learn from incident reports? *Age and Ageing*, *42*(4), 527–531. https://doi.org/10.1093/ageing/aft058.
Hill, A. M., Hoffmann, T., Hill, K., Oliver, D., Beer, C., McPhail, S., & Haines, T. P. (2010). Measuring falls events in acute hospitals - A comparison of three reporting methods to identify missing data in the hospital reporting system. *Journal of the American Geriatrics Society*, *58*(7), 1347–1352. https://doi.org/10.1111/j.1532-5415.2010.02856.x.
Hill, A. M., McPhail, S. M., Waldron, N., Etherton-Beer, C., Ingram, K., Flicker, L., & Haines, T. P. (2015). Fall rates in hospital rehabilitation units after individualised patient and staff education programmes: A pragmatic, stepped-wedge, cluster-randomised controlled trial. *Lancet*, *385*, 2592–2599 North American Edition (9987). 2598p https://doi.org/10.1016/S0140-6736(14)61945-0.
Hitcho, E. B., Krauss, M. J., Birge, S., Claiborne Dunagan, W., Fischer, I., Johnson, S., & Fraser, V. J. (2004). Characteristics and circumstances of falls in a hospital setting: A prospective analysis. *Journal of General Internal Medicine*, *19*(7), 732–739. https://doi.org/10.1111/j.1525-1497.2004.30387.x.
Holloway, R. G., Tuttle, D., Baird, T., & Skelton, W. K. (2007). The safety of hospital stroke care. *Neurology*, *68*(8), 550–555 556p https://doi.org/10.1212/01.wnl.0000254992.39919.2e.
Hurtig, R., & Downey, D. (2009). *Augmentative and Alternative Communication in Acute and critical Care Settings*. San Diego, California: Plural Publishing Inc.
Janken, J. K., Reynolds, B. A., & Swiech, K. (1986). Patient falls in the acute care setting: Identifying risk factors. *Nursing Research*, *35*(4), 215–219.
Jiam, N. T., Li, C., & Agrawal, Y. (2016). Hearing loss and falls: A systematic review and meta-analysis. *Laryngoscope*, *126*(11), 2587–2596. https://doi.org/10.1002/lary.25927.
Joanette, Y., & Goulet, P. (1994). Right Hemisphere and Verbal Communication: Conceptual, Methodological, and Clinical Issues. *Paper presented at the 22nd Clinical Aphasiology Conference, Durango, CO*.
Kauhanen, M. L., Korpelainen, J. T., Hiltunen, P., Määttä, R., Mononen, H., Brusin, E., & Myllylä, V. V. (2000). Aphasia, depression, and non-verbal cognitive impairment in ischaemic stroke. *Cerbrovascular diseases*, *10*(6), 455–461. https://doi.org/10.1159/000016107.
Kwan, F., Kaplan, S., Hudson-McKinney, M., Redman-Bentley, D., & Rosario, E. R. (2012). Comparison of fallers and nonfallers at an inpatient rehabilitation facility: A retrospective review. *Rehabilitation Nursing*, *37*(1), 30–36. https://doi.org/10.1002/rnj.00004.
Lawrence, J. I., & Maher, P. L. (1992). An interdisciplinary falls consult team: A collaborative approach to patient falls. *Journal of Nursing Care Quality*, *6*(3), 21–29.

Lee, J. E., & Stokic, D. S. (2008). Risk factors for falls during inpatient rehabilitation. *American Journal of Physical Medicine & Rehabilitation*, *87*(5), 341–350. https://doi.org/10.1097/PHM.0b013e31816ddc01.

Lin, F. R., & Ferrucci, L. (2012). Hearing loss and falls among older adults in the United States. *Archives of Internal Medicine*, *172*(4), 369–371. https://doi.org/10.1001/archinternmed.2011.728.

Long, S. J., Brown, K. F., Ames, D., & Vincent, C. (2013). What is known about adverse events in older medical hospital inpatients? A systematic review of the literature. *International Journal for Quality in Health Care*, *25*(5), 542–554. https://doi.org/10.1093/intqhc/mzt056.

Luxford, K., Axam, A., Hasnip, F., Dobrohotoff, J., Strudwick, M., Reeve, R., & Viney, R. (2015). Improving clinician-carer communication for safer hospital care: A study of the 'TOP 5′ strategy in patients with dementia. *International Journal for Quality in Health Care*, *27*(3), 175–182. https://doi.org/10.1093/intqhc/mzv026.

Mansfield, A., Inness, E. L., Wong, J. S., Fraser, J. E., & McIlroy, W. E. (2013). Is impaired control of reactive stepping related to falls during inpatient stroke rehabilitation? *Neurorehabilitation and Neural Repair*, *27*(6), 526–533. https://doi.org/10.1177/1545968313478486.

Matarese, M., Ivziku, D., Bartolozzi, F., Piredda, M., & De Marinis, M. G. (2015). Systematic review of fall risk screening tools for older patients in acute hospitals. *Journal of Advanced Nursing*, *71*(6), 1198–1209. https://doi.org/10.1111/jan.12542.

McKechnie, D., Fisher, M. J., & Pryor, J. (2016a). The characteristics of falls in an inpatient traumatic brain injury rehabilitation setting. *Journal of Clinical Nursing*, *25*(1/2), 213–222. https://doi.org/10.1111/jocn.13087.

McKechnie, D., Fisher, M. J., & Pryor, J. (2016b). A case-control study examining the characteristics of patients who fall in an inpatient traumatic brain injury rehabilitation setting. *Journal of Head Trauma Rehabilitation*, *31*(2), E59–E70. https://doi.org/10.1097/htr.0000000000000146.

Meade, C. M., Bursell, A. L., & Ketelsen, L. (2006). Effects of nursing rounds: On patients' call light use, satisfaction, and safety. *The American Journal of Nursing*, *106*(9), 58–70 (quiz 70-51).

Merlin, T., Weston, A., & Tooher, R. (2009). Extending an evidence hierarchy to include topics other than treatment: Revising the Australian 'levels of evidence. *BMC Medical Research Methodology*, *9*(34), 34. https://doi.org/10.1186/1471-2288-9-34.

Miake-Lye, I. M., Hempel, S., Ganz, D. A., & Shekelle, P. G. (2013). Inpatient fall prevention programs as a patient safety strategy: A systematic review. *Annals of Internal Medicine*, *158*(5, 2), 390–396. https://doi.org/10.7326/0003-4819-158-5-201303051-00005.

Middleton, A., Niruban, A., Girling, G., & Myint, P. K. (2010). Communicating in a healthcare setting with people who have hearing loss. *BMJ*, *341*(c4672). https://doi.org/10.1136/bmj.c4672.

Mion, L. C., Gregor, S., Buettner, M., Chwirchak, D., Lee, O., & Paras, W. (1989). Falls in the rehabilitation setting: Incidence and characteristics. *Rehabilitation Nursing*, *14*(1), 17–22. https://doi.org/10.1002/j.2048-7940.1989.tb00667.x.

Morello, R. T., Barker, A. L., Watts, J. J., Haines, T. P., Zavarsek, S. S., Hill, K. D., & Stoelwinder, J. U. (2015). The extra resource burden of in-hospital falls: A cost of falls study. *Medical Journal of Australia*, *203*(9), 367 e361–e368 https://doi.org/10.5694/mja15.00296.

Morrison, G., Lee, H. L., Kuys, S. S., Clarke, J., Bew, P., & Haines, T. P. (2011). Changes in falls risk factors for geriatric diagnostic groups across inpatient, outpatient and domiciliary rehabilitation settings. *Disability & Rehabilitation*, *33*(11), 900–907 908p https://doi.org/10.3109/09638288.2010.514019.

Nyberg, L., & Gustafson, Y. (1995). Patient falls in stroke rehabilitation: A challenge to rehabilitation strategies. *Stroke*, *26*(5), 838–842 835p.

Nyberg, L., & Gustafson, Y. (1996). Using the Downton index to predict those prone to falls in stroke rehabilitation. *Stroke*, *27*(10), 1821–1824.

Nyberg, L., & Gustafson, Y. (1997). Fall prediction index for patients in stroke rehabilitation. *Stroke*, *28*(4), 716–721.

O'Halloran, R., Worrall, L. E., & Hickson, L. (2009). The number of patients with communication related impairments in acute hospital stroke units. *International Journal of Speech-Language Pathology*, *11*(6), 438–449. https://doi.org/10.3109/17549500902741363.

Oliver, D., Britton, M., Seed, P., Martin, F., & Hopper, A. J. (1997). Development and evaluation of an evidence-based risk assessment tool (STRATIFY) to predict which elderly inpatients will fall: Case-control and cohort studies. *BMJ*, *315*, 1049–1053. https://doi.org/10.1136/bmj.315.7115.1049.

Oliver, D., Connelly, J. B., Victor, C. R., Shaw, F. E., Whitehead, A., Genc, Y., & Gosney, M. A. (2007). Strategies to prevent falls and fractures in hospitals and care homes and effect of cognitive impairment: Systematic review and meta-analyses. *BMJ: British Medical Journal*, *334*(7584), 82–85. https://doi.org/10.1136/bmj.39049.706493.55 International Edition.

Oliver, D., Daly, F., Martin, F. C., & McMurdo, M. E. (2004). Risk factors and risk assessment tools for falls in hospital in-patients: A systematic review. *Age and Ageing*, *33*(2), 122–130. https://doi.org/10.1093/ageing/afh017.

Oliver, D., Healey, F., & Haines, T. P. (2010). Preventing falls and fall-related injuries in hospitals. *Clinics in Geriatric Medicine*, *26*(4), 645–692 648p https://doi.org/10.1016/j.cger.2010.06.005.

Oliver, D., Papaioannou, A., Giangregorio, L., Thabane, L., Reizgys, K., & Foster, G. (2008). A systematic review and meta-analysis of studies using the STRATIFY tool for prediction of falls in hospital patients: How well does it work? *Age and Ageing*, *37*(6), 621–627. https://doi.org/10.1093/ageing/afn203.

Park, M., Delaney, C., Maas, M., & Reed, D. (2004). Using a nursing minimum data set with older patients with dementia in an acute care setting. *Journal of Advanced Nursing*, *47*(3), 329–339 311p https://doi.org/10.1111/j.1365-2648.2004.03097.x.

Pfeiffer, E. (1975). A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *Journal of the American Geriatric Society*, *23*(10), 433–441. https://doi.org/10.1111/j.1532-5415.1975.tb00927.x.

Qureshi, K. N., & Hodkinson, H. M. (1974). Evaluation of a ten-question mental test in the institutionalized elderly. *Age and Ageing*, *3*(3), 152–157. https://doi.org/10.1093/ageing/3.3.152.

Rabadi, M. H., Rabadi, F. M., & Peterson, M. (2008). An analysis of falls occurring in patients with stroke on an acute rehabilitation unit. *Rehabilitation Nursing*, *33*(3), 104–109.

Rapport, L. J., Hanks, R. A., Millis, S. R., & Deshpande, S. A. (1998). Executive functioning and predictors of falls in the rehabilitation setting. *Archives of Physical Medicine & Rehabilitation*, *79*(6), 629–633.

Rapport, L. J., Webster, J. S., Flemming, K. L., Lindberg, J. W., Godlewski, M. C., Brees, J. E., & Abadee, P. S. (1993). Predictors of falls among right-hemisphere stroke patients in the rehabilitation setting. *Archives of Physical Medicine and Rehabilitation*, *74*(6), 621–626.

Rigby, K., Clark, R., & Runciman, W. B. (1999). Adverse events in health care: Setting priorities based on economic evaluation. *Journal of Quality in Clinical Practice*, *19*(1), 7–12. https://doi.org/10.1046/j.1440-1762.1999.00301.x.

Rosario, E. R., Kaplan, S. E., Khonsari, S., & Patterson, D. (2014). Predicting and assessing fall risk in an acute inpatient rehabilitation facility. *Rehabilitation Nursing*, *39*(2), 86–93. https://doi.org/10.1002/rnj.114.

Ryu, Y. M., Roche, J. P., & Brunton, M. (2009). Patient and family education for fall prevention: Involving patients and families in a fall prevention program on a neuroscience unit. *Journal of Nursing Care Quality*, *24*(3), 243–249. https://doi.org/10.1097/NCQ.0b013e318194fd7c.

Salamon, L. A., Victory, M., & Bobay, K. (2012). Identification of patients at risk for falls in an inpatient rehabilitation program. *Rehabilitation Nursing*, *37*(6), 292–297 296p https://doi.org/10.1002/rnj.036.

Saverino, A., Benevolo, E., Ottonello, M., Zsirai, E., & Sessarego, P. (2006). Falls in a rehabilitation setting: Functional independence and fall risk. *Europa Medicophysica*, *42*(3), 179–184.

Saverino, A., Moriarty, A., Rantell, K., Waller, D., Ayres, R., & Playford, D. (2015). A qualitative description of falls in a neuro-rehabilitation unit: The use of a standardised fall report including the International Classification of Functioning (ICF) to describe activities and environmental factors. *Disability and Rehabilitation*, *37*(4), 355–362. https://doi.org/10.3109/09638288.2014.923520.

Saverino, A., Waller, D., Rantell, K., Parry, R., Moriarty, A., & Playford, E. D. (2016). The role of cognitive factors in predicting balance and fall risk in a reuro-rehabilitation setting. *PLoS One*, *11*(4), e0153469. https://doi.org/10.1371/journal.pone.0153469.

Schmid, A. A., Wells, C. K., Concato, J., Dallas, M. I., Lo, A. C., Nadeau, S. E., & Bravata, D. M. (2010). Prevalence, predictors, and outcomes of poststroke falls in acute hospital setting. *Journal of Rehabilitation Research and Development*, *47*(6), 553–562.

Seshadri, S., Beiser, A., Kelly-Hayes, M., Kase, C. S., Au, R., Kannel, W. B., & Wolf, P. A. (2006). The lifetime risk of stroke: Estimates from the Framingham Study. *Stroke*, *37*(2), 345–350. https://doi.org/10.1161/01.STR.0000199613.38911.b2.

Shaw, R., Drever, F., Hughes, H., Osborn, S., & Williams, S. (2005). Adverse events and near miss reporting in the NHS. *Quality and Safety in Health Care*, *14*(4), 279–283. https://doi.org/10.1136/qshc.2004.010553.

Sinanovic, O., Raicevic, B., Brkic, M., Hajdarbegovic, E., Zukic, S., Kojic, B., & Imamovic, K. (2012). Falls in hospitalized acute stroke patients. *Medicinski Arhiv*, *66*(1), 33–34.

Smith, J., Forster, A., & Young, J. (2006). Use of the 'STRATIFY' falls risk assessment in patients recovering from acute stroke. *Age and Ageing*, *35*(2), 138–143. https://doi.org/10.1093/ageing/afj027.

Spoelstra, S. L., Given, B. A., & Given, C. W. (2012). Fall prevention in hospitals: An integrative review. *Clinical Nursing Research*, *21*(1), 92–112. https://doi.org/10.1177/1054773811418106.

Spreen, O., & Strauss, E. (1991). *A compendium of neuropsychological tests: Administration, norms, and commentary*. New York: Oxford University Press.

Steel, J., Ferguson, A., Spencer, E., & Togher, L. (2015). Language and cognitive communication during post-traumatic amnesia: A critical synthesis. *NeuroRehabilitation*, *37*(2), 221–234. https://doi.org/10.3233/nre-151255.

Steel, J., Georgiou, A., Balandin, S., Hill, S., Worrall, L., & Hemsley, B. (2019). A content analysis of documentation on communication disability in hospital progress notes: diagnosis, function, and patient safety. *Clinical Rehabilitation. Early online*. https://doi.org/10.1177/0269215518819717717.

Strauss, D., Ojdana, K., Shavelle, R., & Rosenbloom, L. (2004). Decline in function and life expectancy of older persons with cerebral palsy. *NeuroRehabilitation*, *19*(1), 69–78.

Suzuki, T., Sonoda, S., Misawa, K., Saitoh, E., Shimizu, Y., & Kotake, T. (2005). Incidence and consequence of falls in inpatient rehabilitation of stroke patients. *Experimental Aging Research*, *31*(4), 457–469. https://doi.org/10.1080/03610730500206881.

Sze, K., Wong, E., Leung, H. Y., & Woo, J. (2001). Falls among chinese stroke patients during rehabilitation. *Archives of Physical Medicine and Rehabilitation*, *82*(9), 1219–1225. https://doi.org/10.1053/apmr.2001.25094.

Teasell, R., McRae, M., Foley, N., & Bhardwaj, A. (2002). The incidence and consequences of falls in stroke patients during inpatient rehabilitation: factors associated with high risk. *Archives of Physical Medicine & Rehabilitation*, *83*(3), 329–333 325p https://doi.org/10.1053/apmr.2002.29623.

The University of Queensland. (n.d.). Communication Disability Centre. Retrieved from https://shrs.uq.edu.au/research/research-centres-and-units/communication-disability-centre

Trenerry, M. R., Crosson, B., Deboe, J., & Leber, W. R. (1989). *Stroop Neuropsychological Screening Test: Manual*. Odessa (FL): Psychological Assessment Resources.

Tsur, A., & Segal, Z. (2010). Falls in stroke patients: Risk factors and risk management. *Israel Medical Association Journal*, *12*(4), 216–219.

Tuffrey-Wijne, I., Goulding, L., Gordon, V., Abraham, E., Giatras, N., Edwards, C., & Hollins, S. (2014). The challenges in monitoring and preventing patient safety incidents for

people with intellectual disabilities in NHS acute hospitals: Evidence from a mixed-methods study. *BMC Health Services Research*, *14*(1), 432–445. https://doi.org/10.1186/1472-6963-14-432.

Tutuarima, J. A., de Haan, R. J., & Limburg, M. (1993). Number of nursing staff and falls: a case-control study on falls by stroke patients in acute-care settings. *Journal of Advanced Nursing*, *18*(7), 1101–1105 1105p https://doi.org/10.1046/j.1365-2648.1993.18071101.x.

Tzeng, H. M., Titler, M. G., Ronis, D. L., & Yin, C. Y. (2012). The contribution of staff call light response time to fall and injurious fall rates: An exploratory study in four US hospitals using archived hospital data. *BMC Health Services Research*, *12*, 84. https://doi.org/10.1186/1472-6963-12-84.

Tzeng, H. M., & Yin, C. Y. (2009a). Relationship between call light use and response time and inpatient falls in acute care settings. *Journal of Clinical Nursing*, *18*(23), 3333–3341. https://doi.org/10.1111/j.1365-2702.2009.02916.x.

Tzeng, H. M., & Yin, C. Y. (2009b). Are call light use and response time correlated with inpatient falls and inpatient dissatisfaction? [corrected] [published erratum appears in J NURS CARE QUAL 2010 Jul-Sep;25(3):260]. *Journal of Nursing Care Quality*, *24*(3), 232–242 211p https://doi.org/10.1097/NCQ.0b013e3181955f30.

Tzeng, H. M., & Yin, C. Y. (2010). Nurses' response time to call lights and fall occurrences. *Medsurg Nursing*, *19*(5), 266–272.

Tzeng, H. M., & Yin, C. Y. (2013). Frequently observed risk factors for fall-related injuries and effective preventive interventions: A multihospital survey of nurses' perceptions. *Journal of Nursing Care Quality*, *28*(2), 130–138. https://doi.org/10.1097/NCQ.0b013e3182780037.

Tzeng, H. M., & Yin, C. Y. (2014). Most and least helpful aspects of fall prevention education to prevent injurious falls: A qualitative study on nurses' perspectives. *Journal of Clinical Nursing*, *23*(17–18), 2676–2679. https://doi.org/10.1111/jocn.12295.

Ugur, C., Gucuyener, D., Uzuner, N., Ozkan, S., & Ozdemir, G. (2000). Characteristics of falling in patients with stroke. *Journal of Neurology, Neurosurgery, and Psychiatry*, *69*(5), 649–651. https://doi.org/10.1136/jnnp.69.5.649.

Uniform Data System for Medical Rehabilitation (2009). *The FIM System® Clinical Guide, Version 5.2.* Buffalo: UDSMR.

Vassallo, M., Mallela, S. K., Williams, A., Kwan, J., Allen, S., & Sharma, J. C. (2009). Fall risk factors in elderly patients with cognitive impairment on rehabilitation wards. *Geriatrics & Gerontology International*, *9*(1), 41–46. https://doi.org/10.1111/j.1447-0594.2008.00506.x.

Vieira, E. R., Berean, C., Paches, D., Caveny, P., Yuen, D., Ballash, L., & Freund-Heritage, R. (2013). Reducing falls among geriatric rehabilitation patients: A controlled clinical trial. *Clinical Rehabilitation*, *27*(4), 325–335. https://doi.org/10.1177/0269215512456308.

Vieira, E. R., Freund-Heritage, R., & da Costa, B. R. (2011). Risk factors for geriatric patient falls in rehabilitation hospital settings: A systematic review. *Clinical Rehabilitation*, *25*(9), 788–799. https://doi.org/10.1177/0269215511400639.

Vlahov, D., Myers, A. H., & Al-Ibrahim, M. S. (1990). Epidemiology of falls among patients in a rehabilitation hospital. *Archives of Physical Medicine & Rehabilitation*, *71*(1), 8–12 15p.

Watkin, L., Blanchard, M. R., Tookman, A., & Sampson, E. L. (2012). Prospective cohort study of adverse events in older people admitted to the acute general hospital: Risk factors and the impact of dementia. *International Journal of Geriatric Psychiatry*, *27*(1), 76–82. https://doi.org/10.1002/gps.2693.

Weschler, D. A. (1987). *Wechsler Memory Scale-Revised.* New York: Psychological Corporation.

Wiens, A. N., Bryan, J. E., & Crossen, J. R. (1993). Estimated WAIS-R FSIQ from the National Adult Reading Test-Revised in Normal Subjects. *Clinical Neuropsychology*, *7*, 70–84. https://doi.org/10.1080/13854049308401889.

Wong, J. S., Brooks, D., & Mansfield, A. (2016). Do falls experienced during inpatient stroke rehabilitation affect length of stay, functional status, and discharge destination? *Archives of Physical Medicine and Rehabilitation*, *97*(4), 561–566. https://doi.org/10.1016/j.apmr.2015.12.005.

World Health Organization (2001). *International Classification of Functioning, Disability and Health (ICF).* Geneva: World Health Organization.

Young, N. L., Gilbert, T. K., McCormick, A., Ayling-Campos, A., Boydell, K., Law, M., & Williams, J. I. (2007). Youth and young adults with cerebral palsy: Their use of physician and hospital services. *Archives of Physical Medicine and Rehabilitation*, *88*(6), 696–702. https://doi.org/10.1016/j.apmr.2007.03.005.

Zdobysz, J. A., Boradia, P., Ennis, J., & Miller, J. (2005). The relationship between functional independence scores on admission and patient falls after stroke. *Topics in Stroke Rehabilitation*, *12*(2), 65–71. https://doi.org/10.1310/g89q-80vr-p5p7-9pth.

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