



STEP
SAFELY

STRATEGIES FOR PREVENTING AND MANAGING
FALLS ACROSS THE LIFE-COURSE



**World Health
Organization**

Step safely:
strategies for preventing and
managing falls across the **life-course**

Step safely: strategies for preventing and managing falls across the life-course

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FOREWORD

EVERY YEAR MORE THAN 684,000 PEOPLE DIE AS THE RESULT OF A FALL, AND AN ESTIMATED 172 MILLION MORE ARE LEFT WITH SHORT- OR LONG-TERM DISABILITY – A SHOCKING STATISTIC THAT REPRESENTS SUBSTANTIAL HUMAN SUFFERING: IN COMPARISON, 410,000 PEOPLE DIED FROM MALARIA IN 2019.

The vast majority (82%) of these deaths occur in low- and middle-income countries, and globally falls result in more years lived with disability than transport injury, poisoning, drowning and burns combined. Falls are a growing and under-recognized public health issue and many factors – including ageing populations, increased urbanization and sedentary lifestyles – mean that global fall-related injury rates are predicted to rise drastically in the coming decades.

The view that falls are an inevitable part of life, particularly as we age, can create fatalism and complacency when it comes to how we respond to the problem. But there is growing evidence and awareness – upon which this resource is based – that many falls are preventable and that prevention efforts are effective. There is nothing to stop us strengthening these efforts with immediate effect. Fall-prevention efforts can be led and assisted by all who are affected – communities, individuals, employees, employers, institutions, health care professionals, health and social care and leisure service providers, governments, nongovernmental organizations (NGOs) and international collaborations.

In addition, the SDGs and their associated targets give us an international mandate to improve health and reduce health inequity, which aligns well with a key goal of this package: to focus fall-prevention efforts on high-risk groups in both low- and middle-income countries as well as high-income countries. Fall-prevention efforts will contribute to the achievement of three key SDGs:

- **Goal 3:** Ensure healthy lives and promote well-being for all at all ages
- **Goal 8:** Promote inclusive and sustainable economic growth, employment and decent work for all
- **Goal 11:** Make cities and human settlements inclusive, safe, resilient and sustainable

Now is the time to push the prevention and management of falls higher up the planning, policy, research and practice agenda and to reduce the burden of fall-related injury on a local and global scale. The World Health Organization (WHO) urges all concerned individuals to work together to implement these strategies to reduce the growing harm, suffering and loss that result from falls.

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ABBREVIATIONS AND ACRONYMS

UN	United Nations
SDGs	Sustainable Development Goals
WHO	World Health Organization
NGOs	nongovernmental organizations
NHMRC	National Health and Medical Research Council of Australia
PPE	personal protective equipment

KEY TERMS

“PRIMARY PREVENTION”	Refers to the prevention of injury
“SECONDARY PREVENTION”	Refers to reducing the severity of injury
“TERTIARY PREVENTION”	Refers to decreasing the frequency and severity of disability after an injury

SYMBOLS

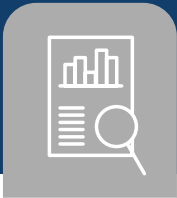
	Safer people
	Safer environments
	Safer policies and legislation

INTRODUCTION





INTRODUCTION



A FALL IS AN EVENT WHICH RESULTS IN A PERSON COMING TO REST INADVERTENTLY ON THE GROUND OR FLOOR OR OTHER LOWER LEVEL. FALLS, TRIPS AND SLIPS CAN OCCUR ON ONE LEVEL OR FROM A HEIGHT (1).

This document, *Step safely: strategies to prevent and manage falls across the life-course*, is a technical package designed to support practitioners, policy-makers, managers, researchers and advocates in their work to prevent falls, and prevent and manage fall-related injuries. It describes how falls are preventable; recommends interventions based on current evidence about what works to prevent falls; and describes how practical and policy interventions can prevent deaths and injuries across the life-course. It also provides implementation guidance on interventions for which implementation caveats feature strongly in the evidence base.

This package is structured using a **life-course approach** (see Box 1) and focuses on falls among three key risk groups: children and adolescents; workers; and older people.

BOX 1

LIFE-COURSE APPROACH TO FALL PREVENTION

A life-course approach to fall prevention considers the role of individual, biological, social, economic and environmental factors across the life span that can either prevent or cause falls at every age.

This approach helps identify opportunities to enable health-enhancing lifestyles and create safer environments early and at critical periods in the life-course in order to prevent falls (2).

Source: (Transforming our world: the 2030 Agenda for Sustainable Development. United Nations; 2015).



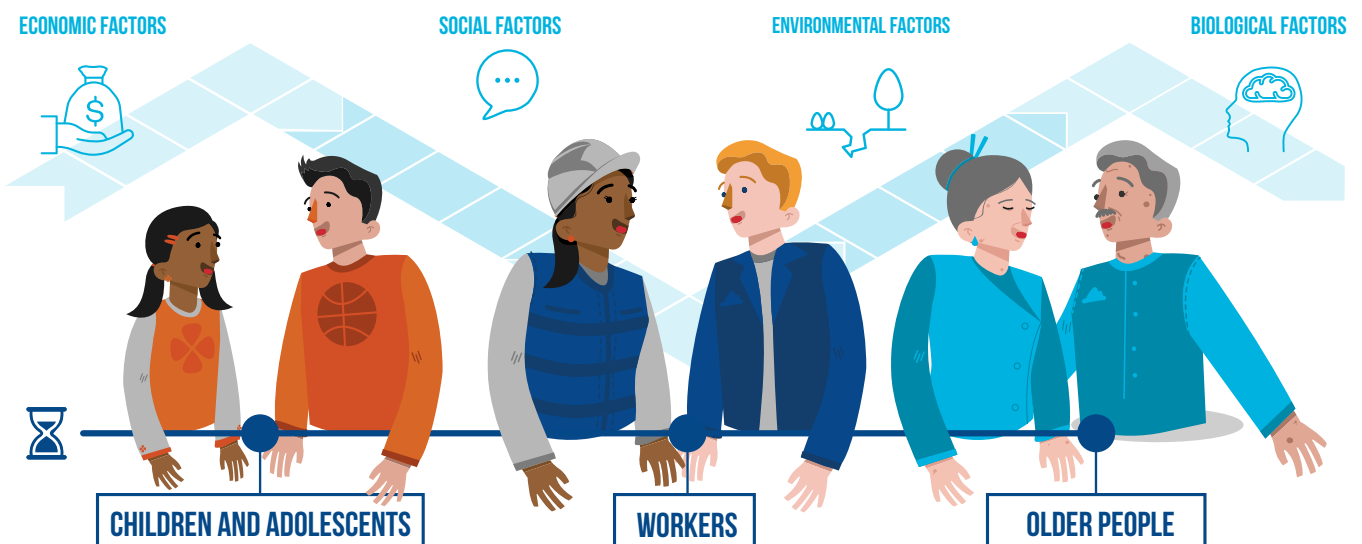
The package also draws on a **systems approach** to help guide comprehensive fall-prevention planning. Such an approach involves seeing falls – their occurrence, and the severity of their outcome – as the result of the interplay of complex factors: a person’s biology (including frailty, muscle and bone strength, balance, vision and cognitive function) (3,4); their behaviour; their physical environment; and their cultural and socioeconomic environment. A systems approach moves beyond individual behaviour and provides for environments, policies and awareness that prioritize safety, creating buffers so that falls are either avoided or made less serious because of protections in place (see Systems approach section, page 11).


WHO IS THIS TECHNICAL PACKAGE FOR?

This package is for all practitioners and stakeholders working to prevent falls among those most at risk. These fall into two broad categories (between which there will be overlap):

- **those working to prevent falls** – from GPs to community nurses, and from parents to occupational therapists and occupational health and safety practitioners;
- **those who help facilitate fall-prevention work** – i.e. people who make political funding decisions, programme managers, fall-prevention advocates, architects and planners etc.

The package is also aimed at decision- and policy-makers, in particular from ministries of health; national lead agencies, where they exist (e.g. in child and adolescent safety, healthy ageing, occupational and public health etc.); and ministries of education, sport, community services, planning, product safety and finance, who can use it to generate greater political and financial engagement with fall-prevention and management.



A low-angle photograph of a worker in a grey t-shirt and shorts sitting on an orange lift bucket. The worker is surrounded by a dense network of black power lines against a clear sky. A hook is visible hanging from the bucket. The text is overlaid on the left side of the image.

THIS TECHNICAL PACKAGE IS DESIGNED TO SUPPORT PRACTITIONERS, POLICY-MAKERS, MANAGERS, RESEARCHERS AND ADVOCATES IN THEIR WORK TO PREVENT FALLS, AND PREVENT AND MANAGE FALL-RELATED INJURIES.



HOW THIS TECHNICAL PACKAGE WAS DEVELOPED

The concept, purpose and scope of this technical package were devised at a WHO Expert Consultation on Fall Prevention and Management in Geneva in June 2016. A global survey of potential end-users of the package (including 67 professionals who deal with fall prevention or management) was conducted and combined with the findings of a rapid review of evidence on what works in the prevention and management of falls. The findings of the survey and the evidence review then directly informed the development of this package.

Rapid review approach

A rapid review approach was taken to summarize the evidence about fall-prevention across three key population groups (5). This approach enabled the collation and synthesis of a large amount of evidence given the time and resources available to develop this technical package.

Evidence identification

Published research about the effect of fall-prevention interventions on fall outcomes in high-, middle- and low-income countries was sought for each key risk group: children and adolescents, workers, and older people (with separate searches conducted for older people in the community, in hospital and in residential care settings). Specific search strategies were developed for each of these population groups and these systematic literature searches were conducted in September 2017. An evidence synthesis report was developed as a standalone document, including details of search terms used, the number of records found, and the studies included (6). In addition, expert context reviewers were asked to suggest any subsequently published systematic reviews or randomized trials that contributed significant new findings to the body of evidence, and such studies were manually added.

Articles were screened for eligibility against agreed criteria to ensure that they related to the key risk groups of interest; that they included an intervention to prevent or manage falls; and that they had reported the effect of this intervention on fall outcomes. For most population groups, only the highest quality study types (systematic reviews and controlled trials) were included in the evidence synthesis report. While this approach ensured that only high-quality evidence was included, it also risked the disregarding of some useful learnings from studies with less robust designs. Thus, because the evidence base for occupational falls is less well developed than for other high-risk groups, a broader range of study types was included (including controlled before-after studies, interrupted time series studies, cohort studies, case-control studies, and crossover studies). Also, in sections where the rapid review approach used tight search criteria focused on systematic reviews and controlled trials, external expert reviewers were asked to nominate any additional key studies they considered important in their field to inform guideline development (for instance, studies of population-based interventions where randomization was not possible but was substituted by another valid research design).



HOW THIS TECHNICAL PACKAGE WAS DEVELOPED

Assessment of quality and strength of evidence





As part of the evidence synthesis report (6), studies were appraised by two or more team members using standardized instruments to assess the quality and risk of bias as appropriate for each study type (7), including the AMSTAR rating tool for systematic reviews (8), Cochrane's Risk of Bias tool for randomized controlled trials (9), the CASP Cohort Study Checklist for cohort and crossover studies (10), and criteria suggested by the Cochrane EPOC Review Group for interrupted time series and controlled before-after studies (11).

Interventions were categorized, and the overall strength of evidence for each intervention was assessed, by two or more team members using the National Health and Medical Research Council of Australia (NHMRC) Levels of Evidence guidelines (7). This is a pragmatic tool well suited for this purpose. It assesses similar domains to the Cochrane GRADE approach and includes a matrix designed for grading evidence recommendations to inform guideline development (see Annex 2). This tool was used to rate the evidence base for each intervention according to: the quality, quantity and type of available studies; the consistency of findings across studies; the extent of clinical impact, risk and benefit; the generalizability of the study population to the population of interest; and the extent of applicability to high-, low-, and middle-income settings. Because most studies were conducted in high-income settings, the rating for the applicability to low- and middle-income settings was based on a judgement of the resources (human, technology, skills etc.) required to implement the intervention. These ratings were then discussed with the full review team at an all-day workshop using a consensus approach.



HOW THIS TECHNICAL PACKAGE WAS DEVELOPED

The evidence base was robust in some areas (e.g. interventions for fall prevention among older people living at home) while in other areas it was promising at best (e.g. occupational falls). The recommendations in this technical package are as follows:

STRENGTH	DEFINITION
 STRONGLY RECOMMENDED	Interventions that were classified according to NHMRC guidelines as A, “excellent” . These interventions are consistently supported by several high-quality systematic reviews and/or randomized controlled trials and have a large benefit.
 RECOMMENDED	Interventions that were classified according to NHMRC guidelines as B, “good” . These interventions are supported by evidence from some robust studies including randomized trials and systematic reviews, and have a significant benefit.
 PROMISING	Interventions that were classified according to NHMRC guidelines as C, “satisfactory” . These interventions are supported by evidence from some robust studies, but there may be only few studies, or studies may have some risk of bias or conflicting evidence about the extent of the benefit of the intervention.
 PRUDENT	Some interventions were classified according to NHMRC guidelines as D, which have poor or weak evidence to support their use. This package nonetheless recommends these interventions as “prudent” where they were judged by experts to be advisable despite a current lack of high-quality research to support their use, where the intervention had face validity and did not result in significant harm in reviewed studies. (It is worth mentioning that some prudent interventions may never have a body of research evidence to support their use because they are unlikely to be the subject of high-quality research studies due to difficulties in performing the required research, or because the intervention seems so basic and fundamental that research is not deemed necessary. This should not rule out these interventions as unimportant or unworthy of consideration, and should rather place them in the “prudent” category.)



HOW THIS TECHNICAL PACKAGE WAS DEVELOPED

Limitations of the research

It is important to note the limitations of research evidence in guiding practice. Much safety practice is not supported by formal research trials with people, but still makes common sense according to the principles of physics and other pure sciences. For instance, there is no body of high-quality evidence to support the use of parachutes for military pilots, but most would agree it is more prudent to use one rather than not if jumping from an aircraft. That said, interventions with neither research evidence nor a strong pragmatic rationale to support their use have not been included as recommendations in the package, though some are discussed in the document where they are commonly used in practice or often described in the literature.

Package preparation and peer review

The draft evidence synthesis report was used as the basis for the development of this technical package. Each population section in the package was initially drafted by a review team member, then one team member took responsibility as the main author for subsequent drafts of the whole document to ensure consistency throughout (see Contributors). This main author then worked with a technical writer and WHO staff on iterative drafts. In February 2020 a draft was circulated by WHO to 50 external reviewers who are global experts in fall prevention and management for critical feedback. This feedback was then collated by WHO and a list of suggested changes was circulated to reviewers and incorporated into the final draft by the authorship team.



WHAT THIS TECHNICAL PACKAGE CONTAINS AND HOW TO USE IT

Section 1: This section identifies the main risk and protective factors for each of the key at-risk risk groups targeted in this package – be it children in playgrounds, homes, schools or the outdoor environment; workers in a range of settings; or older people at home, in residential care or in hospital. It provides the context for falls and fall prevention across the three key age groups, and can help guide decisions on where to focus fall-prevention and management efforts.¹

Section 2 contains a situational assessment that outlines the first steps to understanding local needs (e.g. who is most at risk, what interventions could work in your context; what resources are available), and in deciding what success will look like and how to identify when success has been achieved. This section provides an outline of the key steps involved in performing a situational assessment in any given context, in order to help focus fall-prevention and management efforts.

Section 3 provides a selection of interventions that can be implemented to address the needs identified by the situational assessment. These are labelled strongly recommended, recommended, promising, or prudent, and are presented for each of the three main life-course groups most at risk: children and adolescents, workers, and older people.

This section provides evidence on what works to prevent falls for each key risk group; suggested steps to implement interventions at local or national levels; and links to available tools, research articles and other resources. Case studies are provided throughout as examples of how fall-prevention interventions are being implemented in different settings.




Section 4: This section describes the basic management principles that apply when falls occur, and provides links to resources and guidelines for the treatment and management of serious fall-related injuries. The conclusion summarizes the actions and contexts required to prevent and manage falls at a national and global level.

1. This package cannot and is not intended to cover all populations participating in all activities – for example, it does not address sporting injuries for adults, or occupational injuries to older people. But it addresses the broadest risks for the three broad, at-risk life-course groups.



A SYSTEMS APPROACH TO ADDRESSING FALLS

As well as being defined as strongly recommended, recommended, promising or prudent, and in addition to being tailored to the needs of children and adolescents, workers, and older people, these interventions fall broadly into the three “safe system” domains: safer people, safer environments, and safer policies and legislation (each denoted throughout this package by green symbols). While there is overlap between these domains, they broadly encompass the following:

 <p>PEOPLE</p>	<p>Safer people interventions aim to strengthen awareness, knowledge and skills, and access so that individuals, organizations and communities can make safer choices when it comes to preventing falls. Strengthening awareness includes making people aware of their personal vulnerability to falls (e.g. as a result of loss of muscle strength with age, or reduced vision); awareness of risk factors such as alcohol, medications or hazards in their environment; and greater awareness of evidence-based fall prevention interventions (such as exercise for older adults).</p> <p>Improving access may include ensuring appropriate opportunities for lifelong physical activity that builds and maintains balance, muscle strength and bone density. Safer people interventions also include improving people’s knowledge and skills about how to perform tasks safely or to use products safely – be it a ladder, a child’s highchair or stroller – to avoid a fall.</p>
 <p>ENVIRONMENTS</p>	<p>Safer environment interventions aim to eliminate fall hazards in the home, the community or in the workplace – for example, providing soft-fall surfaces that can reduce the risk of injury to children falling in playgrounds; stair guards to prevent children falling down stairs; or scaffolding for construction workers that includes guard rails and toe boards, planked platforms, and safe access points. They also aim to create supportive active transport and mobility systems and health care facilities and improve product safety.</p>
 <p>POLICIES</p>	<p>Safer policies and legislation interventions are a powerful tool for achieving behavioural or environmental change, especially when accompanied by enforcement.</p> <p>These may include, for example, legislation that demands the use of safe scaffolding, harnesses or helmets; laws that require landlords to install window guards on windows in high-rise accommodation; regulations that stipulate the use of non-slip surfaces in public buildings; or regulations that prohibit unsafe products such as baby walkers; or government policies mandating best practice guidelines for home design or minimum standards for clinical falls risk assessments.</p>



A SYSTEMS APPROACH TO ADDRESSING FALLS

A note on “prevention” terminology

A systems approach to reducing the negative health consequences of falls acknowledges that while we cannot prevent falls from happening all together, we are able to take steps to reduce the chance of a fall occurring and also the amount of harm a person experiences in the event of a fall. Prevention terminology may be used differently across a range of disciplines, so readers should be aware that this package uses the terms primary, secondary and tertiary prevention as defined in the general injury prevention literature, such as the WHO’s *World report on violence and health (2001)* and the WHO/UNICEF *World report on child injury prevention (12)* (see Box 2).

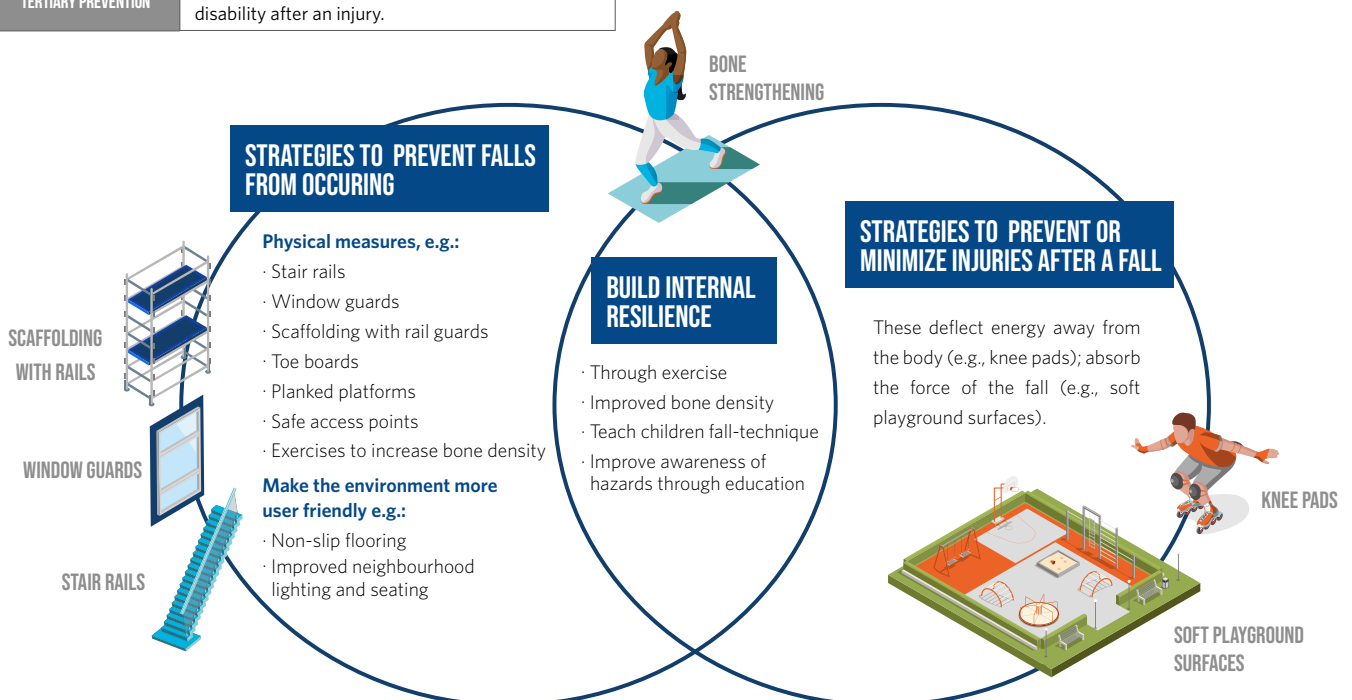
BOX 2


PRIMARY AND SECONDARY INTERVENTIONS TO PREVENT AND MANAGE INJURIOUS FALLS

Interventions that aim to prevent falls from occurring (primary prevention) and interventions that aim to reduce injuries at the time of a fall (secondary prevention) may overlap (see diagram below).

Interventions to reduce injuries after a fall are especially useful for situations where falls are expected (e.g. playing sports) or unpredictable (e.g. working outdoors in mixed terrain), or if the person experiences recurring falls. Sometimes several interventions may be used together. For instance, to protect children when using trampolines, preventive interventions such as supervision and equipment maintenance can be made, alongside secondary interventions such as ensuring a soft fall ground surface beneath the trampoline and that the hard frame is covered with safety padding.

“PRIMARY PREVENTION”	Refers to the prevention of injury.
“SECONDARY PREVENTION”	Refers to reducing the severity of injury.
“TERTIARY PREVENTION”	Refers to decreasing the frequency and severity of disability after an injury.





**GLOBALLY, 75% OF FATAL FALLS
AMONG OLDER PEOPLE (AGED 70
YEARS AND OVER) OCCUR IN LOW-
AND MIDDLE-INCOME COUNTRIES.**



FALLS: KEY FACTS



Globally, over **80%** of fatal falls occur in low- and middle-income countries⁽¹³⁾



GLOBALLY, MORE THAN

684 000

PEOPLE DIE EACH YEAR FROM A FALL ⁽¹³⁾

Falls are the world's **2ND LEADING CAUSE** of **unintentional injury deaths** and are the main cause of morbidity for some age groups and sectors ⁽¹³⁾



Globally, **75% OF FATAL FALLS** among older people (aged 70 years and over) occur in low- and middle-income countries, even though only 65% of people aged 70 years and over live in low- and middle-income countries⁽¹³⁾



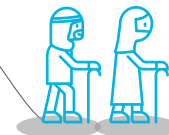
An estimated **172 MILLION** falls each year result in short- or long-term disability⁽¹⁴⁾



Falls are the **leading cause of injury in young children** and are estimated to account for **25–56%** all child injury hospital visits^(12, 15–17)



The estimated number of global deaths from occupational falls was **36 000** in 2017, accounting for **12% of all occupational injury deaths.**⁽¹⁴⁾



AGEING POPULATIONS are associated with the rising number of falls each year⁽¹⁾

● CHILDREN AND ADOLESCENTS ● WORKERS ● OLDER AGE

SECTION 1:

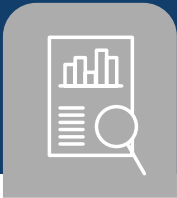
THE MAGNITUDE OF FALLS WORLDWIDE





SECTION 1:

THE MAGNITUDE OF FALLS WORLDWIDE



FALLS ARE THE WORLD'S SECOND LEADING CAUSE OF INJURY MORTALITY AND ACCOUNT FOR OVER 684 000 DEATHS PER YEAR – OVER 80% OF WHICH OCCUR IN LOW- AND MIDDLE-INCOME COUNTRIES (13).

According to the Global Health Estimates, in 2019 just over 66% more people died from falls than from malaria (13). Falls also place a significant burden on health systems, an estimated 172 million falls each year result in short- or long-term disability (14). Globally, falls are responsible for over 38 million disability-adjusted life years (DALYs) every year (18) – a figure that is rising steadily (1,18).

Globally, there was a 53% increase in the number of total deaths due to falls from 2000 to 2019, despite only a 6% increase in deaths due to all injuries combined during the same period (13). This represents an enormous financial and emotional burden for those families and communities affected – and one set to rise dramatically in the decades ahead if the problem is not comprehensively and strategically addressed.





WHY ARE FALLS A GROWING PROBLEM?

There are many factors driving the burden of falls at a global level – not least our ageing populations, as the highest rate of fall-related deaths is among people aged over 60 years (13). Another driving factor is the world’s growing population, which means the proportion of people living in urban areas and in multistorey and high-rise apartment buildings is increasing. This also results in more people working at height in the construction industry (19). High-rise apartment living places young children particularly at risk of serious falls, especially those from families recently relocated from rural areas where most dwellings are only one storey high (12).

Globalization and urbanization also result in the separation of families, and the removal of family-based support systems (20). This is a new phenomenon in many low- and middle-income countries, where residential care facilities and other formal services and supports for older people are not readily available. Increasing numbers of older people now live at home without supportive care, which not only increases the risk of falls but can also impact the quality of life for older people following a fall injury (21). Changes in work, transport and recreation are also leading to more sedentary lifestyles which can increase risk of falls, particularly in older adults (22).

Inequality and the social determinants of fall-related injury

The risk of a fall being fatal is highest in low- and middle-income countries – a stark reminder that inequality is a key factor when it comes to falls and their impact. Just over 80% of fall-related mortality occurs in this group of countries, where poverty can compromise environmental safety and available medical and rehabilitation services (18). Global inequalities in standards of housing, occupational safety and health, and access to safe products also contribute to elevated risk of falls among those living in low-income communities. Limited surgical care and rehabilitation services available to people of low socioeconomic status compounds the burden of falls in terms of health outcomes for the majority of the world’s population.

And these countries’ large and ageing populations are not only increasing the death and disability that can result from falls, but also the burden of the costs of falls for national health systems.

Redressing these health outcome inequities is hampered by the limited data and research on many types of falls and at-risk groups, particularly in low- and middle-income countries. As with many other public health issues, policy-makers and practitioners in these countries face serious flaws in health information in general and injury surveillance in particular, as well as a significant lack of research infrastructure, and consequently a huge gap in the evidence base for the effectiveness of globally recognized fall-prevention and management interventions (23).



WHAT ARE THE RISKS?

The main risk factors for falls relate to people's individual characteristics and circumstances (age, gender, physical capacity, cognitive capacity, developmental stage, socioeconomic status, culture etc.); hazards in the environment in which people live or work (e.g. trip hazards in older people's homes, high-rise dwellings without window guards; unsafe steps, stairs and footpaths; unsafe scaffolding and inappropriate use of ladders); and lack of robust policies to effectively reduce the risk factors for falls and their consequences (e.g. lack of occupational health and safety legislation, lack of legislation compelling landlords to install window guards in high-rise blocks).

Other risks, such as the influence of diet (malnutrition and obesity), a lack of safe transport options (particularly safe active transport options) and difficulty accessing health care, are particularly likely to affect people in low-resource settings (1,24-26), while sedentary lifestyles are a particular issue for those in high income countries.





WHO IS MOST AT RISK?

Three specific population groups account for the highest burden of falls and fall-related injury: older people, children and adolescents and workers in high risk occupations. Older people aged 60 and over have the highest risk of death or serious injury from falls and the risk increases with advancing age (13). Several high-risk occupations predispose workers to fall related injury (14), and among children and adolescents, infants in particular have high fall morbidity rates (13).



CHILDREN AND ADOLESCENTS



Falling is a normal part of development as children explore their (not always child-friendly) environment, learn to walk and challenge themselves. Minor falls are an important part of child development that help children develop fundamental movement skills and risk-assessment skills. Not all falls are problematic, and the aim should not be to eliminate all falls in children entirely, particularly not if this means reduced engagement in physical activity. But serious falls are problematic and children are prone to injurious falls as they are naturally curious and not always able to judge risk well. Around the world, boys are more likely to die from falls than girls (13).

In 2019, falls were responsible for an estimated 31,818 deaths among children and adolescents aged below 15 years (13). Child fall mortality rates are up to three times higher in low- and middle-income countries than high-income countries (27), with the world's highest fatal child fall rates estimated to occur in the low- and middle-income countries of South-East Asia (2.4 per 100 000 deaths) and the Eastern Mediterranean (1.8 per 100 000 deaths) (27).



FALLS IN CHILDREN ARE MORE PREVALENT IN LOW- AND MIDDLE-INCOME COUNTRIES DUE TO FACTORS SUCH AS INFORMAL AND POOR QUALITY HOUSING AND PLAYING UNSUPERVISED IN POTENTIALLY UNSAFE OUTDOOR SPACES.



WHO IS MOST AT RISK?

Risk factors for falls in children and adolescents

Age, gender and poverty are important risk factors for falls (28). Different types of falls occur depending on the developmental phase and activities children are undertaking, and at all stages of child development, boys are more likely to fall than girls (29). There is also a strong link between socioeconomic status and childhood falls. Overcrowding, hazardous environments, single parenthood, young maternal age, low maternal education, caregiver stress and inequities in access to health care all increase the risk of falls and can also limit access to health care when falls do occur (12,30). Falls in children are more prevalent in low- and middle-income countries due to factors such as informal and poor quality housing (16) and playing unsupervised in potentially unsafe outdoor spaces such as in trees, on balconies, or near wells, ladders or edges of fields (31,32). Globally, children living in rural areas are at higher risk of most types of falls compared to children in urban areas, except falls from windows (33).

Growing populations mean our cities are not only getting bigger but also denser. Increasingly, people, including children, live in high-rise apartments and have reduced access to green, recreational and safe open spaces. Urbanization and the expansion of high-rise residential living creates direct risks, such as falls from high-rise windows and balconies, but it also creates a lack of opportunity for lifelong participation in physical activity necessary to develop strength, balance and aerobic fitness required for good health (34). In addition, increasing use of technology means that more children are replacing participation in physical activities, sport and active recreation with more “screen time” as a source of leisure and socialization. Children who do not get enough physical activity, opportunities for safe exploration, adequate nutrition and sunlight, may not achieve peak bone density during late adolescence (making them more prone to osteoporosis in later life), and will also fail to develop the strength, balance or physical literacy to prevent falls and safely assess risk in childhood and adolescence (30,35,36).

Furthermore, a large number of children working in poor conditions, particularly in the construction industry in low- and middle-income countries, are exposed to high fall risk on a daily basis (37). These risk factors for falls present different challenges to be addressed by fall-prevention interventions for low- and middle-income countries when compared to those in high-income countries.



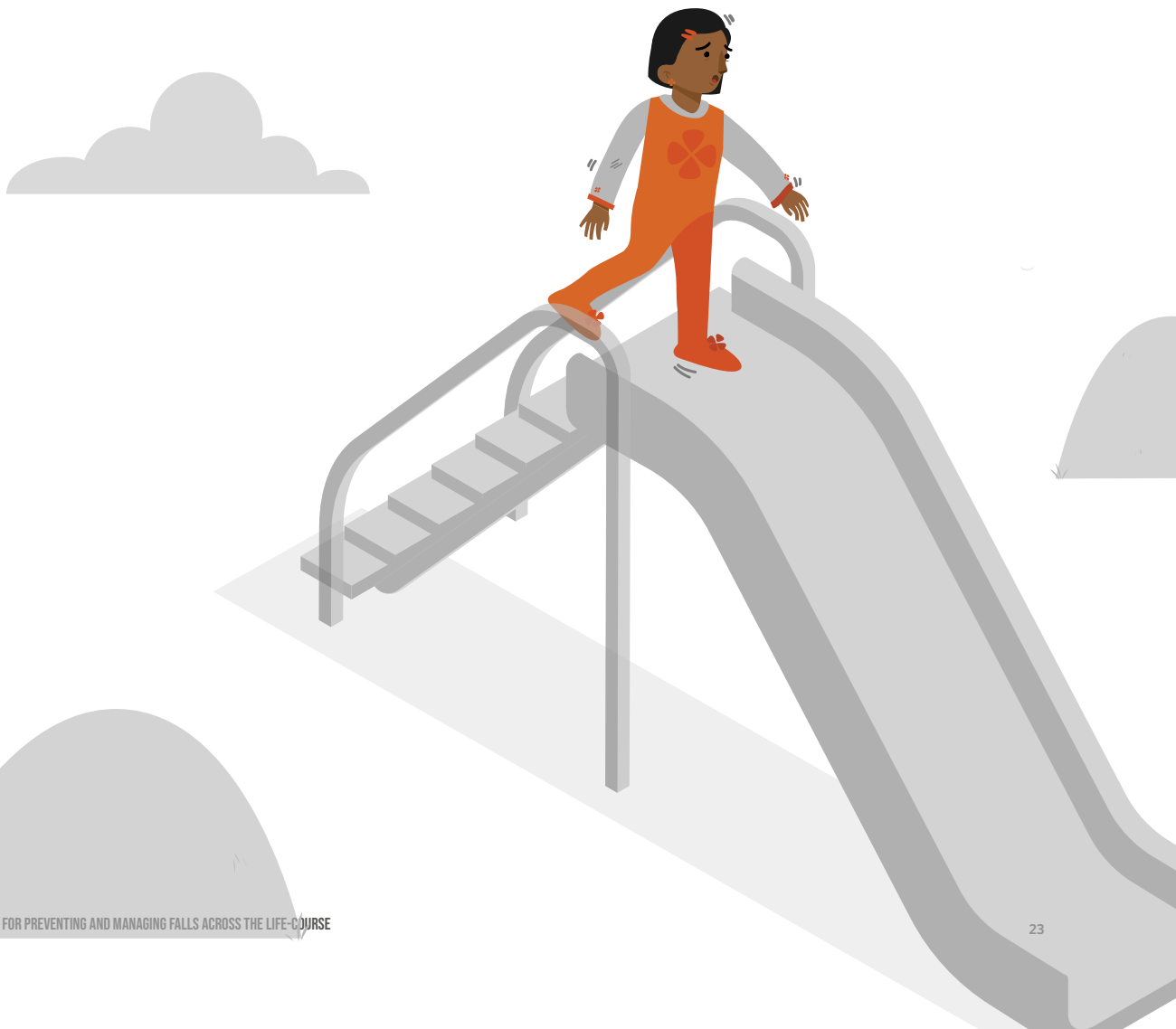
Where do children and adolescents fall?



In and around the home: Most falls among children and adolescents of all ages in both high-, and low-, and middle-income countries occur in the home, and home is also the location of a particularly high proportion of falls for infants and pre-school-aged children (38). Infant falls are most often the result of falling from furniture or from someone's arms at home (38). There is a sound body of evidence demonstrating the effectiveness of home safety interventions in reducing falls risk among children (39–41).



In schools and playgrounds: Falls in playgrounds can be serious, particularly if a child experiences a head injury or a bone fracture in the growth plate area. In schools, a substantial proportion of falls also occur during physical education lessons (42,43). Sedentary children are more prone to sustaining an injury when they do engage in activity, compared to habitually active children, which suggests that developing physical fitness and aptitude in children is protective against falls (44). Physical activity should thus be promoted amongst children and steps taken to make them safer while being physically active, rather than avoiding activity as a means of reducing fall injury risk (44).

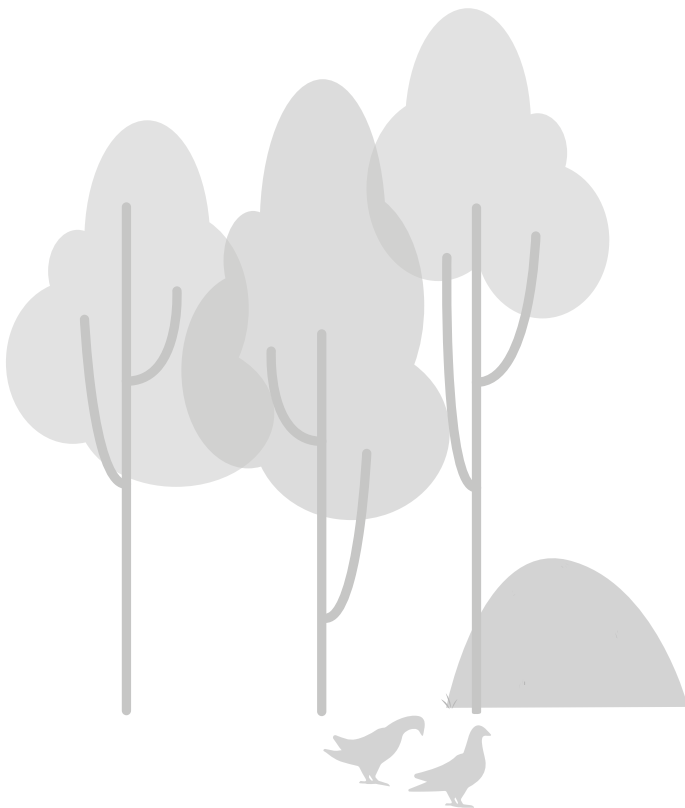




During sports, leisure and outdoor activities: Children and adolescents should be encouraged to engage in active sport and leisure pursuits as part of a healthy lifestyle even though some sporting activities introduce some risk of falls (22,34,45). While there is some evidence about reducing falls in organized sport (46), no formal research about how to reduce falls outdoors (such as into wells, or from trees, rooftops, cliffs and rock ledges, or construction sites) was found in the evidence review for this report.



In the workplace: Children engaged in domestic or paid work can suffer injuries, including falls. Hazardous child labour, i.e. work that can be dangerous to health and safety of children, is prohibited by international convention. Steps to reduce falls must include increased and sustained efforts to eliminate all forms of hazardous child labour (47).





WHO IS MOST AT RISK?



CHILDREN &
ADOLESCENTS



WORKERS



OLDER PEOPLE





WORKING AGE AND ADULTS²

An estimated 317 million people suffer work-related injuries globally each year (48), and in 2017 alone, occupational injuries caused an estimated 304 000 deaths (14).

Falls are among the three most common causes of both fatal and non-fatal occupational injuries in many high-income countries (49–51). In 2017 there were an estimated 36 000 global deaths due to falls that occurred during work (14). In the United States of America (USA) in 2014, falls, slips and trips injured one in every 423 full-time workers and were responsible for the deaths of 798 workers (51). The most frequent injuries resulting from non-fatal falls are sprains, strains and tears, with an average of 12 days lost from work per fall injury in the USA (51). Comparison of occupational fall injuries between countries is difficult because of differences in injury definitions, data sources, and collection techniques (52).

However, studies that account for such differences suggest there is disparity in fall fatality rates not only between high- and low-and-middle-income countries, but also between high-income countries themselves and different jurisdictional areas within countries (53). For instance, fall fatality rates in the UK are approximately one third of those in the USA (53). This may be due to differences in reporting or in modifiable factors such as policy, enforcement and culture (53).

Data on the burden of falls in low- and middle-income countries are limited, but these countries undoubtedly face additional challenges in preventing occupational falls, including higher proportions of informal, poorly regulated labour practices and low enforcement of safety standards compared to high-income countries (54). Differences in employment opportunities, the nature of workplaces, and the degree of implementation and regulation of international occupational safety and health standards across countries also put people in low- and middle-income countries at higher risk of occupational falls (55). Redressing this requires evaluating the relevance, feasibility and applicability of selected effective fall-prevention interventions from high-income countries for low- and middle-income settings.

² There is a lack of global data about workplace injuries in commonly used sources such as the GHE or GBD. Work-related injuries are not generally identifiable in ICD-coded data. Improved standardized work-related injury data collection and coding is required. Occupational data is from sources as cited¹⁴.



WHO IS MOST AT RISK?

Risk factors for falls in workers

Occupational activities that involve hazardous conditions, such as working at height or on slippery, cluttered, or unstable surfaces, increase the risk of falls in the workplace (1). The construction industry has the highest rate of fatal falls in high-income countries; fatal falls from a height occur at over seven times the rate of other industries (56). The vast majority of fatal falls in the construction industry occur among men, reflecting the predominance of men in the construction industry (57). Other industries in which workers are at high risk of falls include cleaning, maintenance, transport, agriculture, warehousing and material moving (51,56,58). Falls from heights are contributing significantly to death and disability in migrant workers travelling to high-income countries to work in the construction industry, for instance in the Middle East (19).

The highest rates of reported non-fatal falls in the USA occur in the health care sector and the wholesale and retail industries (58). In Canada, falls within the health care sector are most common among carers, facility support service workers and community health workers (59), with both the largest number of lost workdays and the costliest fall injuries occurring among female health sector staff (51). Older workers have a higher chance of falling in all workplaces, with those working well into older age particularly vulnerable to occupational falls.





WHO IS MOST AT RISK?

A large proportion of the workforce in low- and middle-income countries is employed in the informal economy (60) where poor working conditions, irregular working hours, a lack of protection, and lack of representation often mean worker safety is overlooked (61). Informal economies often employ vulnerable workers such as children, pregnant women, older persons and migrant workers (62) – all of whom are at higher risk of injury and less likely to have access to insurance or other kinds of social benefits (63). In this context, severe fall injuries can result in permanent exclusion from the labour market and poverty, given frequently absent or inadequate workers' compensation and social welfare (54).



Where do workers fall?

Falls can occur in any workplace. In high-income countries such as the USA, falls among health care sector workers primarily occur in community settings – either outdoors, in patients' rooms or kitchens – and are associated with slippery surfaces due to icy conditions or liquid contaminants (64). Falls on construction sites commonly occur from roofs, ladders and scaffolding, through floor openings and down stairs (65).



There seems to be little evidence relating to **the location and mechanism of falls** in low- and middle-income countries. However, one study shows that in these countries the commonest cause of spinal cord injury is falls from roof tops and trees while collecting fodder for animals – in rural communities many families will own animals for which fodder has to be collected regularly in this way (66) (see Case study 1).



Most evaluated occupational fall-prevention interventions target the **construction, service and health care sectors**. Further research is required to determine whether these interventions are relevant for other occupations where individuals are exposed to high fall risk, such as maintenance, transport and agriculture (55).





WHO IS MOST AT RISK?



CASE STUDY 1

DATA COLLECTION REVEALS ROLE OF FALLS IN TRAUMATIC SPINAL CORD INJURY NEPAL

Data on falls in low- and middle-income countries is often lacking, but some countries are undertaking research to shed light on the problem.

The Spinal Injuries Rehabilitation Centre (SIRC) in Sanga, Nepal, conducted a study on patients admitted between 2015 and 2016, and has found that that falls are the country's main cause of traumatic spinal cord injury (TSCI) – knowledge that could be used to guide future action to prevent such falls.

The SIRC study, conducted on 184 patients, revealed that falls caused almost 70% of TSCI across both genders and all age groups. Of the fall-related incidents, falls from trees (47%) were the most commonly reported, followed by falls from a building or structure (often due to unsafe buildings and a lack of safety precautions) (34%), and falls from a cliff or mountainside (10%). In Nepal, falls predominantly affect farmers and members of rural communities who climb trees to collect fruits and leaves for fodder for their livestock.

Nearly twice as many men than women were admitted to SIRC with fall-related TSCI. As a percentage of all TSCI, falls accounted for over 80% of cases in females, and (over 64%) in males. The epidemiology of fall injuries is complex and the data in this sample may be affected by factors such as differential exposure to fall risks by gender and by lower frequency of admission from rural districts further away from the SIRC.

This study demonstrates a need for injury surveillance and further research, as a better understanding of the pattern of TSCI in Nepal, and other similar low- and middle-income countries in South-East Asia, is essential in order to enable much needed progress in TSCI prevention and rehabilitation within these contexts.

**OUR CHANCES OF BEING
INJURED OR DYING AS A RESULT
OF A FALL INCREASE WITH AGE
ACROSS THE GLOBE.**





WHO IS MOST AT RISK?



OLDER PEOPLE

Our chances of being injured or dying as a result of a fall increase with age (67) across the globe (68). Advancing age is associated with impaired balance, poorer mobility, vision and cognition, each of which can increase the risk of falls (69). Globally, a third of people aged 65 years and older fall at least once per year, with 5% of these falls resulting in a fracture (69-71).

In nursing homes, fall rates are higher, with the average fall incidence estimated to be 1.6 falls per bed per year, with almost half of residents falling more than once a year (72). The main physical consequences of falls among older people are hip fracture, other fracture, traumatic brain injury, damage to intra-thoracic and intra-abdominal organs, spinal and nerve injuries, joint distortion and dislocation, soft-tissue damage, bruises and cuts (73). The fear of falling can also have a significant impact on quality of life in older persons (74).



WHO IS MOST AT RISK?

Risk factors for falls in older age

Falls are hard to attribute to any one risk factor (see Figure 1). Fall risk factors interact dynamically and some risk factors can change (75,76). A range of demographic, physical, psychological, medical, socioeconomic, environmental, behavioural and other risk factors affect falls risk, although older age and a history of past falls are perhaps the most important key predictors of future falls in older people (77). The risk of a fall is higher among older people with low mobility, poor balance, those who are visually impaired, cognitively impaired and those living with Parkinson's disease, arthritis and/or depression (4,78,79).

Gender is also an important risk factor. While younger males are more likely than younger females to die from falls, fall-related death rates are roughly similar for males and females aged over 60 years (13). More than 85% of all fall-related deaths in women occur in those aged over 60 years, while just over 60% of fall-related deaths in men occur in those aged over 60 years (13). The use of medications such as antidepressants, sedatives and antihypertensives, and polypharmacy (the ongoing concurrent use of multiple medications) also increase the risk of falls (80–83), as does the use of alcohol and other recreational drugs. In the event of falls in older persons, low body mass index and osteoporosis are risk factors for fractures (84–86).

For those in residential care, the profile of risk factors differs to that of community dwellers (79). The level of care required also makes a difference, with older people requiring low to middle levels of care more likely to fall than both those requiring a high level of care and those requiring no care (87). In fact those with the highest risk of falls are those in care settings who are able to mobilize, but require assistance (88). Moreover, globalization and urbanization often separate families and lead to the breakdown of family-based support systems (20). This is a new phenomenon in many low- and middle-income countries, where care facilities and formal support services for older people are rare or non-existent. Increasing numbers of older people now live at home without supportive care, which not only increases the risk of falls but can also impact the quality of life for older people following a fall injury (21).

There are interesting cultural differences in fall risks that are yet to be conclusively explained (68). For instance, the rate of falls among older Chinese people is lower than in other countries. Cultural expectations about physical activity throughout the life-course and in old age may play a role – in some cultures there is a belief that older people should rest and not exert themselves while others value remaining fit and active. Choice of activity type may also play a role. Racial and ethnic differences also exist within countries; for instance, Native American and African American people have higher rates of injurious falls than white Americans (89,90).



Where do older people fall?

In and around the home: Older people living independently in the community are most likely to fall in and near their own homes, where falls on stairs and in bathrooms are associated with high risk of injury. Trip hazards, slippery or uneven flooring, poor lighting, clutter and lack of handrails are key environmental fall risks for older people at home (91). Falls also occur away from the home, including in public spaces, on public transport and when navigating road systems as pedestrians or cyclists (92,93) and when using motorized mobility scooters (94).



In residential care facilities: Residential care facilities are domestic settings (including nursing homes and care homes) providing long-term care for people who are no longer able to care for themselves independently due to disability. Older people often adapt poorly to new environments and once placed in residential care are more likely to fall and are more likely to experience severe consequences following a fall compared to those living in the community (87,95). They also have impaired mobility and/or cognition that increases their falls risk. Residents' rooms and adjoining bathrooms are the most common places of falls in residential care, while the periods between late morning and midday, and afternoon and early evening (i.e. before meal times) are the times that falls in residential care are commonly reported (87).





Within residential care facilities, fall-related injuries are more commonly reported and studied among older people in nursing homes. Residential care for older people in low- and middle-income countries is not as readily accessible as in high-income countries, and because of traditional values, older people in low- and middle-income countries are usually reluctant to leave home to live in residential care (96).



In hospitals: Most research on fall prevention in hospitals has been conducted with older adults (97) and reveals that the key risk factors are:

- the impact of surgery or a specific diagnosis on mobility (71,98);
- delirium (99,100);
- the use of particular medications, introduction of new medications and/or other changes to existing medications (71,98,101);
- the unfamiliar and unknown environment, leading to challenges in navigation and mobility (71);
- environmental hazards such as inappropriate bed height (98);
- bed rest and lack of mobilization during hospital stay, leading to reduced mobility and function (102). For example, in 2015 it was estimated that in one of France's largest hospitals, 20% of all patients older than 70 were significantly less able to perform the basic tasks necessary for daily living at the time of discharge than they were when they entered the hospital (103);
- lack of one-to-one patient education on reducing fall risk (104);
- inadequate training or supervision of staff, a lack of protocols or failure to implement protocols (105);
- lack of effective communication between clinical staff and patients, which can undermine opportunities for patients to request mobility assistance and report pain or medication side effects, all of which are related to fall risk (106).



WHO IS MOST AT RISK?

Many other risk factors for falls in hospital settings are general risk factors as well as agitation and confusion, and environmental hazards such as poor lighting, uneven flooring, trip hazards and suboptimal chair heights (79,107–111). The availability of staff able to deal with the needs of older patients may also have an impact on falls risk (98). While many risk factors are not unique to hospital settings, they may be more commonly associated with hospitals due to their higher prevalence among hospital patients. Risk factors for falls in acute hospitals do not seem to differ from those in rehabilitation hospitals (98).

The majority of studies included in the systematic evidence review focused on older adults, and all focused on high-income countries. This lack of evidence on in-hospital fall-prevention interventions in low- and middle-income countries may be due to different practice priorities. For example, many health care services in low- and middle-income countries have historically had to focus on delivering basic service to save the lives of as many people as possible, which has often resulting in limited investment in quality improvement efforts, including patient safety (112,113).





APPROACHES TO PREVENTING AND MANAGING FALLS

Fall prevention and management should take a systems approach, which strives to create safer people, safer environments and safer policies and legislation (see page 11) and uses targeted prevention interventions to address the risk factors.

There is growing evidence about effective interventions, particularly in high-income countries, and fall-prevention interventions have been implemented and evaluated by organizations, services, employers and researchers for many years. International partnerships and centres of research excellence now exist (for example, the Prevention of Falls Network for Dissemination ProFouND partnership, the Fall Prevention Centre of Excellence, the United States Centers for Disease Control and Prevention, USC Leonard Davis School of Gerontology); major forums have been held; and several significant reports and many resources have been published in recent years, including the WHO global report on fall prevention in older age (68,114).

Interventions to address risk factors include improving physical mobility issues, awareness of medication use, community infrastructure and housing, public awareness, appropriate policies and legislation. Research needs to identify best practice in specific settings tailored to different income and resource settings.

While some risk factors cannot be changed (like age and sex), other factors can be modified. Interventions can be exercise-based, behavioural, cultural, educational, clinical, environmental or technological. They can be implemented as single interventions or as part of multicomponent programmes, or multifactorial programmes (these are multicomponent programmes that are tailored to address individual needs and risk-factors).

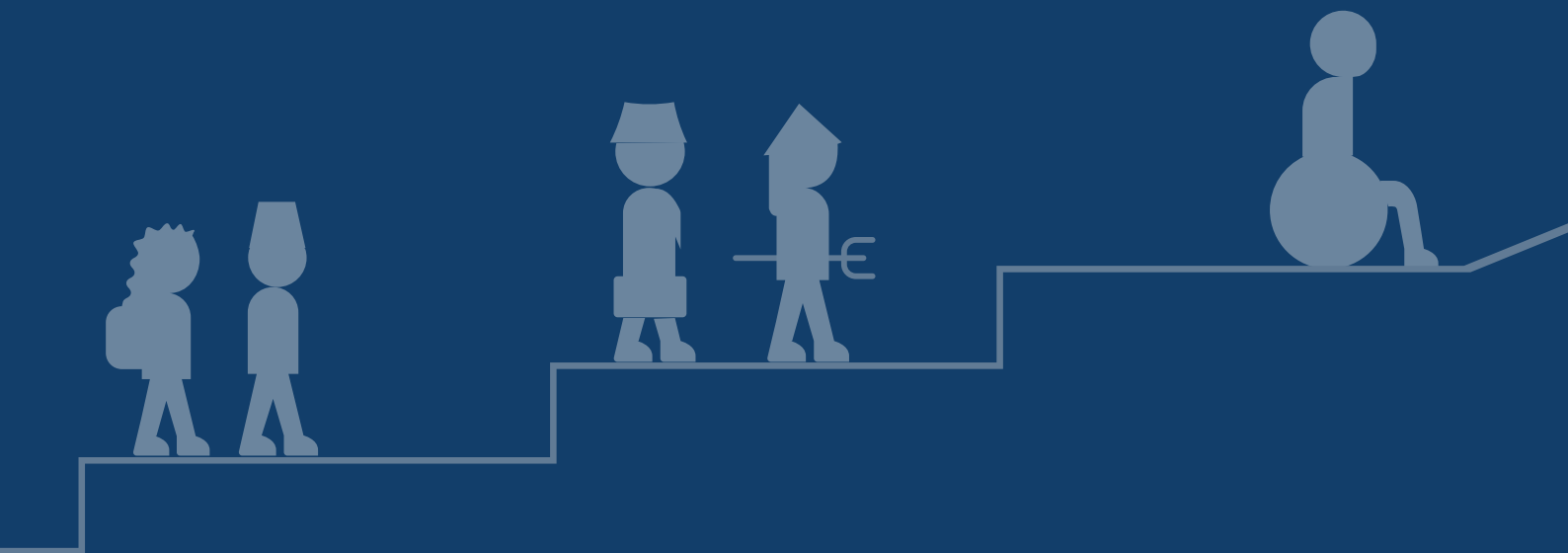
Some of the interventions in this package are “primary prevention interventions” and are designed to prevent falls (e.g. window guards, stair rails, non-slip flooring); others are “secondary prevention interventions” and are designed to minimize the impact of a fall should it happen (e.g. soft surfacing in playgrounds, hip and back protectors, furniture corner covers, exercise to strengthen bones and muscles after a fall etc.). These interventions can be made, as appropriate, during the three key life-course stages highlighted in this technical package: childhood and adolescence; working years; and older age. **Section 2** sets out these interventions according to life-course stage with recommendations based on the strength of evidence available for each. **Section 3** describes “tertiary prevention interventions” – the key aspects of fall management required to prevent death and minimize disability and suffering for those who have experienced a serious fall-related injury.

SECTION 2:

ASSESSING

THE FALLS SITUATION –
KEY STEPS

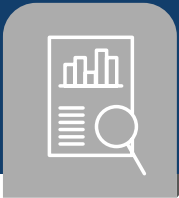






SECTION 2:

ASSESSING THE FALLS SITUATION – KEY STEPS



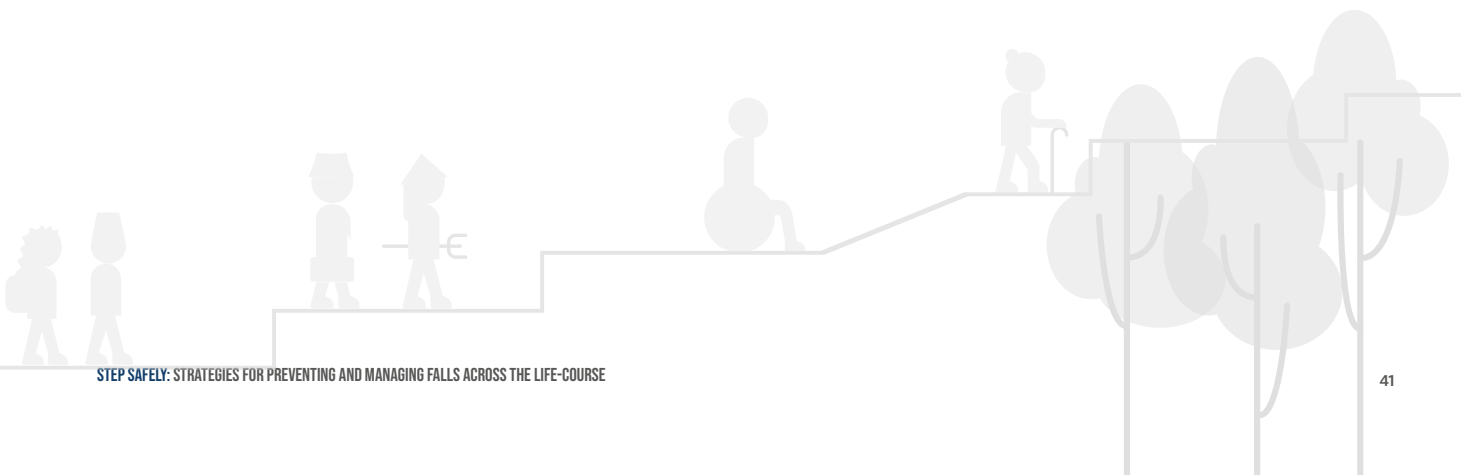
INTERVENTIONS TO PREVENT FALLS SHOULD IDEALLY BEGIN WITH A SITUATIONAL ASSESSMENT IN ORDER TO UNDERSTAND WHICH TYPE OF INTERVENTION WILL BE MOST EFFECTIVE AND COST-EFFECTIVE IN A GIVEN SETTING.

IDENTIFY THE MAIN TYPES OF FALLS IN YOUR AREA



Review all available local, regional or national data to help you decide which populations to target and which data would be most useful for advocacy, including:

- emergency department data
- hospital admission data
- trauma registries
- emergency medical service data (ambulance)
- primary and community care data
- death registries, coroners' statistics, autopsy reports
- hospital outpatient clinic data
- fall-specific surveys involving health practitioners/others
- falls data kept by facilities, workplaces or insurance companies
- occupational health and safety organizations
- local government data





IDENTIFY THE MAIN TYPES OF FALLS IN YOUR AREA

Explore how to access this data in your jurisdiction. If data are not available, consider what systems may be set up to gather data, or if you can gather it for yourself.

- **Identify and consult with the relevant stakeholders** – either in person or through an analysis of relevant online forums.
- **Talk to health professionals about the fall injuries they see** – for a list of relevant practitioners see “Who this package is for” section on page 4.
- **List the key risk factors for falls and the population groups and locations in which people are at greatest risk** – including age, gender, ethnicity, geographic location, family income level, and health status (e.g. the levels of physical activity – active or inactive – of those presenting with falls injuries, and whether they are on medication); types of activities being engaged in (e.g. sports or occupational exposure); environmental characteristics or hazards; locations where most falls occur (e.g. at home, school, or in public spaces such as sidewalks, places of worship, farming areas or fields); time of day, year, or climate-related factors. Are there cultural factors at play that may affect behaviours or attitudes in relation to fall prevention?

IDENTIFY GROUPS, INDUSTRIES OR ORGANIZATIONS WITH WHOM YOU CAN WORK TO ADDRESS FALLS



- **Identify who has an interest in or responsibility** for those most at risk of falling, and for the protective products or the key hazards identified.
- **Identify organizations that may have experience** or expertise, resources or outreach to at-risk groups, including government, community groups, community leaders, businesses, the not-for-profit sector, hospitals, research organizations etc. (these stakeholders will have been identified during step 1).
- **Discuss with these groups** their preferred approach to sharing expertise, information, and resources.
- **Identify ways that stakeholders** can reach or contact at-risk groups and thus opportunities for awareness-raising and engagement in advocacy activity. Remember that it may also be worthwhile to advocate for change in the attitude and behaviour of health care practitioners who may have fatalistic attitudes to falls among older people.
- **Engage with groups** that may not share your concerns but which nevertheless could have an impact – e.g. product manufacturers, landlords’ associations, employers in high-risk industries).
- **Look for mutually beneficial opportunities** with local businesses or other potential partners (e.g. manufacturers or retailers of safety standard-conforming products and safety products).



ASSESS CURRENT EFFORTS TO ADDRESS FALLS AND IDENTIFY POTENTIAL RESOURCES



- **Identify local programmes and resources that are already available.** What are others doing in fall prevention? What opportunities exist to join forces or to use what they have developed?
- **Identify existing initiatives and controls, checklists, training kits or visual aids** that may be useful.





IDENTIFY EXISTING POLICIES AND REGULATIONS, AND OPPORTUNITIES TO FURTHER THESE



- **Identify any existing laws, regulatory frameworks or policies** relevant to the intervention being considered, along with those that should be put in place (relating to health care, labour standards, building codes and regulations, accessibility, education etc.). It may be helpful to tap into international standards to help inform appropriate interventions and ensure their effectiveness, for example on stairs, window guards, scaffolding, nursery furniture, non-slip flooring, E-bikes, motorized mobility scooters etc.
- **Ascertain which entities have legal jurisdiction and responsibility for enforcement of relevant laws and regulatory frameworks related to fall prevention** (e.g. in building and urban design, on building sites, care facilities, schools, workplaces etc.).

The case studies in this package provide some examples of policy “success stories” in relation to fall prevention.

IDENTIFY RESOURCES REQUIRED TO ADDRESS NEEDS HIGHLIGHTED BY SITUATIONAL ASSESSMENT



All stakeholders and partners can consider what resources they need to work on this collaboratively, including elements such as:

Human resources such as:

- Programme staff, specialists or educators
- Sports coaches, exercise and strength and balance trainers
- Health care professionals
- Industry leaders
- Corporate boards
- Community leaders and local NGOs
- Trade unions
- Local businesses
- Researchers and data collectors
- Older people’s associations and advocates
- Technical support for implementation – for example, for a city-wide window guard programme
- Safety and security officers (in hospitals, care homes, schools, on construction sites)



Financial resources for:

- Training and supervision of professionals working to prevent falls among identified high-risk groups
- Transport costs for home visitors
- Training and educational materials
- Risk assessment
- Public awareness campaigns and literature
- Infrastructure – e.g. soft playground surfaces, non-slip floor surfaces in hospitals
- Assistive products and equipment for fall prevention and management (e.g. mobility aids, hospital beds with side rails, personal alarms, and sports and exercise equipment to assist with activities of daily living, such as over-toilet-frames)
- Exercise and strength and balance training classes, and teachers who have been trained to deliver such classes
- Research
- Data collection
- Pilot testing
- Monitoring and evaluation



Potential sources of funding include:

- National, state and local programme budgets with a prevention focus
- Foundations
- Private sector donors or collaborators (for instance in the production of safe and cheap Personal Protective Equipment)
- Government departments
- Regulators
- Charities
- Nongovernmental organizations
- Health care insurers



MONITORING AND EVALUATION



Monitoring is an ongoing process of observing “indicators” (for instance, the number of fall-related injuries or the number of consultations with medical staff resulting from falls).

Evaluation (which should be planned at the outset, and not only once implementation has begun) focuses on determining whether an intervention reached the intended populations, was delivered as planned, was acceptable to participating communities, resulted in fewer and less-damaging falls and fall-related injuries, and/or attained the desired outcome.

Data gathered during both monitoring and evaluation of activities are essential to help decision-makers guide future policies and strategies. Information about the cost-effectiveness of interventions is particularly useful for those making decisions about resource allocation where competing priorities must be weighed.

Systems to monitor falls and the impact of fall-prevention interventions should suit local settings, although the ability to compare findings with other settings (for instance, other countries, facilities or workplace settings) is very useful.

It is worth mentioning that not all countries currently have routine systems for collecting data to monitor numbers of falls or to evaluate the effect of interventions. These systems are vitally important and should be developed wherever possible, which necessarily requires the commitment of resources. Where routine data systems do not exist, practitioners and policy-makers should consider the options available to collect data to determine the effectiveness of an intervention in their context or setting (even if the data collection does not continue after the end of the evaluation).

Many locally implemented falls prevention programmes will not be large enough to show a reduction in falls over a reasonable time frame. In settings where datasets or timeframes are too small to demonstrate a reduction in falls or fall related injuries, it is better to focus on implementing evidence-based interventions and evaluating the implementation process or proxy outcomes associated with falls.

When it comes to occupational falls and workplace injuries there is a general lack of global data in commonly used sources such as the Global Health Estimates or the Global Burden of Disease, and work-related injuries are not generally identifiable in ICD-coded data. Improved, standardized, work-related injury data collection and coding is therefore required.

Each of the sections on the three life-course groups in this package has its own monitoring and evaluation segment.

SECTION 3:

INTERVENTIONS

**FOR PREVENTING FALLS
ACROSS THE LIFE-COURSE**





SECTION 3:

INTERVENTIONS FOR PREVENTING FALLS ACROSS THE LIFE-COURSE

The fall prevention interventions in this package focus on the three key risk groups:





The burden of falls among these population groups can be reduced locally (in homes and communities), institutionally (in schools, workplaces, hospitals, and care homes), and nationally (through policies, laws, research, monitoring and evaluation). Interventions can address risk and protective factors for falls across the life-course, and some (e.g. improving fitness, greater awareness, installation of hazard barriers) have been shown to have preventive effects for different age groups and across many settings.

This section provides an overview of interventions (primary, secondary, or tertiary, see page ix for definitions) to prevent injurious falls for which there is evidence or expert consensus and provides examples of how to reduce the likelihood of falls; modify risk factors for such falls; or reduce the immediate and long-term consequences of fall-related injury.

The interventions are rated as strongly recommended, recommended, promising or prudent. It is important to note that this section is based only on a review of high-quality research evidence to date and thus cannot be considered an exhaustive list of all potential policies, programmes and practices that may reduce falls and fall-related injuries.





INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS CHILDREN AND ADOLESCENTS

This section describes interventions to reduce falls among children in three settings:



IN THE HOME



IN SCHOOLS AND PLAYGROUNDS



DURING SPORTS AND LEISURE ACTIVITIES








INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS



IN THE HOME

SUMMARY OF KEY INTERVENTIONS: PREVENTING FALLS AMONG CHILDREN AND ADOLESCENTS IN THE HOME	
 RECOMMENDED	<ul style="list-style-type: none"> Give parents information about child fall risks and support them to reduce these risks around the home. Provide parenting programmes for low-income and other marginalized families.
 PROMISING	<ul style="list-style-type: none"> Home visits and safety assessments with multiple components. Install window guards, bars and childproof locks for windows in high-rise blocks. Use stair guards or gates. Discourage baby walkers.
 PRUDENT	<ul style="list-style-type: none"> Include corner protectors for sharp furniture corners as part of a home safety programme for new parents or for parents with young children. Improved safety standards for children’s equipment and furniture. Child-friendly housing designs and building codes. Raise awareness of the importance of supervising young children among parents and carers. Rental housing policies that ensure regular safety checks. Provide opportunities for children to be active in play and recreation. Fence off or otherwise restrict access to dangerous areas.



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN THE HOME



Most falls among children and adolescents (in countries of all income levels) occur in the home, and home is the location of a particularly high proportion of falls for infants and pre-school aged children (38,40,115,116).

The body of evidence demonstrating the effectiveness of home safety interventions in reducing falls among children is growing.






Safer people



Safer environments



Safer policies and legislation

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>RECOMMENDED</p>	 <p>PEOPLE</p>  <p>ENVIRONMENTS</p>	<ul style="list-style-type: none"> <p>Give parents information about child fall risks and support them to reduce these risks around the home: Giving parents home safety information can reduce injuries from falls (40) and educating parents about home safety also increases the use of safety equipment, which in turn reduces the risk of falls (39,117). Parent education may be more effective when the safety advice is tailored to the family rather than generic, relates to the distinct stages of the child’s physical and cognitive development, is provided in a systematic manner (based on an evidence-based protocol) and is adjustable to the specific needs of the caretaker (40). Parent education about child home safety is normally most effective when delivered one-on-one and in conjunction with home visits and assessments by trained staff, though these are quite expensive (39).</p> <p>Provide parenting programmes for low-income and other marginalized families: Even parenting programmes that do not specifically target child injury, do, in fact, result in reduced child injury in vulnerable families (single parent, young parents and parents with learning difficulties), and some evidence indicates that these programmes can also improve the safety of home environments (116). Parenting programmes may help parents develop realistic expectations of their child’s developmental abilities and behaviours, and can also address the broad social determinants of injury including parent social support, mental health, positive parenting and supervision practices, and facilitate access to supportive services for families who need it most (116).</p>
















INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN THE HOME

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>ENVIRONMENTS</p>	<ul style="list-style-type: none"> Home visits and safety assessments with multiple components: Home safety assessments by trained staff can be particularly effective when accompanied by safety product give-aways such as stair gates (118), window guards or locks, furniture corner cushions, and advice on their installation (41,116). There is some evidence that multiple home visits are more effective than single visits in changing parental behaviour (119). Home visits are labour-intensive, and where resources do not allow for such population-wide approaches, targeting low-income families is advisable, as children of low income households are at greater risk of fall-related injury and there is evidence that home visits are effective for vulnerable households, including single-parent families, young parents and low-income families (41,116). There is also evidence that the provision of free or low-cost general home safety improvements such as the installation of handrails for stairs and steps, non-slip surfacing, and fixing of loose carpets reduce falls among children as well as among older people (120) (see Case study 2).
 <p>PROMISING</p>	 <p>POLICIES</p>  <p>ENVIRONMENTS</p>	<ul style="list-style-type: none"> Install window guards, bars and childproof locks for windows in high-rise blocks: This can be achieved through voluntary window guard provision and installation programmes or by making landlords liable for the installation and maintenance of window safety devices (40,121,122). There is some evidence that window safety education campaigns coupled with the provision, installation and maintenance of free window guards are more effective than those where individuals buy and install them themselves (123) and that legal requirements of landlords and clear avenues for remedy for noncompliant landlords may increase effectiveness. Discourage baby walkers: Home visit staff should advise parents and carers who have baby walkers to discard them, especially in homes with stairs. In addition to causing injuries, baby walkers can also lead to underdevelopment of the lower limbs. Parental education reduces baby walker possession and use (39,40,117,118,121), but voluntary standards or legislation banning walkers may reduce risk more than parental education (125,126).
 <p>PROMISING</p>	 <p>ENVIRONMENTS</p>	<ul style="list-style-type: none"> Use stair guards or gates. Use stair guards or gates: Parents and carers should be encouraged to use stair guards or gates, uptake of which can be improved by the provision and/or installation of free or subsidized home safety equipment (40,118,121,122,124).



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN THE HOME

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PRUDENT</p>	 <p>ENVIRONMENTS</p>	<ul style="list-style-type: none"> • Include corner protectors for sharp furniture corners as part of a home safety programme for new parents or for parents with young children: The use of furniture corner cushions increases when they are provided free of charge, or when carers are given advice on where to buy them. While these do not prevent falls they can reduce the severity of fall-related injury. Provide instructions for use and resources about where these can be accessed in brochures and websites. Include information about furniture corner protectors in education and awareness campaigns for parents and for people who work with parents, early childhood educators and paediatricians (40,41). • Fence off or otherwise restrict access to dangerous areas: This includes cliffs, wells and pools (40).
 <p>PRUDENT</p>	 <p>ENVIRONMENTS</p>  <p>PEOPLE</p>	<ul style="list-style-type: none"> • Improved safety standards for children's equipment and furniture: This includes standards for prams, strollers, highchairs, cots, playpens, bunk beds, trampolines and supermarket trolleys (38). • Child-friendly housing designs and building codes: This can include a reduced number of stairs, or design of stairs that can be blocked or fitted with a gate, along with the use of safety glass rather than annealed glass (40,124).
 <p>PRUDENT</p>	 <p>PEOPLE</p>	<ul style="list-style-type: none"> • Raise awareness of the importance of supervising young children among parents and carers: This is especially prudent in relation to leaving children on raised surfaces such as changing tables or with children playing or climbing on furniture, or near heights and other hazards such as stairs, water, trees etc. (117,121). • Provide opportunities for children to be active in play and recreation: This should include diverse activities that develop balance, strength, control and coordination (34,128,129).
 <p>PRUDENT</p>	 <p>POLICIES</p>	<ul style="list-style-type: none"> • Rental housing policies that ensure regular safety checks: This includes safety checks on, for example, the condition of bannisters, and provision of subsidized stair guards for dwellings with young children, particularly for those renting from a social housing provider (120,127).
 <p>PRUDENT</p>	 <p>PEOPLE</p>	<ul style="list-style-type: none"> • Provide opportunities for children to be active in play and recreation: This should include diverse activities that develop balance, strength, control and coordination (34,128,129).
 <p>PRUDENT</p>	 <p>ENVIRONMENTS</p>	<ul style="list-style-type: none"> • Fence off or otherwise restrict access to dangerous areas: This includes cliffs, wells and pools (40).



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN THE HOME



CASE STUDY 2

WINDOW GUARDS AND STRONG LEGISLATION CUT FALLS DEATHS

NEW YORK CITY, USA

In the 1970s, New York City Department of Health (NYCDOH) implemented the United States' first window guard intervention to prevent children falling from windows.

The initiative began with a pilot programme in which police and hospitals voluntarily reported window falls to the health department. A public health nurse visited each home where a fall occurred to determine the circumstances, counsel families on injury prevention and arrange for window guard installation.

NYCDOH distributed printed materials with the slogan “Children Can’t Fly”, aired TV and radio prevention messages, and distributed approximately 16 000 free window guards to 4200 families. Window falls decreased in the Bronx by 41% from 1973 to 1974 and the pilot programme was expanded citywide during 1974–1975. In 1976, the NYC Board of Health amended the city’s Health Code to require landlords and building owners to install window guards in apartments housing children aged M10 years, and health-care professionals to report child window falls to NYCDOH.

In the 1980s there was an unexplained rise in the number of window falls. In response, in 1986 the legislation was strengthened, requiring owners to inspect apartments for which tenants did not provide information on child residents. Owners also had to install window guards whenever a tenant requested, regardless of whether children resided in the unit.

At the same time, NYC intensified enforcement efforts by criminally prosecuting non-compliant building owners for Health Code violations, ensuring that owners faced real repercussions for non-compliance. City authorities also implemented an Emergency Repair Programme to install window guards and bill non-compliant owners for their cost. From 2000 to 2016 the city’s Emergency Repair Programme installed window guards in response to over 55 000 violations.

In 1976, 217 children fell out of windows and 24 children died. In 2016 there were nine window falls and two deaths. The window guard programme is estimated to have saved hundreds of children from injury and death and will continue to protect the city’s children.

Source: (130)



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS



IN SCHOOLS AND PLAYGROUNDS

Several playground design features can lessen the risk of serious injury, including reduced equipment height, climb-proof barriers to high areas, soft-fall surfaces and separate areas for different child-age groups and children who have different developmental abilities and needs.

SUMMARY OF KEY INTERVENTIONS: PREVENTING FALLS AMONG CHILDREN AND ADOLESCENTS IN SCHOOLS AND PLAYGROUNDS



PROMISING

- **Provide soft-fall surfacing in playgrounds and playing fields**, and padded or flexible goal posts.
- **Provide school-based teaching** of martial arts-based fall techniques and exercises.












PRUDENT

- **Promote policies** and playground standards requiring soft play surfaces and restricted fall heights.
- Promote **safer trampoline** use and design.
- **Provide physical education (PE)** at school and ample opportunities for active play.





INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN SCHOOLS AND PLAYGROUNDS

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 PROMISING	 ENVIRONMENTS	<ul style="list-style-type: none"> Soft-fall surfacing in playgrounds and playing fields, and padded or flexible goal posts: Fracture rates can be lowered with the introduction of soft-fall surfaces below and around play equipment (131) as soft-fall surfaces reduce the impact of falls and thereby reduce injury severity. There are safety standards about the appropriate depth of soft fall surfacing (some suggest soft fall sand should be 23–31 cm deep) (131) and there is some evidence that granite sand results in fewer fractures than woodchip (131). Soft-fall areas require regular maintenance (see Box 3 for Safe Kids Worldwide safety tips).
 PROMISING	 PEOPLE	<ul style="list-style-type: none"> School- and martial arts-based fall techniques and exercises: School-based physical activity programmes, including the teaching of martial arts-based fall techniques and activity programmes that improve balance, strength, speed, coordination and flexibility in children can reduce fall injuries. This includes teaching children to distribute the energy associated with a fall over a large contact area (rather than single points such as elbows) and to perform a rolling motion during the fall. Implementing physical activity-based fall-prevention programmes in schools rather than sporting clubs is a good way to reach less-active children; this is important as these programmes are more effective for children who are normally less active (128,129). Fall-prevention programmes embedded within school curricula that include physical activity and education are proving to be promising interventions for reducing fall-related injuries and highlight the key overarching message in this package – the importance of physical activity across the life-course (34).
 PRUDENT	 POLICIES	<ul style="list-style-type: none"> Promote policies and playground standards requiring soft play surfaces and restricted fall heights: This is an example of a population health approach, because it targets all children who use playgrounds and it therefore has a high potential for reducing injuries among many children (132,133).
 PRUDENT	 PEOPLE  ENVIRONMENTS	<ul style="list-style-type: none"> Safer trampoline use and design: This includes ensuring only one child at a time uses the trampoline, while supervised, and that the trampoline is regularly checked, with all padding on hard surfaces intact (38) (see Box 4). Provide physical education (PE) at school and ample opportunities for active play: Children should receive adequate and appropriate PE to develop physical skills and health literacy about why and how to be active for lifelong health and social benefits (see Box 5) (128,129).



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN SCHOOLS AND PLAYGROUNDS

BOX 3

SAFE KIDS WORLDWIDE PLAYGROUND SAFETY TIPS

A resource developed by Safe Kids Worldwide (134) suggests a few simple tips for parents to help reduce serious playground injuries.

- Supervise young children
- Choose a play area with **equipment** appropriate to the child's age
- Check there is **soft-fall ground** surface beneath higher equipment
- Check that equipment is **well maintained** and request regular maintenance if not

See www.safekids.org/tip/playground-safety-tips for more information.





INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN SCHOOLS AND PLAYGROUNDS





INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN SCHOOLS AND PLAYGROUNDS

BOX 4

SAFER TRAMPOLINE DESIGNS DON'T ALWAYS REDUCE INJURY

Many modern trampolines have safety features including net enclosures, padding over posts and springs, or spring-free designs.

But while net enclosures do prevent children falling off trampolines, trampoline injuries have increased since the introduction of trampolines with these features in Australia and the USA, mostly due to multi-user injuries. Some researchers think this may be because parents allow their children to take greater risks on trampolines with more safety features. This is a reminder that safer design alone is not always enough and can result in changes to how an item is used. Safer design should be coupled with education about safe use and maintenance, as recommended in product safety guidelines (38,135).

- Check condition of mats and net regularly to ensure the trampoline is in good condition and ensure that the mat and net do not have holes, that springs are intact and securely attached at both ends, and that the frame is not bent and leg braces are securely locked.
 - Ensure hazard-free surrounds: Ensure that the area around the trampoline is free from hazards such as walls, fences, play equipment or garden furniture. Also make sure there is an overhead clearance to avoid objects such as clothes lines, trees and wires.
- Ensure one person only at a time uses the trampoline.
 - Supervise children at all times, regardless of age. It is recommended that children under the age of 6 should not use trampolines, but if they do, extra care must be taken with younger children as they are more prone to serious injury on trampolines.
 - Use safety padding on the frame to avoid injury.





INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN SCHOOLS AND PLAYGROUNDS

For further information see:

www.productsafety.gov.au/news/trampoline-safety-its-flippin-important

www.healthychildren.org/English/safety-prevention/at-play/Pages/Trampolines-What-You-Need-to-Know.aspx

www.kidsafensw.org/imagesDB/wysiwyg/Trampolines2014.pdf





**WHO RECOMMENDS THAT
5-17-YEAR-OLDS HAVE 60 MINUTES
MODERATE TO VIGOROUS PHYSICAL
ACTIVITY PER DAY.**



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS IN SCHOOLS AND PLAYGROUNDS

BOX 5

SCHOOLS AND PHYSICAL ACTIVITY

As outlined in the WHO Global Action Plan on Physical Activity (22) and the Kazan Action Plan on Physical Education (PE), Physical Activity (PA) and Sport (136), schools should be obliged to ensure they provide adequate PE to girls and boys of all ages.

In addition to PE curricula, adequate time should be given to allow children to engage in physical activity at school, including before and after the school day and during break times.

WHO recommends that 5-17-year-olds have 60 minutes moderate to vigorous physical activity per day (34).

In child care centres and pre-schools, and for all children under the age of 5 years, WHO recommends that children engage in 180 minutes per day of active play, with those aged 3-5 years having 60 minutes per day of moderate to vigorous activity and limited sedentary screen time (137).





INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS



DURING SPORTS AND ACTIVITIES³

SUMMARY OF KEY INTERVENTIONS: PREVENTING FALLS AMONG CHILDREN AND ADOLESCENTS DURING SPORTS AND LEISURE ACTIVITIES



PROMISING

- **Promote policies** requiring protective equipment such as helmets.



PRUDENT

- Awareness and access to **appropriate safety equipment** such as helmets, mouthguards, and knee, elbow, shin and wrist protection.
- **Enlist respected sports personalities** or others as safety role models for children.
- **Match children to those of similar size**, weight and abilities in games, sports, and other outdoor activities.
- **Provide training to coaches** and others working with children in sports clubs, and the parents and volunteers who support them.
- Run education and awareness **campaigns**.
- Remove children from play **following concussion** or other injuries.
- Regularly maintain and **inspect equipment** and playing surfaces for wear, tear and slip and trip hazards.

³ While this section applies primarily to children and adolescents, as adults also engage in sports the remarks made here are broadly applicable to people of all ages.



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS DURING SPORTS AND ACTIVITIES

There is limited information about the frequency and rate of fall-related sports injury because of the known limitations of hospital and other ICD-coded datasets in identifying such cases. Where evidence exists, up to one-third of all sports and leisure injuries can be linked to falls, and most are the result of one of three mechanisms: a fall from height (e.g. off a horse); a fall during speed or change of direction (e.g. when skiing or skateboarding); or a fall following contact or collision with another participant (e.g. in soccer) (138-140).

The direct evidence to support interventions to reduce falls and fall-related injury in sports is generally not strong, but is stronger in relation to primary prevention of the inciting event and particular injured body regions. For example, it is now well established that up to 50% of injuries to the lower limb in team ball sports can be prevented through targeted exercise training programmes, making attention to this an important aspect of qualified coaching and training (141). Coaching of participants in interventions that minimize the risk of falls, or mitigate their impacts, such as measures to avoid contact, or progressive training in tackling technique are also important and underline the critical nature of qualified coaching and training staff (142).

There are also many useful guidelines that suggest that interventions to reduce falls and/or the injuries that result from them among participants during sport and leisure activities should focus on risk and protective factors, including safety of the sports environment through measures such as softening hard surfaces, and regular maintenance and inspection of equipment and playing surfaces for trip and slip hazards.









A young boy with dark hair, wearing a blue and white striped t-shirt and dark brown pants with white stripes on the side, stands on a dirt path. He is holding a large, weathered wooden cricket bat with both hands, looking off to the side. The background is a blurred natural setting with trees and a hillside. A white speech bubble graphic is overlaid on the left side of the image, containing text.

**ACCESS TO APPROPRIATE SAFETY
EQUIPMENT SUCH AS HELMETS,
MOUTHGUARDS, AND KNEE, ELBOW,
SHIN AND WRIST PROTECTION
IS RECOMMENDED.**












INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS DURING SPORTS AND ACTIVITIES

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 PROMISING	 POLICIES	<ul style="list-style-type: none"> • Promote policies requiring protective equipment such as helmets in high-risk sport and leisure activities, including cycling and skateboarding. Legislation and policies in organizations like sporting clubs can be more effective than voluntary standards (115,143).
 PRUDENT	 ENVIRONMENTS	<ul style="list-style-type: none"> • Awareness and access to appropriate safety equipment such as helmets, mouthguards, and knee, elbow, shin and wrist protection: Protective equipment should be worn for the sport as long as it is: manufactured to relevant safety standards; worn appropriately; and does not interfere with safe engagement in a sport (e.g. a wrist guards may reduce dexterity and helmet attachment straps may pose a hanging or strangulation risk in some contexts like climbing or playground use). Examples of appropriate use of safety equipment includes wrist guards which have been shown to provide protection during snow-boarding (144), and which, by extrapolation should be considered for other sports such as skateboarding or rollerblading where grip and hand dexterity are not compromised. Helmets have been proven effective for cycling and horse riding, but are not recommended for use in playgrounds and are unlikely to prevent concussion on sports fields (145).
 PRUDENT	 PEOPLE  ENVIRONMENTS	<ul style="list-style-type: none"> • Enlist respected sports personalities or others as safety role models for children: There can be benefits to enlisting respected, well-known role models to encourage children to adopt safe sports practices such as: engaging in contact sports safely and without the intention of hurting themselves or others; training in a sport in order to reduce the likelihood of sustaining an injury and therefore playing for longer; always wearing the correct protective equipment when indicated.
 PRUDENT	 POLICIES	<ul style="list-style-type: none"> • Match children to those of similar size, weight and abilities in games, sports, and other outdoor activities, especially for collision and contact sports where there is a risk of body contact that could then lead to a fall. Modification of sports to match children's ability and developmental stage is also prudent to encourage participation and enjoyment and may also reduce injury risk; for instance, tackling can be switched for 'tagging' in several codes of football (146).



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS DURING SPORTS AND ACTIVITIES

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 PRUDENT	 PEOPLE	<ul style="list-style-type: none">• Provide training to coaches and others working with children in sports clubs, and the parents and volunteers who support them: This can include training on safe practices and first aid responses; protective equipment; removal from play following concussion and other injuries. This training should emphasize the importance of appropriate techniques and skills (e.g. how to avoid contact with another player or learn skills in how to tackle) to prevent sports injury and should result in a recognized accreditation so that parents can assess whether a coach is appropriately qualified to train their children in a given sport (141,147).
 PRUDENT	 PEOPLE  POLICIES	<ul style="list-style-type: none">• Run education and awareness campaigns in schools and educational curricula, community centres, parks, retailers and on children's media (TV and radio programmes) on themes such as safe engagement in sport, the importance of concussion injury, and the use of protective equipment such as helmets and kneepads (128).
 PRUDENT	 POLICIES	<ul style="list-style-type: none">• Remove children from play following concussion or other injuries: While there is a paucity of studies regarding concussion and children, key consensus groups such as the Concussion in Sport Group strongly recommend that concussed children be removed from play, provided with medical care and follow protocols for a supervised, graded return to play and other activities (126,148-152). Sporting clubs, coaches, parents and players should be educated about removal from play and the reason for this recommendation.
 PRUDENT	 ENVIRONMENTS	<ul style="list-style-type: none">• Regularly maintain and inspect equipment and playing surfaces for wear and tear and slip and trip hazards (153).



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS

Monitoring and evaluation

Data on falls among children and adolescents can be gathered from hospitals and other health service facilities, schools, day care centres, sports clubs and other relevant organizations, as well as through insurance claim records. Although not specific to children and adolescents, the International Olympic Committee has recently released recommendations for sports injury surveillance outside of healthcare settings that uses injury coding that maps across to ICD (154). It is important to use detailed data to identify common mechanisms and geographic locations of falls, to tailor interventions accordingly, and to monitor their effectiveness. Use of WHO Injury surveillance guidelines, WHO Fatal injury surveillance in mortuaries and hospitals and ICD Chapter 20 (external causes) coding for hospital admissions data could facilitate routine collection of the required information. This would provide information about the number of injurious falls over a given period of time to determine whether falls are a problem in particular settings and whether steps to address falls are working.



Credit: Philip Baarendse



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS

The European Child Safety Alliance uses an innovative “report card” approach (see Figure 2) to monitor progress on child safety across European countries, including fall prevention. The Child Safety Report Cards summarize each country’s performance on specific injury prevention measures and whether these measures are:

- existing, clearly stated, implemented and enforced;
- existing, clearly stated but only partially implemented or enforced; or
- neither existing nor clearly stated.

Conducted periodically, this report card system enables each country to identify gaps, easily compare their performance to other countries, and to monitor progress against key indicators as in Figure 2 (more information available at <http://www.childsafetyeurope.org/tactics/child-safety-report-cards.html>).

FIGURE 2: EUROPEAN CHILD SAFETY ALLIANCE ‘REPORT CARD

FALL PREVENTION	
National policy requiring playground equipment and landing surfaces to meet safety standards.	
National law banning the marketing and sale of baby walkers.	
National law requiring environmental changes to prevent children from falling out of windows in all buildings with more than one story/level (e.g., window guards or locks).	
National regulation for all private and public buildings requiring safe design for guardrails to prevent falls from balconies and stairs.	
National policy that increases access to childcare equipment, such as stair gates, for disadvantaged families (e.g., national equipment give-away/loaner programme or policy making such childcare equipment essential childcare articles taxed at a lower rate).	
National ministry/government department with mandated responsibility for child and adolescent fall prevention.	
Government approved national injury prevention strategy with specific targets and timelines related to child and adolescent fall prevention.	
National programme of child home visits that includes education on child fall prevention.	
National media campaign at least once in past five years targeting child and adolescent fall prevention.	

Score (out of possible five stars)

$$[(\text{😊} \times 4) + (\text{😐} \times 1) + (\text{😞} \times 4)] / 18 \times 5 = \text{★★★★★}$$

Source: European Child Safety Alliance “child safety report” scorecard



INTERVENTIONS TO PREVENT FALLS AMONG CHILDREN AND ADOLESCENTS

Further resources on preventing falls among children and adolescents

See below links to other resources on preventing falls among children and adolescents.

CHILD FALL-PREVENTION TOOLKITS FOR PARENTS, CAREGIVERS, PRACTITIONERS, AND EVENT PLANNERS FOR SAFE SPORTS CLUBS.

www.dsr.wa.gov.au/clubs/healthy-clubs/Making-sport-safe
www.directorthocare.com/preventing-fall-sports-falls-and-injuries/

CHILD SAFETY EUROPE

Good practice guide for fall prevention in children.
www.childsafetyeurope.org/publications/goodpracticeguide/info/fall-prevention.pdf

ONTARIO NEUROTRAUMA FUNDATION FALL PREVENTION MONTH

<http://fallpreventionmonth.ca/toolkit>

SAFE KIDSWORLDWIDE

Safety tips for child fall-prevention.
www.safekids.org/tip/
Safety tips for skating/skateboarding safety.
www.safekids.org/content/skatingskateboarding-safety-pre-teens

DIRECT ORTHOPEDIC CARE

Child fall-prevention toolkits for parents, caregivers, practitioners, and event planners for safe sports clubs.
www.directorthocare.com/preventing-fall-sports-falls-and-injuries/

MAYO CLINIC, MINNESOTA, USA

Key fall risks to children and safety tips.
www.mayoclinic.org/healthy-lifestyle/infant-and-toddler-health/in-depth/child-safety/art-20046124

PARACHUTE CANADA

Fall prevention (0-6 years) programme outlines and resources including images and videos.
www.parachutecanada.org/child-injury-prevention/item/fall-prevention

SYDNEY CHILDREN'S HOSPITALS NETWORK

Good investments in unintentional child injury prevention and safety promotion.
www.schn.health.nsw.gov.au/files/attachments/net3243_good_practice_guide_a4_fa2-web.pdf
[prevention/item/fall-prevention](http://www.schn.health.nsw.gov.au/files/attachments/net3243_good_practice_guide_a4_fa2-web.pdf)



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS

This section describes interventions to reduce falls among workers in two settings:



IN THE
WORKPLACE






IN THE POLICY-MAKING
ARENA





INTERVENTIONS TO PREVENT FALLS AMONG WORKERS

SUMMARY OF KEY INTERVENTIONS TO PREVENT FALLS AMONG WORKERS	
 PROMISING	<ul style="list-style-type: none">▪ Employee access to and use of slip resistant shoes.▪ Installation of slip-resistant flooring.▪ Increased floor cleaning frequency.▪ Multicomponent workplace safety programmes.▪ Enforcement of more stringent workplace safety regulations in the construction industry.
 PRUDENT	<ul style="list-style-type: none">▪ Economic incentives for companies to improve work environments.▪ Functioning occupational health and safety systems.▪ Avoid working at heights wherever possible.▪ Safe scaffolding.▪ Harnesses, restraint systems, fall arrest systems for those working at heights.▪ Safer roofing works to protect those working on roofs.▪ Improve standards and regulations for the manufacture and safe use of extension and step ladders.▪ Remove trip hazards in workplaces.▪ Ensure safe railings for stairs and heights.▪ Support older workers to participate in falls prevention activities.



**ELIMINATING HAZARDS ALTOGETHER IS
ADVISABLE, FOR INSTANCE WORKING AT
GROUND LEVEL WHEREVER POSSIBLE
RATHER THAN AT A HEIGHT.**



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS IN THE WORKPLACE

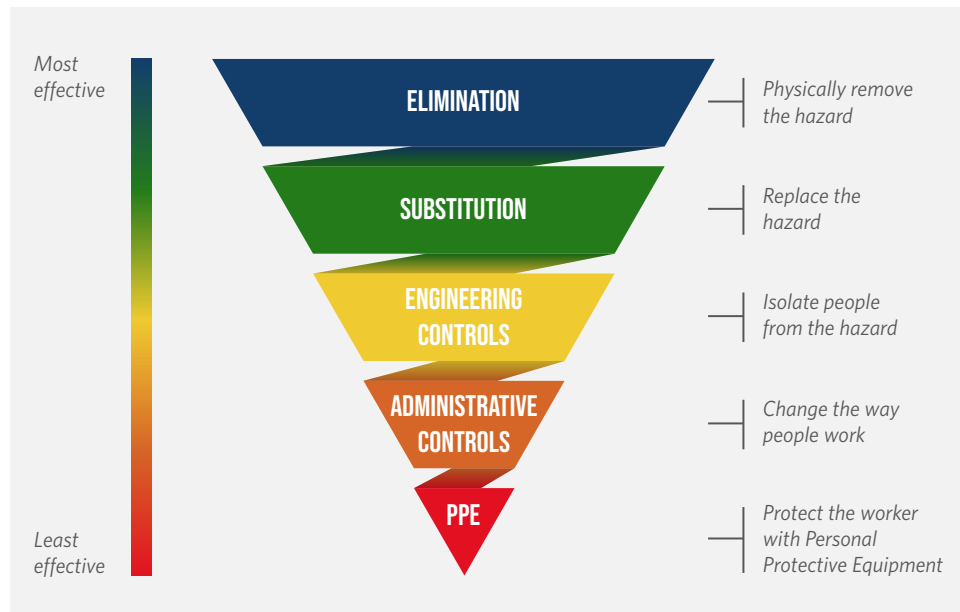


IN THE WORKPLACE

There are significant differences in the fall risks to which people are exposed in various industries. This means that fall-prevention interventions should be tailored to the work environment. A hallmark approach to managing these risks is “risk management”. An example of risk management principles is ISO 31000 – an international standard that provides generic principles and guidelines for the effective management of any risk in a variety of industries and settings.

The hierarchy of control is a framework often used to guide risk management in the workplace (155) (see Figures 3 and 4). The hierarchy ranks intervention categories in order of effectiveness, indicating that intervention types at the top should be sought first wherever possible as they potentially offer better protection than those at the bottom (156). Even so, the hierarchy of control framework should be considered a layered approach, with opportunities to intervene at all levels (157). Eliminating hazards altogether is advisable, for instance working at ground level wherever possible rather than at a height. Where hazard elimination is not possible, interventions that substitute or replace hazards with something less dangerous, or separate people from hazards, should be sought.

Figure 3. Industrial hygiene hierarchy of controls (CDC)



Source: The National Institute for Occupational Safety and Health 2015.



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS IN THE WORKPLACE

Engineering controls such as modifying machinery or equipment such as guard rails, elevated work platforms, hoists, or cranes to improve the physical environment are the next line of defence. Next in the hierarchy are administrative controls, which are about changing the way people work. These include job rotations that limit the number of hours worked in hazardous situations; organize and sequence work to reduce the number of trades working above or below each other; reduce the need to hurry to complete a job; use warning signs to flag hazards and “no-go” zones; and train staff about safe work practices (158).

Personal protective equipment (PPE), such as hard hats, are said to offer the lowest level of protection from risk compared to elimination and engineering strategies. Even so, PPE is often vitally important, either in addition to interventions higher up the hierarchy or as a single intervention in situations where other intervention types are not possible (159). Hence PPE is often recommended in safety manuals and guidelines, and required by legislation in many industries in different countries.





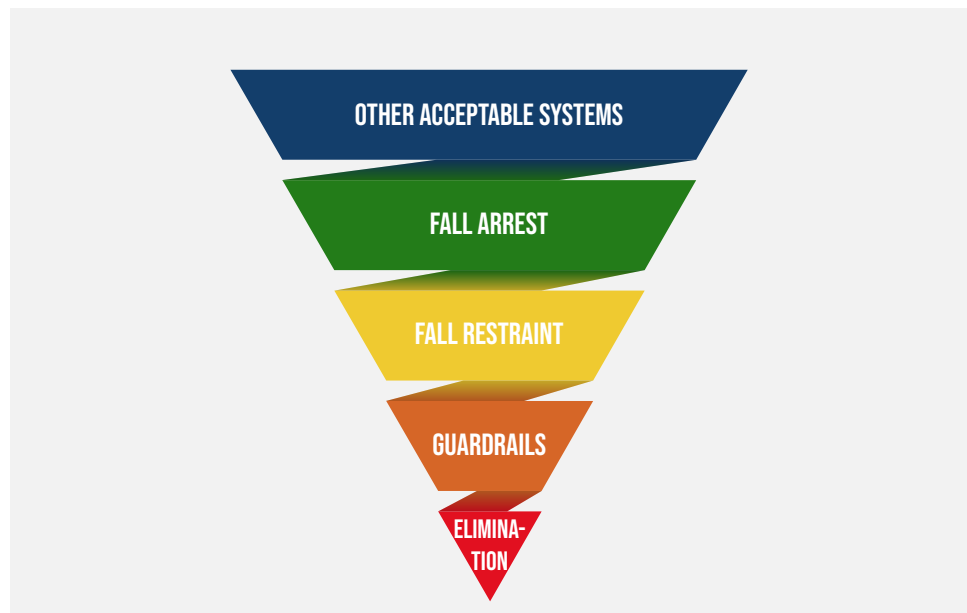
INTERVENTIONS TO PREVENT FALLS AMONG WORKERS IN THE WORKPLACE

As with most fall prevention interventions, it is important to note that a lack of evidence for interventions such as PPE does not mean they are ineffective, but may simply mean that a formal research base has not yet been established to demonstrate effectiveness.

Preventing workplace falls may involve one or more of the interventions in this section and be implemented at individual worksites or at national or state level. Interventions can involve establishing safety performance targets at worksites, providing economic subsidies for worksite safety improvements, or providing personal protective equipment to individual workers.

To date, a limited amount of high-quality research has been conducted into the effectiveness of these workplace interventions, with the vast majority of studies conducted in the restaurant, hospital and construction sectors of high-income countries. The interventions recommended are those that have some promising or prudent evidence to support them and that address key known risk factors for occupational falls.

Figure 4: Hierarchy of controls to prevent falls from heights



Source: (160) p13



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS IN THE WORKPLACE






Safer people



Safer environments

















Safer policies and legislation

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>ENVIRONMENTS</p>  <p>POLICIES</p>	<ul style="list-style-type: none"> • Employee access to, and use of, slip-resistant shoes: Provision of slip-resistant shoes by employers (especially for low income workers who may not be able to afford to buy them) can reduce slips. This has been shown among hospital and restaurant staff (161). There is some evidence that shoes may start to become less effective at preventing slips after 6 months of use (162). • Rougher floor surfaces with a higher “coefficient of friction”: Workplace design and building standards should consider slipperiness of floor surfaces; floors must be kept dry (161).
 <p>PROMISING</p>	 <p>PEOPLE</p>  <p>ENVIRONMENTS</p>  <p>POLICIES</p>	<ul style="list-style-type: none"> • Increased floor cleaning frequency: The risk of slipping increases when floor surfaces are wet or contaminated. Frequent floor cleaning reduced falls in a study of restaurant workers (161), and is often included as part of multicomponent fall-prevention strategies in settings such as hospitals (163). • Multicomponent workplace safety programmes: The components vary considerably depending on the work environment. <ul style="list-style-type: none"> • In hospitals: these include on-site assessment, slip-resistant shoes, improved floor cleanliness, and hazard elimination (163) (see Case study 3). • On construction sites: these include safety inspections to improve adherence to standards, and financial incentives for safe sites to change safety attitudes and behaviours, information and feedback to staff at all levels about injury rates through noticeboards and newsletters (164,165). • Drug-free workplace programmes may reduce injury rates in construction, manufacturing and service industries, including falls. This is well-established practice in some workplaces, although in some settings it can be ethically and legally complex to introduce and enforce, particularly for existing employees (165). In the USA, programmes studied have included education about drug abuse and treatment, drug testing, employer provision and funding of employee assistance and treatment programmes, and protection against dismissal for workers who agree to treatment and have no repeat violations. In this programme, employers were offered a discount on workers’ compensation insurance for enrolling (164).



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS IN THE WORKPLACE

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PRUDENT</p>	 <p>PEOPLE</p>  <p>ENVIRONMENTS</p>	<ul style="list-style-type: none"> • Avoid working at heights wherever possible: Work at ground level where possible, including handling loads and performing detailed work. • Safe scaffolding: This can include features such as guard rails and toe boards, planked platforms and safe access points. Use of scaffolding that complies with safety standards can reduce falls injuries among construction workers (165-169). • Safer roofing works to protect those working on roofs: This includes the use of skylight covers, guard rail systems, safety net systems, and personal fall-arrest systems (171,172).
 <p>PRUDENT</p>	 <p>PEOPLE</p>  <p>ENVIRONMENTS</p>  <p>POLICIES</p>	<ul style="list-style-type: none"> • Harnesses, restraint systems, fall arrest systems for those working at heights: While there is little high-quality formal evidence to support the use of such personal protective equipment, its use is clearly prudent, and is often recommended in safety guidelines and required by legislation (170,171).
 <p>PRUDENT</p>	 <p>POLICIES</p>	<ul style="list-style-type: none"> • Improve standards and regulations for the manufacture and use of extension and step ladders: Education for ladder users is also important. The Centers for Disease Control and Prevention’s National Institute for Occupational Safety and Health (NIOSH) has a ladder safety app with information about safety and positioning for those working in commercial, domestic or any other setting (173).
 <p>PRUDENT</p>	 <p>ENVIRONMENTS</p>	<ul style="list-style-type: none"> • Remove trip hazards in workplaces: This includes keeping walkways clear of objects, securing loose cords and wires, reducing clutter, providing adequate lighting in all work areas, including outdoors and in stairwells (163).
 <p>PRUDENT</p>	 <p>PEOPLE</p>	<ul style="list-style-type: none"> • Support older workers to participate in fall-prevention activities: Older workers would benefit from many of the falls prevention strategies for older people outlined in the “Older people” section of this package and workplaces should support older workers to access and participate in activities such as exercise programmes.

A person wearing green scrubs and white gloves is mopping a light-colored floor in a hospital setting. To the left, a white gurney with blue accents is partially visible. The scene is lit with a cool, blue-toned light.

SLIPS, TRIPS AND FALLS (STF) ARE THE SECOND LEADING CAUSE OF INJURIES SEVERE ENOUGH TO CAUSE LOST WORKDAYS AMONG HOSPITAL EMPLOYEES IN THE USA.



CASE STUDY 3

MULTISTAKEHOLDER INITIATIVE REDUCES SLIPS, TRIPS & FALLS AMONG HOSPITAL WORKERS

USA

Slips, trips and falls (STF) are the second leading cause of injuries severe enough to cause lost workdays among hospital employees in the USA (174).

In the late 1990s, a multi-disciplinary, multi-institutional initiative in three acute-care hospitals (part of a large non-profit health care organization) in the US (163) led to the design, implementation and evaluation of a comprehensive, best-practice STF prevention programme. The study spanned a 10-year period and involved over 16 000 workers.

As part of the initiative, a Wellness Committee was formed comprising around 25 members from a range of backgrounds ranging from occupational safety, health and human resources to health care providers and legal and financial representatives. In 2000, the Wellness Committee identified STFs as the organization's most expensive worker injury problem.

Members of the Wellness Committee reached out to epidemiologists at the Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health (NIOSH) for assistance in planning and evaluating a best-practice STF prevention programme. The health care organization (which funded the initiative) and NIOSH team pulled in additional stakeholders, including research scientists in the fields of tribology, ergonomics and epidemiology. The prevention programme included analysis of injury records to identify common causes of STFs; onsite assessments of STF hazards; implementation of a rapid hazard reporting system; raising fall-risk awareness among workers through displays, posters, and emails; improvements to housekeeping procedures and products; introduction of STF preventive products and procedures; flooring changes, and voluntary use of slip-resistant footwear for particular workers.

Following the STF programme's implementation from 2000–2002, STF-related injury rates in the hospitals declined by 59%, which was statistically significant. The research led to the publication of a peer-reviewed scientific journal article (163) and served as the basis for a user-friendly practitioner guide (175).

This collaborative research showed that although STFs have myriad causes – such as contaminants on the floor, trip hazards such as uneven floors, cords, and other objects, and human factors – implementing a comprehensive STF prevention programme in hospitals can lead to significant declines in STF-related workplace injuries.

Many of the changes implemented in these hospitals to protect workers also benefitted patients and visitors – an important outcome, as falls comprise the largest single type of reported incident resulting in acute, inpatient hospital care in the USA (176). The direct cost for same-level falls and slips and trips without a fall in the US general population is estimated to be over US\$ 13 billion annually (177). Prevention of STF incidents for patients and workers can reduce human suffering and provide significant savings.



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS







IN THE POLICY-MAKING ARENA



ENFORCEMENT OF SAFETY REGULATIONS REMAINS A VITAL OVERARCHING LEVER FOR REDUCING OCCUPATIONAL FALL INJURIES.



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS IN THE POLICY-MAKING AREA

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>POLICIES</p>	<ul style="list-style-type: none"> Enforcement of more stringent workplace safety regulations in the construction industry: This can include penalties such as fines and suspension of licenses. Enforcement may improve adherence to regulations, which in turn may be effective in reducing fall rates. Most evidence of this is found for enforcement of state-level regulations in the construction industry in high-income countries. For instance, there is some evidence that companies in the USA cited for violating construction standards then have reduced fall injury claim rates in the subsequent year (178). Work safety regulations can include mandates about the provision and use of PPE, communication, processes for reporting workplace injuries and modifying workplace environments in response. Sustained enforcement with high coverage requires a significant amount of resources and capacity from a governing agency, which can be difficult to achieve in some low- and middle-income countries. But enforcement of safety regulations remains a vital overarching lever for reducing occupational fall injuries.
 <p>PRUDENT</p>	 <p>POLICIES</p>	<ul style="list-style-type: none"> Economic incentives for companies to improve work environments: Economic subsidies can help improve the safety of workplace infrastructure and promote actions such as the purchase of personal protective equipment for workers. Subsidies involve the provision of financial assistance to a business or company for improving the safety of work environments to reduce the risk of employee injury - for example, where use of certified scaffolds is not compulsory, subsidies may incentivize their use (167). Interventions requiring the use of safety equipment are often associated with significant costs and it should never be the employee's responsibility to purchase safety equipment. Functioning occupational health and safety systems: A fundamentally important step to reducing falls in workplaces everywhere is ensuring that functioning occupational health and safety systems are in place. Functioning occupational health and safety systems include provisions for compensation for injured workers, occupational health and safety legislation, incentives for industry by means of reduced Workers Compensation Insurance contributions based on reductions in injury incidence and systems for enforcement of rules such as inspections that improve adherence. Not all nations have such systems established, but all should endeavour to achieve them, as they provide a crucial foundation for improving worker safety.



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS

Monitoring and evaluation

Global data on occupational falls are not readily available, largely because work-related injuries are not generally identifiable in International Classification of Diseases (ICD)-coded data. Underreporting in many settings is also a barrier. More standardized work-related injury data collection and coding are required to obtain a better picture of the scope of the problem and to monitor the effectiveness of interventions. ICD codes are available that cover the type of activity when injured and the place of injury (which can help identify the type of workplace where the fall occurred) and the use of these standardized codes in hospitals and health care systems should be encouraged globally.

Data on occupational falls can also be gathered from insurance records (including for workers' compensation), company records, labour force surveys and public health surveillance systems (54). Improved monitoring of fall-related deaths, hospitalizations and injury compensation claims is required to assess the effectiveness of legislation in reducing occupational fall injury. Information about the burden of occupational falls is currently limited in low- and middle-income countries, where many of these information sources are incomplete or non-existent. Efforts to improve data collection on occupational falls are very important for establishing the scale and cost of the problem, along with the impact of intervention programmes.

Workplaces can also establish their own hazard identification, risk assessment and risk management process for the prevention of workplace falls, including keeping records of, and reviewing all, incident reports and actions undertaken. Systematic fatality investigations, such as the NIOSH Fatality Assessment and Control Evaluation (FACE), may reveal the root risk factors of worker falls and gaps between field practices and regulations (58).

A range of stakeholder groups may have an interest in reducing occupational falls, including but not limited to workers, workers unions, families of fall victims, employees, governments, occupational health and safety organizations and ministries, health professionals, researchers, private industry and insurance companies. Professional associations and some government research institutions often play an important role as leaders that initiate and sustain multisectoral collaborations.



INTERVENTIONS TO PREVENT FALLS AMONG WORKERS

Further resources on preventing falls among workers

See below links to other resources on preventing falls among workers.

CENTRE FOR CONSTRUCTION RESEARCH & TRAINING

Fall protection resources for new home construction:

www.cpwr.com/publications/fall-protection-resources-new-home-construction

INTERNATIONAL LABOUR ORGANIZATION

Estimating the economic costs of occupational injuries and illnesses in developing countries:

www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_207690.pdf

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH

Online fall prevention resources:

www.cdc.gov/niosh/topics/falls/default.html

UK HEALTH AND SAFETY EXECUTIVE

<http://www.hse.gov.uk/slips/>

GOV. WESTERN AUSTRALIA, COMMERCE DEPARTMENT

Slips, trips and falls café and restaurant industry (bulletin):

www.commerce.wa.gov.au/sites/default/files/atoms/files/stfs_cafe_restaurant_industry.pdf

LABORERS' HEALTH & SAFETY FUND OF NORTH AMERICA

Online fall prevention resources:

www.lhsfna.org/index.cfm/lifelines/october-2010/fall-prevention-online-resources/

SAFE WORK AUSTRALIA

Slips, trip and falls in the workplace (fact sheet):

http://www.safeworkaustralia.gov.au/system/files/documents/1702/slips_and_trips_fact_sheet.pdf

UNITED STATES DEPARTMENT OF LABOUR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Fall-prevention resources (website):

<http://www.osha.gov/SLTC/fallprotection/index.html>



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE

This section describes interventions to reduce falls among older people in three settings:



**IN AND AROUND
THE HOME**



**IN RESIDENTIAL CARE
FACILITIES**



IN HOSPITALS









INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE



IN AND AROUND THE HOME

SUMMARY OF KEY INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME	
 STRONGLY RECOMMENDED	<ul style="list-style-type: none"> Gait, balance and functional training. Tai Chi. Home assessment and modifications, particularly for high-risk groups, including reducing trip hazards and improving lighting.
 RECOMMENDED	<ul style="list-style-type: none"> Reduction or withdrawal of psychotropic drugs.
 PROMISING	<ul style="list-style-type: none"> Multifactorial interventions (individual fall-risk assessments followed by tailored combinations of referrals and interventions, depending on identified risks). Multicomponent interventions (two or more fixed combinations of fall-prevention interventions not individually tailored following a risk assessment). These usually include an exercise component. Vitamin D supplements for those who are Vitamin D deficient. Cardiac pacemaker insertion for those with carotid hypersensitivity. Cataract surgery for those with cataracts.
 PRUDENT	<ul style="list-style-type: none"> Education about falls and specific factors such as footwear, glasses, high-risk situations and behaviours. Requiring landlords to make necessary modifications to homes and the enforcement of building standards. Improved accessibility of neighbourhoods and public spaces e.g. pavements. Wearable personal alarms, fall sensors, mobile phones with SOS emergency buttons. Organized systems of “checking in” on those who live alone. Deter the use of ladders, chairs, etc. to access heights. Suitable footwear.



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

Most older people want to live in their own homes. Falls are the most preventable cause of needing nursing home placement, hence community-based interventions should be prioritized. There is a strong body of research examining several interventions to prevent falls among older people living independently in the community (179-182), although much of this research has been conducted in high-income countries. Several interventions, including home-based exercise programmes and home safety interventions can substantially reduce falls (120,179,181).

Most falls among older people occur in the home or yard, hence most fall-prevention interventions that involve environmental modifications focus on home safety, particularly for older people at high risk of falls (120,181,183). Key household areas and activities have been identified as particularly problematic for older people: entering and exiting the home; moving around at home; climbing stairs; and using sanitary and kitchen facilities (184). Homes with irregular pavements leading to the residence, loose carpets on kitchen and bathroom floors, loose electrical wires and inconvenient doorsteps also pose fall risks. Poor home surroundings such as garden paths and walks that are cracked or slippery from rain, snow or moss are also dangerous (68).





INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

There is a need for age-friendly public spaces, including footpaths, road-crossings, streets, buildings and transport options that enable older people to navigate their neighbourhoods safely and maintain their day-to-day independence. Walkable, accessible public spaces enable older people to continue to engage in physical activity as part of daily life, which can further reduce falls and improve other aspects of health and well-being (185). Some efforts to facilitate mobility for older people, such as motorized mobility scooters, may increase mobility but may also pose an emerging risk for falls from scooters, which can result in serious injury or death (94,186).

Neighbourhood accessibility is often problematic for older people in low- and middle-income countries (187) but there is growing interest and information available to guide efforts to create age-friendly cities and communities in these regions (112,188). The Global Network for Age-friendly Cities and Communities was established in 2010 and connects member cities, communities and organizations worldwide who are working to become more age friendly (188). This work includes facilitating and advocating for interventions to prevent falls.





INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

Exercise-based programmes

Tailored exercise-based programmes are the most-often studied fall-prevention interventions for older people and have a very strong evidence base to support their effectiveness for those living in the community (189–199). These should be conducted regularly and in addition to, or as part of, the moderate-intensity physical activity recommended for general health (34) (see Box 6 and Case study 4).








Safer people



Safer environments



Safer policies and legislation

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>STRONGLY RECOMMENDED</p>	 <p>PEOPLE</p>	<ul style="list-style-type: none"> • Gait, balance and functional training: Targeted exercise that safely challenges balance and builds functional lower-limb strength is the most effective physical activity intervention to prevent falls in older people living in the community. They can help improve and maintain balance, muscle strength and physical function through activity and reduce both the rate of falls and the number of people who fall (179,181,189,191,192,195,200–207). Standardized programmes of note include FaME and Otago (208,209). • Tai Chi (also called Tai Chi Chuan and Tai Chi Quan) is an example of a type of activity that should be made accessible to older people living independently in the community. While many kinds of Tai Chi reduce falls, there is some evidence that Yang-style Tai Chi may be more effective in reducing the frequency of falls than Sun-style Tai Chi (190). There is also some evidence to suggest that Tai Chi may be most effective at preventing falls in people who were at relatively low risk of falls to begin with (181).
 <p>RECOMMENDED</p>	 <p>ENVIRONMENTS</p>  <p>POLICIES</p>	<ul style="list-style-type: none"> • Make specialized, local “falls-prevention” (evidence-based balance and functional exercise) groups and home programmes available as an accessible part of preventative health care. This can be achieved by collaborations with community-based exercise providers, through sport and recreation facilities and other qualified professionals, including health professionals (many successful trials involve programmes delivered by health professionals) (70,195,201,202,205,210).



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME



CASE STUDY 4

THE FALLS MANAGEMENT EXERCISE (FAME) PROGRAMME

UNITED KINGDOM

Each year in England over 200 000 emergency hospital admissions and 4 million bed days result from falls and fractures among adults aged 65 years and over. The health care costs of this run to approximately £2 billion.

The Falls Management Exercise (FaME) programme is effective at promoting physical activity and preventing falls among people aged 65 and over and in the UK has been shown to be cost-effective. Between 2016 and 2017, Leicestershire, Rutland and Derby local authorities commissioned 29 FaME classes of 24 weeks duration (211). The classes were led by postural stability instructors and delivered in community venues such as leisure centres, football grounds, and village halls.

A total of 348 older people took part in the 29 FaME classes - 79% were aged 70 years and over, 39% were aged over 80 years. Participants had a wide range of health problems (most commonly arthritis (44%), high blood pressure (41%), back pain (38%), overweight/obesity (26%), depression/anxiety (19%), diabetes (17%).

One fifth (21%) had fallen in the last 3 months, 31% were at high risk of future falls, and 48% were very concerned about falling.

Overall, 41% of participants completed at least 75% of the FaME programme classes, thereby increasing their median physical activity by 178 minutes per week, and becoming more confident in their balance and less concerned about falling. The number of



Photo credit:
Physical Activity
Implementation
Study in Community
Dwelling Adults
(PhISICAL)



falls reduced from 1.33 to 0.97 per participant per year, a similar reduction to that seen in trials of the programme. These results emphasise the need to ensure that participants complete as much of the 24 week programme as possible. Older people recognized that they benefitted from the classes through increased physical fitness, reduced social isolation and less fear of falling.




A toolkit to guide commissioners through the FaME commissioning process is available, and includes practical tools such as a business case, service specification and costing tool, as well as resources such as briefings for stakeholders, marketing materials, videos and a summary of the research findings (available from <http://arc-em.nihr.ac.uk/clahracs-store/falls-management-exercise-fame-implementation-toolkit>).

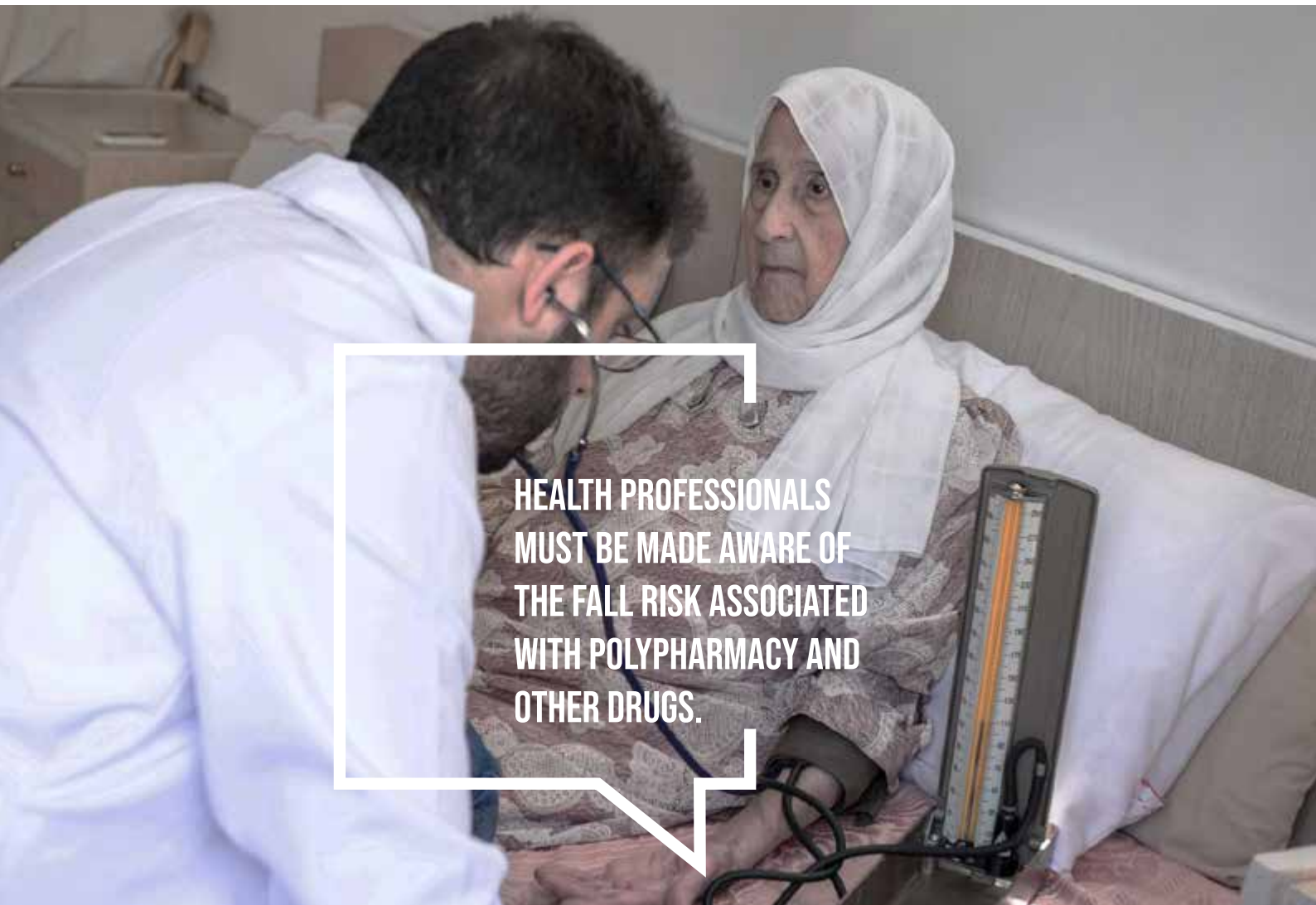
Source: (211)



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

Address medical and behavioural risk factors








STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 RECOMMENDED	 PEOPLE  POLICIES	<ul style="list-style-type: none">• Reduction or withdrawal of psychotropic drugs and rationalization of other medications at primary care level: Review of medications by a doctor or pharmacist with regard to fall prevention can reduce the falls rate and the risk of falling (217,218). Health professionals must be made aware of the fall risk associated with polypharmacy and with psychotropic and other drugs (82,83), and fall-risk assessments should be built into routine practice. Withdrawal from these medications should be supported by a health care provider (181,218) such as doctors and community pharmacists (218). Resources such as the Beers criteria and the Screening Tool of Older Persons' Prescriptions (STOPP) provide guidance to health professionals about rationalizing potentially harmful medication for older adults (81,219).

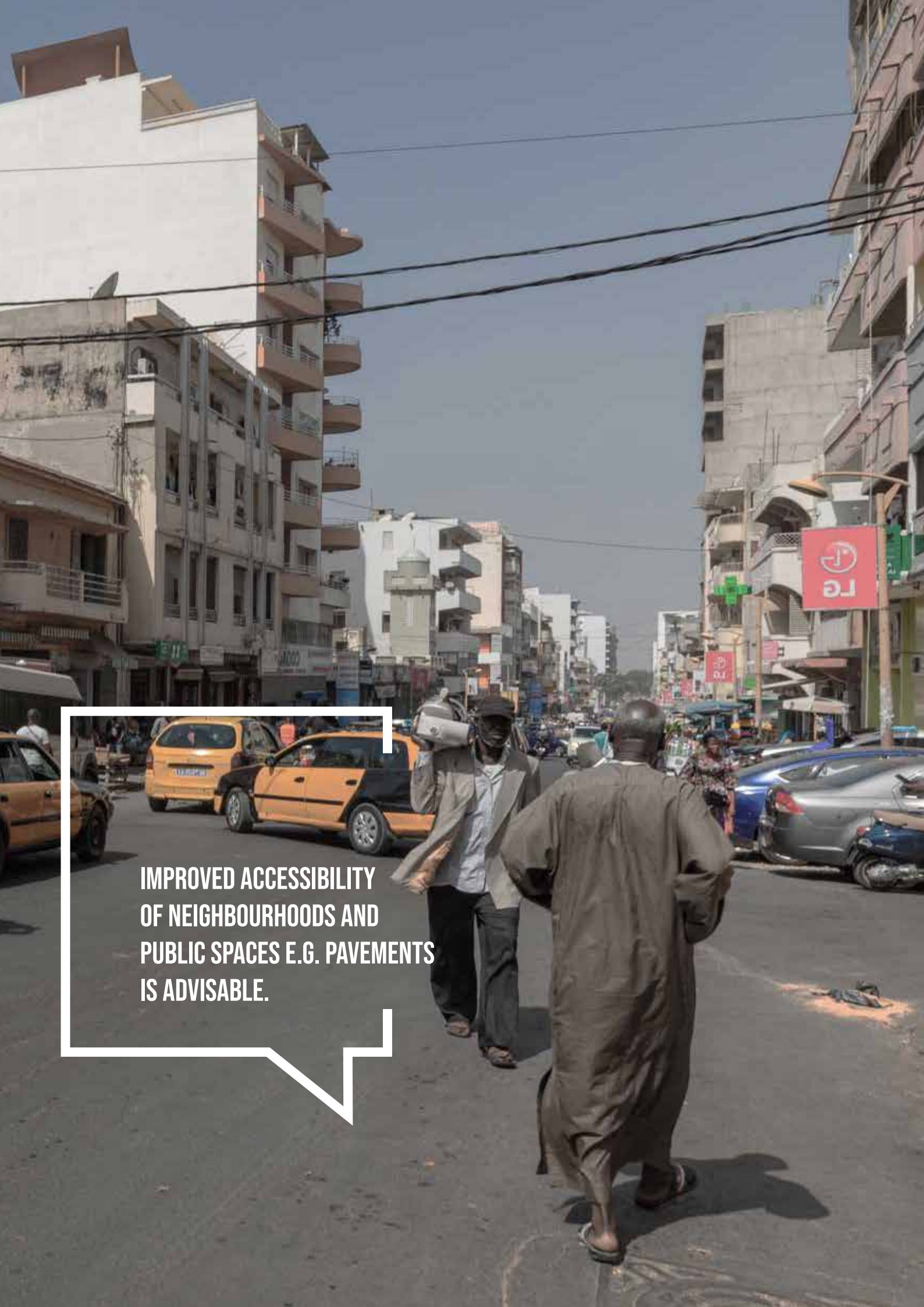


HEALTH PROFESSIONALS
MUST BE MADE AWARE OF
THE FALL RISK ASSOCIATED
WITH POLYPHARMACY AND
OTHER DRUGS.



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>PEOPLE</p>  <p>POLICIES</p>	<ul style="list-style-type: none"> • Vitamin D supplements: While Vitamin D supplements do not reduce falls in all older people who live in the community, daily supplements can significantly reduce falls in older adults who have low vitamin D levels (181). Low vitamin D levels may be a result of limited exposure to sunlight or for those who tend to stay indoors as a result of lifestyle or living circumstances, as well as some medical conditions. Vitamin D supplements may also provide marginal additional benefit as part of a multicomponent or multifactorial intervention, and tend to work better when combined with exercise (220,221). Vitamin D and analogues may also reduce falls but can cause adverse side effects - particularly if given in large doses - and should be used under medical supervision (181). • Cataract surgery: Cataract surgery in one eye can reduce rate of falls, but surgery on the second eye offers no further improvement on rate of falls. First eye surgery in those with cataracts should be expedited to reduce the risk of falls (181,189,222).
 <p>PROMISING</p>	 <p>PEOPLE</p>	<ul style="list-style-type: none"> • Cardiac pacemaker insertion: Cardiac pacemakers can reduce fall rates in those with cardio-inhibitory carotid sinus hypersensitivity (181,189).
 <p>PRUDENT</p>	 <p>PEOPLE</p>	<ul style="list-style-type: none"> • Education about falls and specific factors such as footwear, glasses, high-risk situations and behaviours: Knowledge and education alone does not prevent falls, but improving awareness of the resources, behaviours and support available, and of the preventable nature of falls, is important (e.g. the LIFT programme) (223,224). Information about how to walk on ice, use equipment such as ice grippers and cope with other local weather conditions that pose a risk of falls may also be useful (225). Older people receiving new glasses, particularly multifocals, can initially be at increased risk of falling and should be made aware of this so they have the opportunity to take extra care at this time (181,189).



**IMPROVED ACCESSIBILITY
OF NEIGHBOURHOODS AND
PUBLIC SPACES E.G. PAVEMENTS
IS ADVISABLE.**



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

BOX 6

TIPS ON EXERCISE PROGRAMMES FOR OLDER PEOPLE

To be most effective, targeted exercise-based fall-prevention programmes for older adults should be delivered or prescribed by a health professional or trained layperson, and conducted for at least 3–5 hours per week (3 hours minimum over a minimum of three occasions per week continued for life).

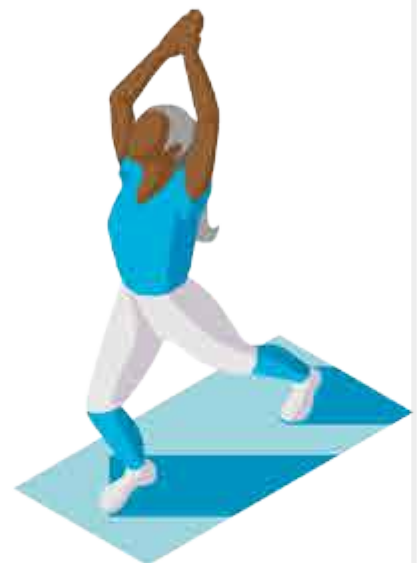
These sessions should include balance and functional exercises as well as strength training (179,212). People starting from a very sedentary base will need to build up gradually to this level. While some exercise is better than none for cardiovascular health, the fall-prevention evidence indicates that at least 3 hours per week is required to ensure fall-prevention benefits, and more is even better (179).

Exercising in groups can improve motivation and adherence, though some people prefer to exercise alone, and individual and home-based programmes are also effective. Recommendation by a General Practitioner can also improve adherence (213).

Programmes should be tailored to participant abilities so they are challenging and safe (214). Examples of standardized programmes include the Otago Exercise Programme (OEP), which consists of 1 hour of supervised, home-based strength and balance exercises and three 30-minute, unsupervised prescribed exercise sessions per week; and the Falls Management Exercise (FaME) programme, a 24-week structured exercise programme combining home-based and supervised exercise classes provided by postural stability instructors (208).

FaME includes functional floor and gait skills, endurance, flexibility, and strength and balance exercise (see Case study 4).








This type of exercise programme can also reduce fear of falling in older people (215). While general exercise (e.g. walking, dancing and resistance training) has other health benefits and thus is preferable to no physical activity, there is no high-quality evidence to suggest it is effective at preventing falls in older people, and it may even be associated with an increased risk of falls. For this reason, some suggest that it may be useful to measure fall outcomes in terms of “fall-free activity time” to account better account for the exposure risk posed by physical activity (216).











INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

Reduce fall hazards in home and neighbourhood environments

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 STRONGLY RECOMMENDED	 ENVIRONMENTS	<ul style="list-style-type: none"> Home assessment and modifications: Home assessment and the tailored prescription of modifications (including grab rails, stair rails, non-slip surfaces, improved lighting and reduced slip and trip hazards) and assistive products by an occupational therapist is particularly effective for those at greater risk of falling (181,189). Community-wide, low-cost home modification programmes can also reduce the occurrence of fall-related injury in older people and are cost-effective interventions (120,226) (see Case studies 5 and 6).
 PRUDENT	 POLICIES	<ul style="list-style-type: none"> Requiring landlords to make necessary modifications to homes: This can be done to provide housing that meets minimum health and safety standards (120,227). Homes and other buildings to be built to safe standards, including universal access and design principles.
 PRUDENT	 ENVIRONMENTS  POLICIES	<ul style="list-style-type: none"> Improved accessibility of neighbourhoods and public spaces: While there is currently little evidence that age-friendly cities reduce falls, there is growing recognition of the importance of accessible public spaces to help older people remain safe and active. This includes the need for road crossings designed and timed to allow older people to cross safely, and for parks and recreation spaces to be inviting, safe and accessible to older people in order to encourage regular physical activity (92,93,228). Wearable personal alarms, fall sensors, mobile phones with SOS emergency buttons: These can be useful for older people at high risk of falls who spend much of their time alone. Some devices, however, have a high rate of “false positives” which can cause annoyance and care must be taken to ensure the use of these devices does not reduce mobility. These systems can be government funded, making them a potential policy intervention. Organized systems of “checking in”: These social support and other services provide calls at a particular time each day to check the well-being of those who are housebound, frail, and/or live alone. This pragmatic intervention is not necessarily supported by research evidence but is a widely used, common sense measure. For example, in Australia, the Red Cross offers Telecross, a daily telephone service whereby volunteers phone isolated people and alert family, friends or neighbours contact cannot be made (see more at www.redcross.org.au/get-help/community-services/telecross).






INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 PRUDENT	 ENVIRONMENTS	<ul style="list-style-type: none">• Deter the use of ladders, chairs, etc. to access heights, as ladder-related deaths are high among older people: Alternatives should be made available to older people, such as home help services or tradespersons (229).
 PRUDENT	 PEOPLE	<ul style="list-style-type: none">• Suitable footwear: Encourage older people to wear enclosed sturdy shoes around the house, rather than slip-on footwear.
 PRUDENT	 POLICIES	<ul style="list-style-type: none">• In low resource settings where occupational therapists are not available, nurses and other community health workers may be trained to provide basic home safety assessment services, although there is no current evidence to determine the effectiveness of this strategy.





INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>PEOPLE</p>  <p>ENVIRONMENTS</p>	<ul style="list-style-type: none">• Multifactorial interventions: These are individual fall-risk assessments followed by tailored combinations of referrals and interventions as described above, depending on identified risks. This approach acknowledges that not all older people have the same risk of falling, and encourages personalized assessment and prescription of appropriate interventions. For this reason, multifactorial interventions are often recommended as part of clinical practice, including by both the British and American Geriatric Societies, but there is mixed research evidence about their effectiveness (180,181,189,205,233,234). Findings about the effectiveness of multifactorial interventions are likely to be influenced by local contexts and health care systems, the design of conducted studies, as well as the variation in component interventions included and the level of adherence to them. Further, the requirement of trained professionals to conduct assessments and tailor interventions may reduce feasibility in low-resource settings.• Multicomponent interventions: These are two or more fixed combinations of fall-prevention interventions that are not individually tailored following a risk assessment (199). Multiple component interventions vary widely, thus so does their impact on fall outcomes. Programmes may include two or more effective interventions such as a medication review, home modifications and provision of assistive products, education, podiatry services and exercise. Programmes that include an evidence-based exercise component are more likely to be effective than those that do not (180,181,189).



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME



CASE STUDY 5

LOW-COST HOUSING IMPROVEMENT PREVENTS INJURIES FROM FALLS

NEW ZEALAND

New Zealand has more than 300 000 medically treated injuries from falls in the home each year, and 150 deaths. A new approach to preventing fall injuries in homes has been successfully trialled in the Home Injury Prevention Intervention study (226).

This intervention consisted of the free installation of home safety features or resolution of safety hazards. Most households recruited in the initial study tended to be older people or parents with younger children – groups that might be expected to be concerned about home safety. A qualified builder audited the homes to identify safety hazards. Depending on the structure and features of the house, qualified builders undertook modifications such as handrails for outside steps and internal stairs, grab rails for bathrooms, outside lighting, edging for outside steps, and slip-resistant surfacing areas such as decks and porches. The programme was trialled in 842 households randomly allocated to an intervention group (who received the home modifications at the start of the trial) and a control group (who received the modifications when the trial ended). The treatment group had a 26% reduction in the rate of injuries caused by falls at home per year compared to the control group. Injuries that were likely to have an environmental cause related to the modifications carried out were reduced by 39%. An average of \$NZ 564 spent per home reduced fall injuries by 26%. The injuries prevented were worth more than six times that spent on the programme, making it highly cost beneficial.



Source: Michael Keall/Joshua Shanley

Following the intervention, participants were able to contact the builders in case any modification needed further work or repairs. The programme team monitored any problems or issues over a two-year period following the intervention. They then held public meetings to explain the results of the study and record participants' impressions. Generally, people were satisfied with the modifications. However, there were clear safety issues with particular modifications and the team revisited homes to address these. This highlights the need to allocate resources for monitoring and remediation work following interventions, and a need for regulation of the quality of safety products more generally.

Although this intervention is not a "one size fits all" approach, which does complicate programme implementation and evaluation, home falls are a widespread and preventable problem, and this provides a strong rationale for wider adoption of these home modifications. The programme was highly cost-effective and therefore well-suited to receiving state support.



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME



CASE STUDY 6

FALL PREVENTION IN OLDER ADULTS USING THE HOME SAFETY SELF-ASSESSMENT TOOL

NEW YORK STATE, USA

One in three older adults in New York State falls in any given year, and 22% of these fall again in the following year. Hospitalization due to falls in older adults outnumbers any other causes (230). Of all of these falls, 40% occur inside the home.

The Home Safety Self-Assessment Tool (HSSAT) was developed by the Department of Rehabilitation Science at the University at Buffalo, State University of New York, to improve recognition of older residents' potential fall situations. The illustrated, easy-to-use tool is designed to enable older adults and their family, friends, social workers, nurses, physicians, physical therapists and occupational therapists, to prevent falls.

HSSAT identifies key home areas to focus on in preventing falls: front entrance, side entrance, hallway/foyer, living room, kitchen, bedroom, bathroom, staircases, and laundry room/basement and the garage area. Using illustrations, the potential hazards for falls are highlighted and solutions suggested.

While difficult to attribute fall prevention to the use of the HSSAT (because it requires long-term observation and control for other factors that influence falls such as age, exercise, illness, and medication), studies found that within 2 months of using the HSSAT, older adults significantly increased their knowledge about home hazards, reduced their fall risk factors, and therefore reduced their fear of falling (231).

Fear of falling is a good indicator of falls because, if older adults have a high level of

fear of falling, they tend to be inactive, lose lean mass muscle and become vulnerable to another fall.

The HSSAT has been used to raise awareness for fall prevention in various communities and specific audiences such as Parkinson's support groups, health-care organizations, rehabilitation facilities, and the Area Agencies on Aging (mandated since 1973 to promote, support, and advocate for the independence, dignity and well-being of seniors, adults with disabilities).

Most recently, a municipal fire department decided to use the HSSAT to install inexpensive grab bars and other home improvement tools in older adults' homes in their service area, while the HSSAT was used for interprofessional education for occupational therapy, physiotherapy, and pharmacy students to promote fall prevention in a university setting (232).





INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

FIGURE 5: SAMPLE PAGE FROM THE HSSAT

Kitchen

The list identifies all the potential home hazards that may cause a fall. If the item applies to your home place a check in the box. Then add the total number of checks and enter it in the box below

<input type="checkbox"/> 1. Cabinet too high or low	<input type="checkbox"/> 5. Presence of throw/ scatter rug
<input type="checkbox"/> 2. Not enough counter space	<input type="checkbox"/> 6. Presence of slippery floor
<input type="checkbox"/> 3. Using a stool or a chair to reach things	<input type="checkbox"/> 7. Poor lighting
<input type="checkbox"/> 4. Not enough room to maneuver	<input type="checkbox"/> 8. Presence of a pet underfoot when preparing meals

Other _____

Total number of problems

* The numbers correspond to the hazard in the picture and solutions on the following page

Source:HSSAT.



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

FIGURE 5

SAMPLE PAGES FROM THE HSSAT

Kitchen



12. Three step ladder
A 3-step ladder with a wide platform top is helpful to reach shelves. The ladder shown in the picture has several key features such as a large standing platform for stable and secure use, thin design for saving space, a convenient hand grip with non-skid steps, and non-marring feet for secure footing on the ladder.
Price range: \$28 - \$142



13. Non-slip socks/Safe shoes
Well fit canvas shoes or athletic shoes are recommended. Shoes with more than 1.5 inch heels may cause falls. If shoes are not preferred inside the home then wearing non-slip socks can diminish the risk of falling on bathroom, kitchen, wood and other slippery floors. The key feature of this non-slip sock is that it has skid resistant treads. Price range: \$1 - \$22 for non-slip socks
\$30 - \$60 for canvas shoes
\$30 - \$90 for athletic shoes



14. Lazy Susan
Lazy Susans can be used to save space and organize items in the kitchen. There are many shapes of Lazy Susans such as full circle, kidney shaped, and d-shaped. They can be a single tray or multi-tier shelves. They can be free standing on a tabletop or installed in a kitchen cabinet. When installing in a cabinet, there should be appropriate clearance from the hinge and the door.
Price range: \$5 - \$34 for single turntable
\$13 - \$340 for 2 tier shelf



15. Hallway security gate
Security gates of different shapes and sizes are available to keep children and pets away from the kitchen, or other restricted areas of the house. Some of the gates swing open in both directions with easy, one hand operation. Some of the gates are tall (39.4 inches) and can expand up to 63.5 inches (Note: When the door is open, there is still a portion of the gate on the bottom that remains in the way. Be careful while stepping over the remaining part of the gate.)
Price range: \$23 - \$190

27



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN THE HOME

Solutions for the Problems in Kitchen

1. Cabinet too high or too low

Move items to the shelves closest to the counter.
Add hooks to the wall for pots and pans you use frequently.

2. Not enough counter space

Make sure available counter space is cleared of clutter. Use Lazy Susan.
(See page 27, item 14)
Move kitchen table closer to counter for additional work space.
Use a rolling cart for added work space.

3. Using a stool to a chair to reach things

Move items to lower shelves.
Replace the stool with a sturdy step ladder. (See page 27, item 12)

4. Not enough room to maneuver

Eliminate clutter or excessive furniture (extra kitchen chairs, etc.) to add space.
Remove a leaf from the table and push it closer to the wall.

5. Presence of a throw/scatter rug

Remove a scatter rug or use a double sided rug tape or a rug pad to secure the rug to the floor. (See page 26, item 8)

6. Presence of slippery floor

Do not walk on a wet floor.
Wear comfortable and fit shoes or socks with a non-skid sole.
(See page 27, item 13)
Change flooring surface to one that is less slippery.

7. Poor lighting

Increase wattage of bulbs to allowable level.
Add under counter lighting.
Add additional overhead lighting.

8. Presence of a pet underfoot when preparing meals

Remove the pet from the kitchen while cooking and add a pet gate to the entry ways of the kitchen. (See page 27, item 15)
Put the pet outside or in a crate.

For information on additional device, See page 28, item 16

Source:HSSAT.



ANY FALL-PREVENTION INTERVENTION NEEDS TO TAKE INTO ACCOUNT NUMEROUS FACTORS, INCLUDING THE THE SAFETY PRACTICES AND REQUIREMENTS OF ANY GIVEN RESIDENTIAL CARE FACILITY.







INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE



IN RESIDENTIAL CARE FACILITIES

Almost all evidence about fall prevention in residential care facilities (see page 35 for a definition of these facilities) relates to older people, and the evidence on the effect of fall-prevention interventions in residential care is limited to trials in high-income countries. Due to the diverse nature of interventions that aim to prevent falls among older people in residential care settings, any fall-prevention intervention needs to take into account numerous factors, including the local context; the safety practices and requirements of any given residential care facility; the available resources; and the specific needs and risk profiles of those taking part in the intervention. The most promising interventions are multifactorial interventions that include more than one component tailored to the individual resident's fall risk profile (72).







SUMMARY OF KEY INTERVENTIONS TO PREVENT FALLS AND FALL-RELATED INJURY AMONG OLDER PEOPLE IN RESIDENTIAL CARE FACILITIES

 STRONGLY RECOMMENDED	<ul style="list-style-type: none"> • Multifactorial interventions: These involve individual fall-risk assessments followed by tailored combinations of referrals and interventions, depending on the identified risks.
 RECOMMENDED	<ul style="list-style-type: none"> • Vitamin D.
 PROMISING	<ul style="list-style-type: none"> • Multicomponent interventions (standardized multicomponent programmes). • Strength and balance exercise. • Hip protectors. • Staff training on links between medication and falls. • Patient education on fall risks and prevention.
 PRUDENT	<ul style="list-style-type: none"> • Attend to medical fall-risk factors such as psychotropic drug use. • Limit the use of chemical and physical restraint in residential care facilities. • Ensure adequate staff-to-resident ratios.



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN RESIDENTIAL CARE FACILITIES

Multifactorial interventions



STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 STRONGLY RECOMMENDED	 PEOPLE  ENVIRONMENTS	<ul style="list-style-type: none">• Multifactorial interventions: These involve individual fall-risk assessments followed by tailored combinations of referrals and interventions, depending on the identified risks. They have the strongest evidence as an intervention to prevent falls among older people in residential care facilities (72,235–238). These vary considerably in their content and there is no clear evidence about which specific components are most important, although exercise is often a component of successful multifactorial interventions.
 PROMISING	 PEOPLE  ENVIRONMENTS	<ul style="list-style-type: none">• Multicomponent interventions: Standardized multicomponent programmes provide less benefit than individually tailored ones, but have still been found to reduce the rate and risk of falls among older people living in residential care (72,97).









INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN RESIDENTIAL CARE FACILITIES

Physical activity and tailored exercise programmes

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 PROMISING	 PEOPLE	<ul style="list-style-type: none"> Exercise: There is inconsistent evidence that targeted exercise programmes may reduce the rate of falls in older people in residential care facilities (97,189,236,237,239,240). Exercise may be more effective and appropriate as an intervention for less-frail residents of facilities than frailer residents. Balance and strength training appear to be the most effective exercise types (189,236). People in residential care should be provided with regular and safe opportunities to be active for general health and well-being and, in particular, to engage in specific, supervised fall-prevention exercise programmes that safely improve balance, gait, strength and function.














Address medical and behavioural risk factors

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 RECOMMENDED	 PEOPLE	<ul style="list-style-type: none"> Vitamin D: There is evidence that Vitamin D as a single intervention reduces the rate of falls, but maybe not the proportion of fallers, among older people in care facilities. It may be particularly effective when given as part of a multifactorial programme. Vitamin D should be only be given where appropriate and under medical supervision (72,97,237).
 PROMISING	 PEOPLE	<ul style="list-style-type: none"> Hip protectors: These do not prevent falls from occurring, but they probably reduce the chance of sustaining a hip fracture in the event of a fall in high-risk individuals - though this very much depends on the likelihood of them being consistently worn (189,241). Hip protectors are only effective if they are worn at the time of a fall. They tend to be more effective among older people in institutional settings rather than those living at home, which may be due to the increased likelihood of being worn. Hip protectors may slightly increase the risk of pelvic fracture (241). There are many types and designs of hip protectors, and the effectiveness in preventing hip fractures varies with type (242). Hip protectors should be considered in individualized care plans for those assessed to be at high risk of falls (243) (see Case study 7).



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN RESIDENTIAL CARE FACILITIES

Education and knowledge

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>PEOPLE</p>  <p>POLICIES</p>	<ul style="list-style-type: none"> ▪ Staff training: Some studies suggest that training nursing staff to recognize harmful medications can reduce the incidence of falls. There is currently little high-level evidence to support other residential care staff education programmes.
 <p>PROMISING</p>	 <p>PEOPLE</p>	<ul style="list-style-type: none"> ▪ Patient education: Some evidence suggests that increasing residential care recipients' knowledge about fall risk and prevention as a single intervention can prevent falls (189). This is likely to be most effective in those without cognitive impairment and as part of multicomponent or multifactorial interventions.
 <p>PRUDENT</p>	 <p>PEOPLE</p>  <p>POLICIES</p>	<ul style="list-style-type: none"> ▪ Medical factors: While there is no strong evidence about interventions involving medication review and other medical factors in residential care settings, it remains prudent to consider and attend to medical fall risk factors such as polypharmacy, psychotropic and other drug use, poor vision and cardiac function among older people in residential care settings (see Case study 8).
 <p>PRUDENT</p>	 <p>ENVIRONMENTS</p>  <p>POLICIES</p>	<ul style="list-style-type: none"> ▪ Limit use of chemical and physical restraint in residential older people's care facilities: There is some evidence that physical and chemical restraint use (including bed siderails) can increase the number and severity of falls (97,110,244).
 <p>PRUDENT</p>	 <p>PEOPLE</p>	<ul style="list-style-type: none"> ▪ Ensure adequate staff to resident ratios: Older people in residential care facilities are often highly dependent and if assistance from carers is unavailable or delayed, residents may attempt risky activities on their own. Adequate staffing and ensuring residents' needs are met can reduce falls (245).



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN RESIDENTIAL CARE FACILITIES



CASE STUDY 7

HIP PROTECTOR COMPLIANCE (INSTRUCTIONAL VIDEO AND SYSTEMATIC REVIEW)

VANCOUVER, CANADA

Clinical studies of the effectiveness of hip protectors yield conflicting results, mainly due to poor acceptance and adherence among users in wearing these devices.

As a result, researchers in Vancouver, B.C., Canada identified potential barriers and facilitators to initial acceptance and continued adherence with hip protector use. The systematic review (243) and accompanying instructional video (<https://youtu.be/MjNkxCBZl5c>) provide decision-makers, health professionals, and caregivers with strategies to improve compliance with the use of hip protectors.





INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN RESIDENTIAL CARE FACILITIES

CASE STUDY 8

SCREENING FOR VISUAL IMPAIRMENT REDUCES FALLS IN LONG-TERM CARE FACILITIES

MANITOBA, CANADA

Research indicates that visual impairment is an independent risk factor for falls and fractures among older adults and that residents in long-term care settings have more than triple the visual deficits of their peers living in community settings.

In 2006, a survey of long-term care facilities in Winnipeg (and in Aberdeen, Scotland), revealed a lack of policy and procedure for regularly testing the vision of long-term care residents (including upon admission). The study revealed that 97.3% of newly screened residents had vision impairment, when there was no prior indication of vision impairment in their health record.

This gap was addressed at the Misericordia Health Centre through a joint venture with Manitoba Health as a 3-year pilot project entitled “Focus on Falls Prevention”. The project’s goal was to provide on-site vision care services to residents in long-term care settings in the Province of Manitoba. Vision care services include on-site vision screening by a trained health-care professional with a reliable vision screening tool, on-site optometry services, appropriate referral, interventions, education and follow up for residents. Interventions included but were not limited to: eye-specific vitamins, new prescriptions for spectacles, cataract surgery, eye drops, photodynamic and Avastin therapy, improved lighting and magnifiers. Since the project’s inception in 2006, over 900 residents have been assessed.

Outcome evidence demonstrates that the group of older people who had vision interventions did not have falls or fractures and improved their balance. Quality of life indicators, including social engagement and depression, also improved. The residents that refused vision interventions had falls, fractures and deaths associated with fractures. They also demonstrated a decrease in balance, social engagement and an increase in depression. The two groups were similar in terms of age, gender and levels of care. One participating region in Manitoba instituted vision screening in a PCH facility and saw an astounding 76% decrease in falls.

In May 2010, the Focus on Falls Prevention Project was officially deemed a programme by Manitoba Health. In addition, the May 2011, Winnipeg Regional Health Authority Falls Prevention & Management Regional Clinical Practice Guidelines recommend that acute, personal care homes and community services and programmes use a validated tool such as the Misericordia Health Centre Focus on Falls Vision Screening Tool to guide their vision risk assessment process.





INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE






IN HOSPITAL

In addition to underlying fall risks, several factors can increase people’s risk of falls while they are patients in hospital, including acute illness, delirium, recovery from surgery, extended periods of immobility or bed rest, being in an unfamiliar place, being in pain, badly fitting footwear or clothes, difficulty sleeping, difficulties with toileting, dizziness and adjustment to new medications. Cluttered environments, understaffing and poor staff knowledge also increase risk. Hospital patients are a diverse group in terms of age, risk factors, and medical and personal histories, so some fall-prevention interventions (often called “safe mobility programmes”) may work better for some patients than others. It is also worth noting that interventions that work for older people at home may not work for them in hospital (see Box 7).

Hospitalized patients’ fall risk may vary rapidly due to changes in health conditions, particularly delirium. Additionally, differences in health system structure, available health resources, and medico-legal requirements across countries influence the presentation of – and risk factors for – falls in hospital settings. Therefore, some hospital safety practices that are effective in high-income settings may not always be easily implemented in low- and middle-income hospital settings.

There are, however, several fall-prevention principles and practices that have application in most hospital settings. This section focuses on preventing falls among older people while they are in hospital, not once they have been discharged from hospital.

SUMMARY OF KEY INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN HOSPITAL

 RECOMMENDED	<ul style="list-style-type: none"> ▪ Multicomponent interventions (standardized service-wide or ward-wide efforts to reduce falls) .
 PROMISING	<ul style="list-style-type: none"> ▪ Multifactorial interventions (including individual fall-risk assessments followed by targeted combinations of interventions). ▪ Exercise, particularly in rehabilitation and subacute settings. ▪ Education to improve patient knowledge about falls.
 PRUDENT	<ul style="list-style-type: none"> ▪ Appropriate footwear (wearing sturdy, enclosed shoes while mobile).



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN HOSPITAL

BOX 7

WHAT WORKS AT HOME MAY NOT WORK IN HOSPITAL

Some interventions that are proven or promising for preventing falls among older people living at home have little evidence to support their use in hospitals, including exercise, medication review, withdrawal of psychotropic drugs, and modification of the physical or social environment.

There are reasons why some interventions are less impactful in studies conducted in hospital settings. For instance, the risk profile of people while admitted to hospital differs markedly from people living in the community, and interventions such as exercise when delivered in hospital normally have a shorter time to have in impact.

Furthermore, hospital environments are often built with accessibility and fall prevention in mind and may already have grab rails, handrails and other safety features in place. Thus, interventions to improve the physical environment may be comparatively less impactful than in people's home environments. Even so, clutter, hard and slippery or floors, issues with lighting and noise may pose environmental fall risks for older people while in hospital.

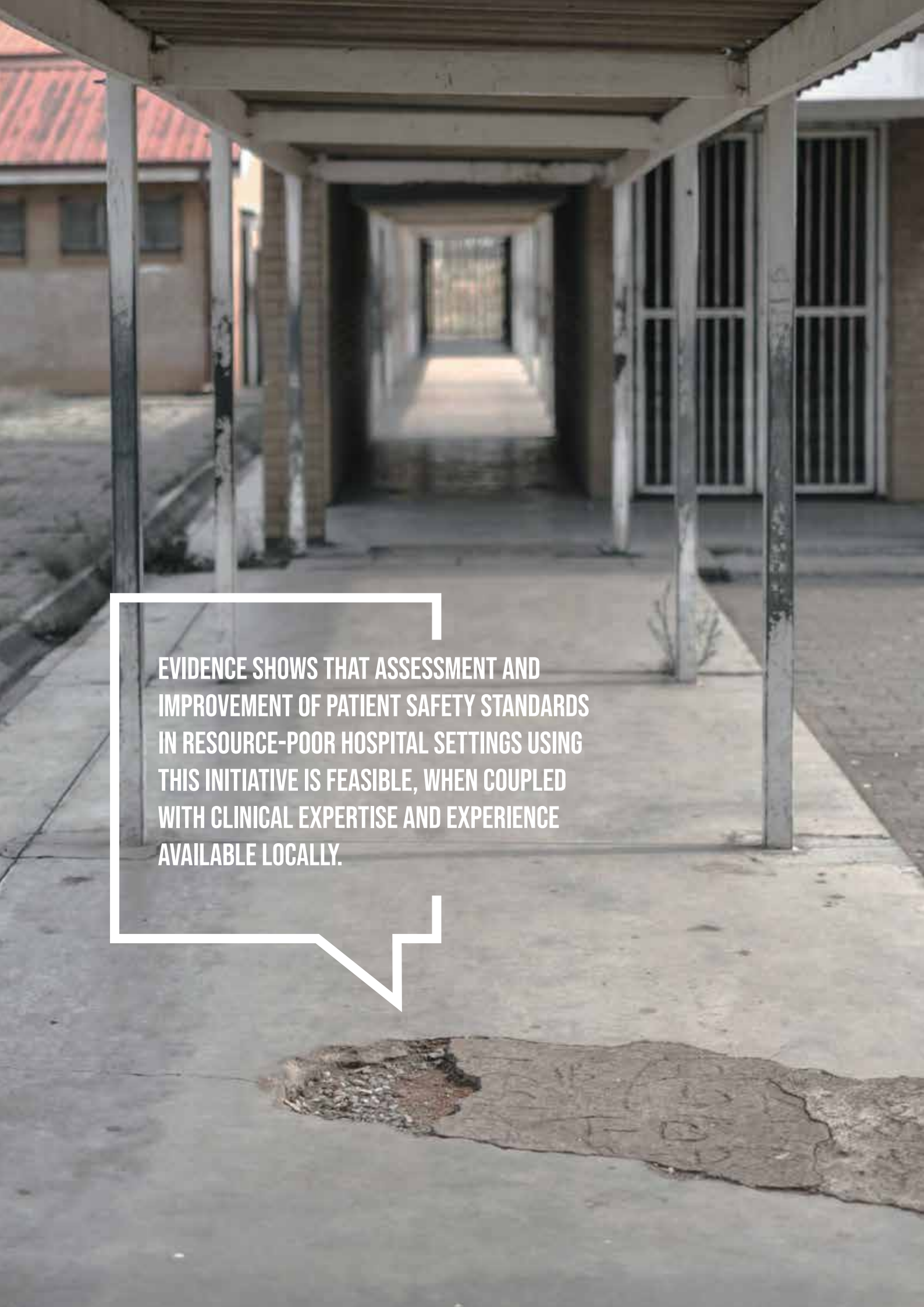
Hospitals are also places where patients normally have their medications reviewed and changed, so interventions that specifically involve medication review for fall prevention may have a less obvious effect on fall rates in hospitals than in other settings. It can also be a place where medications that cause falls are introduced. This does not necessarily mean that interventions like medication review or environmental factors are not important to consider in hospital settings.





INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN HOSPITAL





EVIDENCE SHOWS THAT ASSESSMENT AND IMPROVEMENT OF PATIENT SAFETY STANDARDS IN RESOURCE-POOR HOSPITAL SETTINGS USING THIS INITIATIVE IS FEASIBLE, WHEN COUPLED WITH CLINICAL EXPERTISE AND EXPERIENCE AVAILABLE LOCALLY.



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN HOSPITAL

Low-cost interventions that require neither equipment nor significant changes to hospital infrastructure are most likely to be feasible in low- and middle-income countries, such as staff education about universal fall precautions, patient and family education, and close supervision for people obviously at high risk of a fall (246). These types of interventions are also more likely to be sustainably policy integrated into existing care systems, together with adequate staff support and appropriate governance structures.




WHO's Patient Safety Friendly Hospital initiative may be an effective approach to reducing falls in low-income hospital settings (247). Evidence shows that assessment and improvement of patient safety standards in resource-poor hospital settings using this initiative is feasible, when coupled with clinical expertise and experience available locally (248). Although this intervention does not have a focus on injury prevention, and has not yet been formally evaluated, improving general inpatient safety is likely to have a positive impact on falls and may be more appealing to hospitals in low- and middle-income countries when compared to stand-alone fall-prevention initiatives.

Some interventions (e.g. exercise, patient education) aim to affect intrinsic factors and others aim to modify extrinsic (physical or social) environments. Some interventions are single component and others multicomponent or multifactorial. There is no strong evidence about any single interventions that effectively prevent falls in hospitals (97).






INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN HOSPITAL

Multifactorial interventions

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 RECOMMENDED	 PEOPLE  ENVIRONMENTS	<p>Multicomponent interventions: These often involve standardized service-wide or ward-wide efforts to reduce falls through multiple interventions delivered as a package, which may include staff education, patient education, toileting schedules, medication review, environmental modification, signs to alert patients of fall risk, policies on patient footwear while walking, and exercise.</p> <p>While it is difficult to determine the most important components, there is evidence that hospital programmes that involve a package of targeted interventions can reduce falls (108). Universal fall precautions that include a focus on good nursing care, including asking all patients simple questions on a regular basis – such as whether they are in pain, if they need assistance with toileting, ensuring they have water and other needed items in easy reach – can reduce call bell use and falls (246).</p> <p>Adequate staff resourcing to enable nursing staff to perform regular, proactive patient care rounds support such practice. Targeted, sustained efforts including the education of all ward staff (including cleaning and catering staff) about what they can do to improve safety, such as reducing clutter that prevents access to handrails, applying brakes on equipment with wheels, use of night lights and keeping floors clean and dry, are crucial (246).</p>





INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN HOSPITAL

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>PEOPLE</p>  <p>ENVIRONMENTS</p>	<p>Multifactorial interventions: Multifactorial interventions comprise multiple interventions tailored to individual needs. They involve individual fall-risk assessments followed by targeted combinations of interventions (or referrals for interventions), depending on identified risks. Overall, the evidence to support multifactorial interventions in hospital settings is not strong (97,189,237,249), but because multifactorial interventions can include a very broad range and combination of intervention types, it is difficult to make blanket statements about their effectiveness. It is important to note that the use of fall-risk assessment tools for inpatients (often the first step in multifactorial interventions) are not enough in themselves to prevent falls. These tools may not be more effective than nurse’s judgement alone (250) and some experts argue they can create a false sense that “something is being done” or that all “at risk” patients are identified (109). Fall-risk assessment has no impact without prevention strategies that are effective and implemented to address those risks (251).</p> <p>The most promising multifactorial interventions in hospital settings tend to involve the education of staff, individualized assessment and education of patients, along with ongoing targeted communication between staff and patients (206). There is stronger evidence that multifactorial interventions are effective in subacute and rehabilitation settings rather than acute hospitals (97). Several other implementation points have also been noted, including the importance of leadership support, engagement of frontline clinical staff in programme or intervention design, changing fatalistic attitudes about falls, guidance by a multidisciplinary committee, and pilot-testing (108).</p>








INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE IN HOSPITAL

Exercise

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>PEOPLE</p>	<p>Exercise (as a single intervention): The evidence to support exercise as a single intervention for older people in hospital settings is not as strong as it is for older people at home (97,189). Exercise is often a component of multifactorial interventions, which can reduce falls, although this makes the contribution of exercise to the overall effect of the intervention difficult to determine. Even so, there is some evidence to suggest that exercise may help to prevent falls in hospitals, particularly in subacute settings where the length of stay is longer (252,253). It is important that older people in hospital be encouraged and helped to mobilize regularly, if it is safe and possible to do so, to prevent the rapid loss of strength and capacity often associated with extended bed rest (254). This includes explaining the benefits of staying active while in hospital to improve motivation when patients are likely to be feeling unwell. This includes making hallways accessible for safe mobility by removing equipment that block access to handrails. Hospital stays can cause a person to lose physical function, and while engaging in exercise after discharge from hospital would seem an intuitive remedy for this, there is some evidence that exercise programmes in the early post-discharge period can increase falls, so care must be taken when resuming exercise after a hospital admission (255).</p>

Education (patient knowledge)

STRENGTH OF RECOMMENDATION	SAFE SYSTEM DOMAIN	KEY INTERVENTIONS
 <p>PROMISING</p>	 <p>PEOPLE</p>  <p>POLICIES</p>	<p>Education for patients in hospital: There is some evidence that increasing patient engagement and knowledge can reduce falls (206). This can include advice or counselling, one-to-one or group-based education (including family members), leaflets and booklets, use of mainstream media, or use of Internet-based information. Hospital patient education interventions are most likely to prevent falls when delivered as part of a multifactorial intervention and in rehabilitation wards rather than acute care settings (97,206). Written materials should be adapted for different languages, those with visual impairment (larger font and high contrast) or cognitive impairment (simplified language and pictures).</p>
 <p>PRUDENT</p>	 <p>PEOPLE</p>	<p>Appropriate footwear: Older people in hospital should wear sturdy, enclosed shoes while walking around, rather than socks or slide-on footwear which may be slippery or pose a trip hazard (108).</p>



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE

Monitoring and evaluation

Whole-of-population data about falls and fall-related injury is a valuable resource for monitoring the burden of falls and evaluating fall-prevention interventions – activities that should be part of ongoing practice in hospital and care facility settings.

- **Collect data on fall-related injuries among older people:** Sources can include mortality statistics, hospital discharge records, emergency room records, household surveys, and insurance data. For example, New Zealand has a universal, no-fault accidental injury scheme (the Accident Compensation Corporation) through which researchers were recently able to efficiently and objectively evaluate the effect and cost-benefit of a home safety intervention on fall related injury (120). China has established the National Injury Surveillance and state/province hospital-based injury surveillance. In the USA, The Centers for Disease Control and Prevention conducts surveillance of emergency department and hospital admissions and also conducts an annual household survey – the Behavioural Risk Factor Surveillance System (BRFSS) – in which households report falls and injuries due to falls (256).
- **Collect data on levels of physical activity, functional capacity and strength and balance of older people at risk of falls,** e.g. through community health surveys and studies.
- **Collect data on falls among older people in hospital:** Monitor administrative and clinical data (e.g. falls per 1000 occupied bed days, fall rates by type of falls, specific location of falls) and investigate the frequency and severity of falls (e.g. injury rate, injury rate by severity) in the health organization (257) (see Case study 9).
- **Identify relevant committees, meetings or individuals and form clinical governance frameworks that encourage fall-prevention systems to be developed, monitored and continuously improved:** Professionals including health executives, health service managers, clinicians, educators, people with responsibility for policy and quality improvement, and building maintenance and cleaning staff should share responsibility and maintain fall-prevention governance and systems in the health care setting.
- **Engage frontline health and care providers** to obtain information on any barriers to using fall-prevention systems or interventions.
- **Ensure that fall-prevention policies, procedures and protocols in use are consistent with best practice guidelines** (where available) or national guidelines, and regularly monitored.



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE

- **Collect data on falls among older people living in residential care:** In addition to fall rates, evaluate patient, family and carer perspectives and experiences on personal aspects of care to identify areas of improvement and potential fall-prevention solutions in care facilities.
- **Ensure that information on falls in hospitals and care facilities are reported to the highest level of governance for health and older people's care services:** For example, see the UK National Reporting and Learning System (<https://improvement.nhs.uk/resources/report-patient-safety-incident/>). This involves developing reporting systems that makes it easy for frontline health care workers, patients and their relatives to report a fall. This information should be available for independent oversight and for research.



CASE STUDY 9

CAMPAIGN TO GET IN-PATIENTS ACTIVE RESULTS IN FEWER FALLS

UK

An evaluation the UK's "End PJ paralysis" campaign, which encourages patients to get up, get dressed and out of their pyjamas (PJs), resulted in measurable improvements, including fewer falls, and reduced risk of hospital-acquired pressure ulcers and infections (258).

The 70-day challenge, launched by England's chief nursing officer Professor Jane Cummings in 2018, saw hundreds of hospitals across the UK ensure patients got up and took part in activities instead of being stuck in bed. In all, the drive meant that patients went home earlier, and spent 710 000 fewer days in hospital.

Professor Cummings said the results showed the difference that helping people to get up and about could make, and called on all settings caring for older people to embrace the concept. "We know that many people who are in hospital beds could be helped to get back on their feet sooner, which helps them to get back home to loved ones more quickly," she said. "The campaign to end PJ paralysis has shown what can be achieved when this gold standard is adopted."

Studies have shown that wearing pyjamas and night clothes can reinforce feelings of being unwell and can actually hinder recovery. Research has also shown that around three in five immobile, older patients in hospital have no medical reason for bed rest and increasing the amount of walking they do helps to reduce their length of stay. Getting up and keeping moving is particularly important for people over 80, who can expect to lose 10% of their muscle mass for every 10 days they spend in hospital – the equivalent of 10 years of ageing.

Source: (258)



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE

Further resources on preventing falls among older people

See below links to other resources on preventing falls among older people.

AGENCY FOR HEALTHCARE RESEARCH AND QUALITY

Preventing falls in hospitals: a toolkit for improving quality of care:
<http://www.ahrq.gov/sites/default/files/publications/files/fallpxtoolkit.pdf>

AUSTRALIAN FAMILY PHYSICIAN

Falls prevention in older adults. Assessment and management (journal article):
<http://www.racgp.org.au/afp/2012/december/falls-prevention/>

CDC

Coordinated care plan to prevent older adult falls:
http://www.cdc.gov/steady/pdf/Steady-Coordinated-Care-Final-4_24_19.pdf

CENTRE OF EXPERTISE FOR FALLS AND FRACTURE

Prevention Flanders (Belgium):
<http://www.valpreventie.be>

FALLS MANAGEMENT EXERCISE (FAME)

Implementation toolkit:
<http://arc-em.nihr.ac.uk/clahracs-store/falls-management-exercise-fame-implementation-toolkit>

AMERICAN GERIATRICS SOCIETY

Updated Beers Criteria® (2019) for Potentially Inappropriate Medication Use in Older Adults:
<https://consultgeri.org/try-this/general-assessment/issue-16>

CDC

Compendium of effective fall interventions: what works for community-dwelling older adults, 3rd Edition:
http://www.cdc.gov/homeandrecreationalafety/pdf/falls/cdc_falls_compendium-2015-a.pdf

CDC

Stopping Elderly Accidents, Deaths and Injuries (STEADI) initiative:
<http://www.cdc.gov/steady/>

INTEGRATED CARE FOR OLDER PEOPLE (ICOPE)

Handbook and mobile application:
<https://apps.who.int/iris/bitstream/handle/10665/326843/WHO-FWC-ALC-19.1-eng.pdf>
www.who.int/ageing/health-systems/icope/en/



INTERVENTIONS TO PREVENT FALLS AMONG OLDER PEOPLE

FALLSKIP

Technological tool based on the timed Up and Go Test:
<http://fallskip.com/en/>

GOVERNMENT OF AUSTRALIA MY AGED CARE

<https://www.myagedcare.gov.au/getting-started/healthy-and-active-ageing/preventing-falls-in-elderly>

HEALTH QUALITY AND SAFETY COMMISSION, NEW ZEALAND

Falls in people aged 60 and over (website):
<http://www.hqsc.govt.nz/our-programmes/health-quality-evaluation/projects/atlas-of-healthcare-variation/falls/>

NEW SOUTH WALES FALLS PREVENTION NETWORK

<http://fallsnetwork.neura.edu.au/resources/research/>

UNIVERSITY OF VICTORIA, BRITISH COLUMBIA, CANADA

Canadian fall-prevention curriculum:
<https://continuingstudies.uvic.ca/health-wellness-and-safety/courses/canadian-fall-prevention-curriculum#/0-0>

WEIGHT-BEARING EXERCISE FOR BETTER BALANCE (WEBB)

Guidelines for a community-based fall-prevention programme:
http://www.webb.org.au/attachments/File/WEBB_draft_19.pdf

GOV. OF WESTERN AUSTRALIA, DEPARTMENT OF HEALTH

Post fall multidisciplinary management guidelines for Western Australian health care settings 2018:
www2.health.wa.gov.au/~media/Files/Corporate/general%20documents/Health%20Networks/Falls%20prevention/WA%20Post%20Fall%20Guidelines_Final_2018_PDF.pdf2015-a.pdf

WHO

Age Friendly World (website):
<https://extranet.who.int/agefriendlyworld/>

Global age-friendly cities guide:
http://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf



**INTERVENTIONS TO
PREVENT FALLS AMONG
OLDER PEOPLE**

PREVENTION OF FALLS NETWORK EUROPE

www.profane.eu.org/

UK NATIONAL GUIDANCE AND QUALITY STANDARDS:

www.nice.org.uk/guidance/cg161

www.nice.org.uk/guidance/qs86

VEILIGHEID, NETHERLANDS

<http://www.Veiligheid.nl>

SECTION 4:

MANAGING

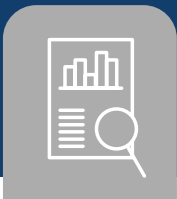
FALLS





SECTION 4:

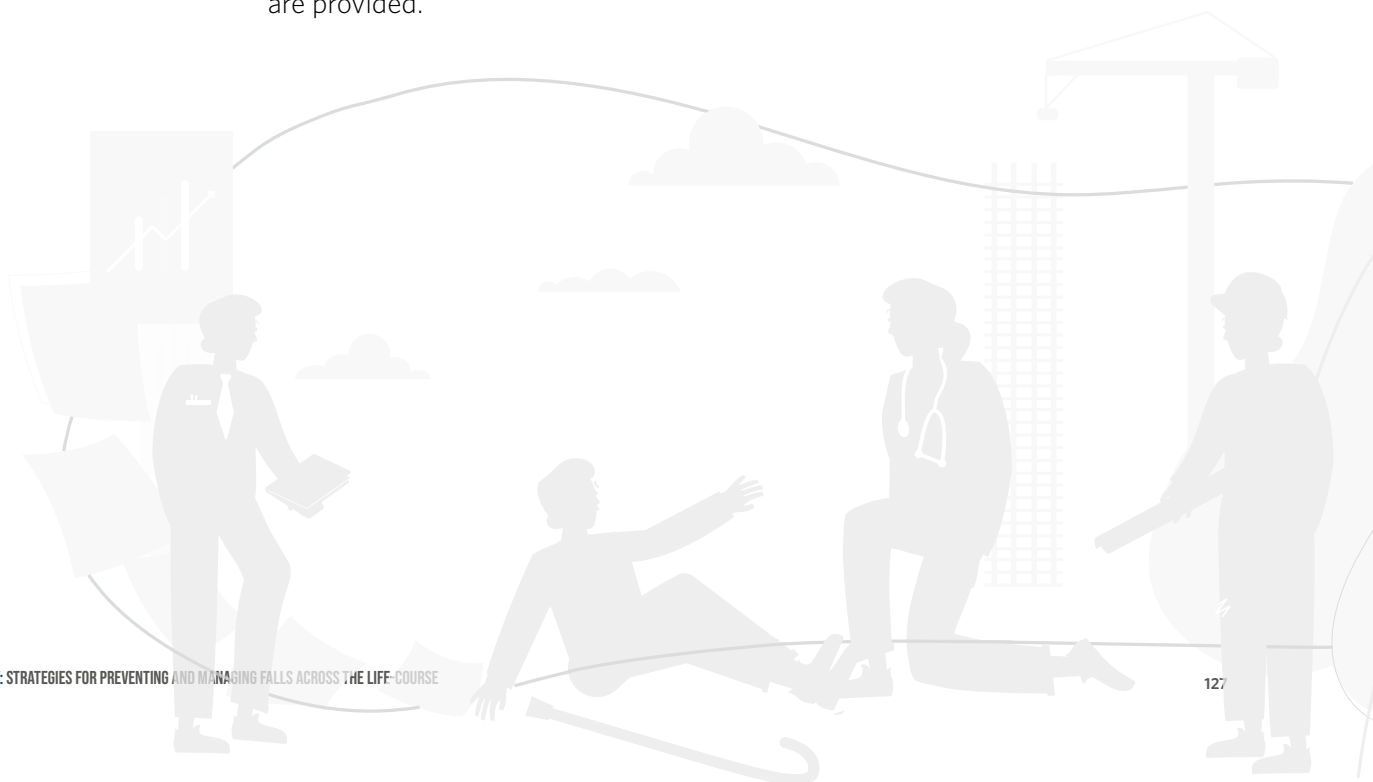
MANAGING FALLS



HIGH-INCOME COUNTRIES' TRAUMA SYSTEMS GENERALLY PERFORM BETTER THAN THOSE IN LOW- AND MIDDLE-INCOME COUNTRIES, REFLECTING THE GREATER ACCESS TO RESOURCES AND MORE ESTABLISHED HEALTH CARE SYSTEMS.

While it is always better to prevent falls occurring in the first place, good injury management is crucial for reducing unnecessary death and disability when serious falls do occur (259,260). Many falls do not require medical attention, but falls from height and high-impact falls in particular can result in serious injury, including spinal cord injury, traumatic brain injury and fracture (261). Moreover, as described in previous sections, falls can affect people differently depending on the underlying ability of their bodies to withstand the force of a fall. Thus, even falls that appear relatively minor can result in serious injury for older people or infants, whose bodies are more susceptible to various types of injury.

This section describes the stages and principles of good injury-management systems and provides links to resources and guidelines for the treatment and management of serious fall-related injury. It is not the intention of this section to comprehensively describe the medical treatment for fall-related injuries, though some basic care principles are described and links to further resources are provided.





INJURY MANAGEMENT SYSTEMS

Many of the principles of fall injury management also apply to other types of injury and are closely aligned with the principles underpinning good health systems more broadly. In good health care systems, all injured people get the care they need when and where they need it.

When a person is injured through a serious fall, emergency care may be needed within minutes or hours in order to prevent death or disability (259,260,262). Falls may present a variety of injury patterns with differing severity and specialist needs. Injury care systems must be able to provide timely access to care as well as appropriate destination triage in order to deliver patients with conditions such as intracranial and cervical spine injuries to appropriate referral centres. Globally, injury care systems vary markedly and, consequently, so do injury outcomes (263). People injured in low- and middle-income countries are much more likely to die than those injured in high-income countries, with these disparities particularly pronounced for those with more severe injuries and those receiving treatment in rural rather than urban areas (261,264). An estimated 2 million lives could be saved every year if fatality rates for injured people in low- and middle-income countries could be reduced to levels similar to those in high-income countries (259,265).

Organized injury management systems, often called trauma systems, save lives and reduce injury-related disabilities (259). An organized trauma system is a coordinated effort in a defined geographic area that delivers care to all injured people and is integrated with local health systems (266). There is consistent global evidence that mature, regionalized trauma systems result in improved patient outcomes (267) (see the WHO trauma systems maturity Index for information about the features of trauma systems at different levels of maturity at www.who.int/emergencycare/trauma/essential-care/maturity-index/en/) (see Table 1).

Source: Dijkink 2017, based on WHO content from <https://www.who.int/emergencycare/trauma/essential-care/maturity-index/en/>.



INJURY MANAGEMENT SYSTEMS

Table 1: WHO maturity index trauma systems

	Level I	Level II	Level III	Level IV
Pre-hospital Trauma Care	<ul style="list-style-type: none"> No mapping of pre-hospital resources No formal EMS, unavailability or duplication of pre-hospital services No defined communication system 	<ul style="list-style-type: none"> Pre-hospital resources are identifiable No coordination between public and private providers of pre-hospital care No universal access number, weak links of communication 	<ul style="list-style-type: none"> Formal EMS present Universal Access Number available Coordination seen between various agencies for pre-hospital care delivery Well defined communication 	<ul style="list-style-type: none"> Formal EMS controlled by a lead agency National universal access number Legislative mechanism in place to govern EMS and allow universal coverage
Education and Training	<ul style="list-style-type: none"> No identified health personnel to offer primary trauma care in community 	<ul style="list-style-type: none"> Identified health personnel in the community for emergency trauma care No definite training requirement for health workers or ambulance personnel 	<ul style="list-style-type: none"> Health professionals and paramedics are trained in provision of emergency trauma care Training courses are available for trauma education 	<ul style="list-style-type: none"> Educational standards and training for emergency trauma care providers laid down Licensing and renewal norms for different levels of paramedics are in place
Facility based Trauma care	<ul style="list-style-type: none"> Role of secondary and tertiary facilities unclear Health facilities lack human and physical resources No clear referral linkages 	<ul style="list-style-type: none"> Roles of various health care facilities are clear Referral linkages are present No documentation or needs assessment of facilities in the line with EsTC guidelines No lead agency in the system 	<ul style="list-style-type: none"> Health facilities in the systems are assessed in line with EsTC guidelines Guidelines and documented human and physical resources are available and ensured round the clock Lead agency present 	<ul style="list-style-type: none"> Mechanism of hospital verification and accreditation is in place through Ministry of Health or professional bodies Lead agency established with mandate to supervise trauma care
Quality Assurance	<ul style="list-style-type: none"> No injury surveillance or registry mechanism in place to get comprehensive data 	<ul style="list-style-type: none"> Injury data available but no formal attempts to document and analyze the data No initiative for Quality Assurance program 	<ul style="list-style-type: none"> Basic Quality Assurance programs in line with EsTC guidelines Guidelines are in place 	<ul style="list-style-type: none"> Formal Quality Assurance programs are in place and are mandated in pre-hospital and facility based services

Note: EsTC, Essential Trauma Care Project.

Source: Dijkink 2017, based on WHO content from <https://www.who.int/emergencycare/trauma/essential-care/maturity-index/en/>



INJURY MANAGEMENT SYSTEMS

High-income countries' trauma systems generally perform better than those in low- and middle-income countries, reflecting the greater access to resources and more established health care systems. However, only some of the improved injury outcomes in high-income countries are due to highly trained physicians and surgeons or expensive equipment and facilities; much of the difference is accounted for by universal access to care and the organization and coordination of services (260,263,267). Many low-cost improvements can be made to trauma systems in low-resource settings, where particularly great gains are waiting to be made to survival rates and disability outcomes (268,269).

Much effort has been made in recent decades to improve the standard of care available to all injured people worldwide, including by groups such as the WHO Global Alliance for the Care of the Injured (270). In 2019, the World Health Assembly adopted a resolution on emergency and trauma care aimed at helping countries to ensure timely care for the acutely ill and injured. Good fall-injury management systems encompass a spectrum of care and consist of several interconnected components (or phases) including:

- **pre-hospital care** – bystander first aid, emergency transport to the right location for appropriate care;
- **hospital care** – teams of health professionals with trauma care training (see the WHO Trauma Care Checklist, available at <https://www.who.int/publications/i/item/trauma-care-checklist>, for an outline of actions at critical points to ensure that life-threatening conditions are not missed and that timely, life-saving interventions are performed). Extremity fracture is one area for improvement at relatively low cost in low-and middle-income countries);
- **surgery;**
- **rehabilitation;**
- **post-care and prevention** of further falls.



STUDIES HAVE SHOWN THAT WHEN AN INJURY OCCURS, BYSTANDERS WHO HAVE FIRST AID TRAINING ARE MORE LIKELY TO ADMINISTER FIRST AID.





PRE-HOSPITAL CARE

Care after a fall begins at the scene of the incident, where simple actions can save lives. Good pre-hospital care includes the administration of appropriate first aid, medical stabilization, and prompt and safe transport to the right facility for definitive care. The provision of pre-hospital care can be extremely cost effective even in low- and middle-income settings and can comprise a combination of systems using lay people and professional paramedics (259). Acute health events can cause falls and screening for acute illness should be carried out for older people who have fallen, such as chest and urine infection, cardiac events and stroke.

Bystanders and first aid

The first responder after a fall is often a lay bystander – a friend, a neighbour, a colleague or family member – and their actions in providing or summoning help can make a big difference to the chain of events that follow. Studies have shown that when an injury occurs, bystanders who have first aid training are more likely to administer first aid, and they are also more likely to provide the correct first aid compared to untrained bystanders (271,272). This highlights the importance of improving knowledge of first aid principles and practices in the general public, but also the particular importance of training people who are most likely to be bystanders in high risk situations, including those who work with the key populations described in this package. This includes those who provide care to children (e.g. parents and educators), those who work in high-risk occupations, and those who work with, live with or care for older people. First responder training for other key professions such as police and drivers can be a high-impact intervention, particularly in countries without reliable ambulance services where people in these roles often transport injured people to medical care facilities.

Initial care, whether provided by lay bystanders or trained professionals, is often of extreme importance in patients who have suffered a fall and sustained a brain or cervical spine injury. Low-cost interventions such as airway repositioning and cervical spine stabilization can save lives and prevent long-term morbidity. These can be effectively implemented at scale with training such as basic emergency care and with low-cost materials. The pre-hospital phase of fall management is particularly amenable to such improvements.

Ambulance and patient transport services



PRE-HOSPITAL CARE

Transport from the location of a fall to a hospital or medical facility is a crucial step and often represents a major barrier to accessing emergency care, particularly in low- and middle-income countries (260). In many high-income countries, specialist coordinated ambulance services are staffed by highly trained paramedics – and even physicians in some countries – who travel to the patient to begin treatment on-site or in transit where required (263). Ambulance services are normally land based, and are sometimes combined with helicopter transfers to get severely injured people to specialist trauma centres quickly. Myriad factors to do with ambulance service design and implementation are important determinants of system performance, including location, communication mechanisms, the establishment and adherence to standardized protocols for triage and treatment. There is evidence that improvements to these and other aspects of ambulance service provision can improve injury outcomes even in high-income countries with sophisticated ambulance services (267).

Some falls do not result in serious injury and may not require hospital admission – in such cases ambulance services may provide treatment at the scene and referral for follow-up care from general practitioners or other community health services. Locally tailored referral protocols can be helpful to ensure people who have fallen are connected with relevant services in their area.

While universal access to specialist ambulance services with highly trained staff





PRE-HOSPITAL CARE

and efficient protocols is ideal, this may not always be feasible in some countries due to cost, lack of infrastructure, personnel and other barriers. The organization of simple, low-cost pre-hospital systems in low- and middle-income countries can reduce injury deaths by 25% (273). In some countries, interventions focusing on viable means of local transport and first responders can be a realistic starting point (260). Emergency transport does not necessarily have to be expensive or specialized to provide some benefit.

For example, a community-based pre-hospital ambulance system and training programme introduced in rural Uganda cost US\$ 90 per life saved. System implementation costs were US\$ 0.93 per capita, and annual maintenance costs per capita were US\$ 0.09. The ambulance service was functional, viable and acceptable to the community (259,274).

In Mexico an increase in ambulance dispatch stations from two to four decreased the mean ambulance response time by 40%. In addition, training increased the use of pre-hospital interventions such as airway management and placement of intravenous lines, which did not affect scene time. Together these measures decreased pre-hospital fatality rates from 8.2% to 4.7% (259).

Most serious fall-related injuries receive definitive treatment in hospitals.



HOSPITAL CARE

This care includes assessment and interventions from physicians, surgeons, nurses and allied health professionals. Hospitals can vary significantly in their characteristics and capacities, both within and between countries, ranging from small rural hospitals staffed by general practitioners with very rudimentary infrastructure and equipment, to large urban regional trauma centres staffed by highly specialized multidisciplinary teams with access to state-of-the-art equipment and facilities.

WHO's Guidelines for essential trauma care outline standards for facility-based injury care that are achievable and affordable worldwide in an effort to reduce geographic inequalities in trauma care (268,275). The key methods outlined to promote and meet these standards are:

- workforce development and training;
- trauma team organization;
- performance improvement;
- hospital inspection;
- the integration of systems.

This guide also describes the resources required to deliver these services: human (staffing and training); physical (infrastructure and equipment); and process (organization and administration).

WHO's guidelines have been implemented (at least partially) in over 51 countries but a review in 2016 found no evidence of their implementation in 143 countries. Thus, there remains substantial room for trauma systems around the world to improve and many lives to be saved.

As with pre-hospital care, many gains can be made to injury outcomes through the organization and standardization of hospital care. Another key factor highlighted in research findings and by advocacy groups is the need for universal access to care; where cost retrieval is required, payment should not be required prior to the provision of care, particularly for emergency care (257, 258).

Workforce training is crucial, including the training of whole teams in how to work together, including junior and less highly trained staff. Some programmes in settings where doctors are scarce involve training non-doctors (sometimes referred to as "nurse practitioners") to perform basic but time-critical procedures normally performed by doctors (259,276) (see Case study 10). Many emergency medicine training courses are now cheaply available or open access online. Several of these courses are described in WHO's guidelines (more available at https://www.who.int/health-topics/emergency-care#tab=tab_1) and links to some are provided in the resources listed at the end of this section.



HOSPITAL CARE

Finally, using a data-driven approach is key to achieving high-quality care for the injured. Systematic facility-based data collection on acute illness and injury helps identify gaps in care. Standardized analyses and audits allow high-yield targeted quality improvements and have been shown to save lives. The WHO International Registry for Trauma and Emergency Care (WHO IRTEC)⁴ is a web-based platform for aggregation and analysis of case-based data from emergency care visits. The platform is free to users and provides a range of automated reports to facilitate quality improvement, system planning and scholarly publication. Standardized audit filters allow rapid identification of cases where simple process changes can save lives. In falls, these audit filters can help identify patients with potentially preventable outcomes due to events such as lack of airway repositioning in altered mental status, lack of cervical spine mobilization, or surgical and post-operative complications.



CASE STUDY 10

TRAUMA TEAM TRAINING

UGANDA AND TANZANIA

The trauma team training course in Uganda and Tanzania, run collaboratively by the Injury Control Centre in Kampala and the Canadian Network for International Surgery (WHO 2004 guidelines) is designed to create trauma teams that function well in under-resourced health centres in rural areas.

The team comprises a clinical officer, an anaesthetist, an orthopaedic technician, a registered nurse and an assistant. The course lasts 3 days and consists of lectures, skill stations and team exercises.

The lectures are designed to ensure that all team members have a common understanding of key issues in clinical trauma care, and of the importance of the trauma team. The skill stations ensure that all participants can proficiently perform their role for the initial care of the injured patient and the preparation of the patient for definitive care. At the end of the course, the participating institution gains a cohesive team. The course has trained around 200 people from 10 hospitals in Uganda since 1998, and plans are in place for its translation into Portuguese for use in Mozambique. This course has also been evaluated in Tanzania where it was found to significantly improve participant knowledge and performance in simulations (276).

⁴ See <https://www.who.int/emergencycare/irtec/en/>



THERE ARE WELL-ESTABLISHED GUIDELINES ABOUT OPTIMAL MANAGEMENT OF FRAGILITY FRACTURES, INCLUDING HIP AND SPINAL FRACTURES IN OLDER PEOPLE.



HOSPITAL CARE

Clinical protocols improve the standardization of care and reduce human error, particularly during situations of high stress. Protocols include the use of checklists to guide practice (see WHO Trauma care checklist at <https://www.who.int/publications/i/item/trauma-care-checklist>).



CASE STUDY 11

BEST-PRACTICE GUIDELINES FOR THE TREATMENT & MANAGEMENT OF HIP FRACTURES

UK

There are well-established guidelines about optimal management of fragility fractures, including hip and spinal fracture in older people.

The UK Blue Book (277) outlines evidence-based care principles, including prompt admission to a specialist orthopaedic or orthogeriatric ward, prompt surgery, early mobilization, pain management, steps to minimize the risk of developing a pressure ulcer, early multidisciplinary rehabilitation, fall-prevention assessment, ongoing community rehabilitation and osteoporosis assessment, including a fracture liaison service.

Some of these principles, such as admission to specialist wards, rely on highly developed health care systems that are often only present in high-income countries, but work is underway to trial these principles in middle-income countries, with promising results (278). Other principles, such as early post-surgical mobilization, may be applied to varying degrees in most settings.

Key elements of good care include:

- Prompt admission to orthopaedic or orthogeriatric care
- Rapid comprehensive assessment – medical, surgical and anaesthetic
- Minimal delay to surgery
- Accurate and well-performed surgery
- Prompt mobilization
- Early multidisciplinary rehabilitation
- Early supported discharge and ongoing community rehabilitation
- Secondary prevention, combining bone protection and falls assessment. (279–281).

The UK National Hip Fracture Database records key activities and outcomes outlined in the Blue Book and enables monitoring, a key mechanism to driving improvement (282).



REHABILITATION

Rehabilitation is a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment (283).

Rehabilitation is an important phase of fall-related injury management and normally occurs after acute medical treatment. Rehabilitation aims to maximize and restore an individual's functioning after a fall-related injury, enabling them to reach their full physical, social, vocational and educational potential (284). In settings where rehabilitation services are limited or inaccessible, rehabilitation principles can be used to guide other health and community services.

Rehabilitation involves engaging in targeted therapeutic activity to improve mobility, strength, flexibility, balance, speech and cognition, and ultimately optimize functioning in everyday life. For people with residual impairment after a fall-related injury, rehabilitation may also involve obtaining and learning to use assistive products such as a wheelchair or walking aid. Rehabilitation can involve a process of adjusting to lower levels of functioning due to associated disability or impairment by modifying home environments, learning new ways of performing tasks and managing ongoing health needs such as pressure care or catheter management (285).

Rehabilitation services may include individual assessment, goal-oriented care and interventions, regular review, discharge planning, home visits, and follow-up (284). These services are ideally provided by a multidisciplinary team of specially trained health professionals including:

- rehabilitation physicians
- physiotherapists
- occupational therapists
- speech therapists
- rehabilitation nurses
- social workers
- psychologists
- discharge planners





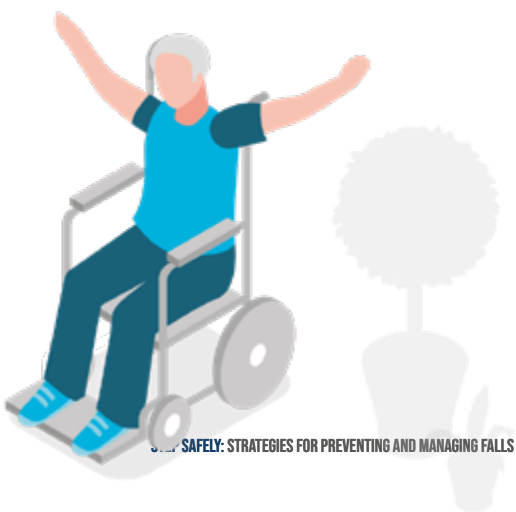
REHABILITATION


Rehabilitation after acute falls often takes place in a specialist inpatient hospital facility or ward, but it may also be provided as an outpatient service, either in a patient's home, at outpatient clinics, or through group outpatient programmes. Early rehabilitation can reduce length of hospital stay by avoiding deconditioning, improving functional capacity and avoiding complications like chest infection or pressure sores, thus reducing pressure on acute health care facilities (277). Rehabilitation can also optimize the outcome of other kinds of medical, surgical and psychological interventions (286,287).

The need for rehabilitation services is growing globally, particularly in low- and middle-income countries, which means that rehabilitation has large potential to lower global disability rates and thereby deliver economic and social benefits (288). But rehabilitation services are particularly under-resourced in low- and middle-income countries, where there are few staff with specialist rehabilitation training, limited specialist facilities and other required infrastructure, assistive products and technology, and where scarce health care resources are often understandably focused on patients presenting with acute health care needs.

In these settings, creative solutions are being successfully used to ensure those who survive serious falls are best placed to return to their full potential. These efforts focus on workforce development, including training existing health care staff in non-rehabilitation settings, steps to include the use and affordability of assistive products, tele-rehabilitation, and improved data about the cost-benefits of rehabilitation services.

Where it is not possible to establish a full multidisciplinary team, simplified rehabilitation teams may be created, or general staff (nurses or aids) may be trained in the most essential aspects of therapies. Where a specialist rehabilitation facility does not exist, a well-trained team can provide rehabilitation services within a general hospital (289) (see Case study 12). Efforts can also focus on educating patients and their families about ways to implement a rehabilitation programme at home after discharge from hospital. Some pilot studies also suggest that nurses and community health workers can be trained to safely provide simple assistive devices in low-resource settings where specialist therapy staff are not available (290,291).



A photograph of a man in a yellow shirt and cap leaning over a child in a wheelchair on a beach. The child is wearing a yellow shirt and blue shorts. The wheelchair has large yellow wheels. The background shows a sandy beach and the ocean under a clear sky. A white speech bubble-like box is overlaid on the right side of the image, containing text.

**THE SIMPLIFIED REHABILITATION PROGRAMME
AIMED TO PREVENT JOINT DEFORMITIES AND
PRESSURE SORES, PROMOTE MOBILITY AND
WHEELCHAIR TRANSFERS, MANAGE BLADDER AND
BOWEL ISSUES, CONTROL PAIN, IMPROVE SELF-CARE
INDEPENDENCE, AND TRAIN CAREGIVERS.**



REHABILITATION



CASE STUDY 12

SIMPLIFIED HOSPITAL REHABILITATION PROGRAMMES

SÃO PAULO, BRAZIL

In the 1980s and 1990s, patients with injury-related disability could wait a year or more before receiving treatment at a rehabilitation centre – a delay that increased the number of secondary complications (contractures, pressure sores, and infections) that reduced the effectiveness of rehabilitation services when they eventually became available.

In response, the Orthopaedic and Traumatology Institute at the Clinical Hospital of the Faculty of Medicine, University of São Paulo, created the Simplified Rehabilitation Programme – initially for people with spinal cord injuries but later extended to older persons with hip fractures and individuals with severe musculoskeletal injuries. The programme aimed to prevent joint deformities and pressure sores, promote mobility and wheelchair transfers, manage bladder and bowel issues, control pain, improve self-care independence, and train caregivers (especially for quadriplegics and older patients).

The rehabilitation team also provided advice about assistive devices and home modifications. It comprised a physiatrist (a specialist rehabilitation doctor), physiotherapist, and rehabilitation nurse for the orientation work with patients and caregivers. In addition, a psychologist, social assistant, and occupational therapist were involved for patients with multiple or complex impairments. The team did not have its own specific unit in the hospital, but cared for patients on the general wards.

The programme usually began in the second or third week after injury when the patient became clinically stable, and continued for the remainder of the patient's stay in hospital. Patients return for their first follow-up evaluation 30–60 days after

discharge and periodically thereafter as needed. The programme had a profound effect on the prevention of secondary complications:

This suggests that developing countries with limited resources and large numbers of injuries can benefit

Complications	1981-1991 (n = 186)	1999-2008 (n = 424)	Percentage point reduction
Urinary infection	85%	57%	28
Pressure sore	65%	42%	23
Pain	86%	63%	23
Spasticity	30%	10%	20
Joint deformity	31%	8%	23

from basic rehabilitation strategies, to reduce secondary conditions. This requires:

- acute care doctors recognizing patients with disabling injuries, and involving the rehabilitation team in their care as early as possible;
- a small and well trained team in the general hospital;
- basic rehabilitative care directed towards health promotion and prevention of complications, initiated soon after the acute phase of trauma care;
- provision of basic equipment and supplies.

Source: (289) p. 115 <https://www.who.int/publications-detail/world-report-on-disability>



REHABILITATION

Rehabilitation services: notes on implementation

- In all health care settings, strategic decisions should be made about how best to focus rehabilitation efforts and spend finite rehabilitation resources. The WHO Rehabilitation 2030 strategy aims to integrate rehabilitation into health systems (292).
- As is the case with hospital care, disability from extremity fractures can be prevented with relatively inexpensive improvements in rehabilitation services and thus the rehabilitation of extremity fracture may be a low-cost opportunity for disability prevention in low- and middle-income countries (268). Conversely, rehabilitation for people who have sustained a more serious injury, such as a spinal cord injury, can be long and significantly more expensive, but in turn can significantly improve a person's quality of life, including their functional independence and productivity, while also preventing further serious and costly complications such as pressure sores, depression, and respiratory, bladder or bowel problems (293).
- Patients with good pre-injury mobility and cognition tend to gain maximum benefit from rehabilitation most quickly. However, for frailer and older patients, while rehabilitation may take longer it can make a very significant difference in functional outcomes, for instance it can mean the difference between being able to return home after a fall injury instead of requiring permanent, full-time residential care (277).
- In settings where there are insufficient resources to provide rehabilitation services to all who require them, there is merit in establishing a specialist rehabilitation team or unit as a centre of excellence to build workforce capacity and provide institution-wide advice on rehabilitation (277).

People who have fallen, particularly older people and those who have been injured





POST-FALL CARE AND TARGETED SECONDARY PREVENTION

by a fall, are at much higher risk of repeat falls, and require targeted attention to reduce this risk. Ideally, people who sustain a serious fall-related injury will have received rehabilitation, but even so they may not have returned to the same level of function they previously enjoyed. Thus, prevention interventions outlined in Section 3 become particularly important and relevant for people who have already fallen.

Health professionals who see people who have had a fall should take a full fall history to identify and discuss the factors that contributed to previous falls. Falls resulting in minor injury are often neglected but can result in fear of falling and reduced activity that can then profoundly affect quality of life and function, and increase the risk of more harmful falls, so they should still be investigated. Many underlying illnesses can cause falls, particularly in older people, and careful evaluation for acute illness such as chest and urine infection, heart attack, stroke or sepsis is needed. Medication review and attention to optimal management of medical problems should be a routine part of post-fall health care. Attention to fall-prevention exercise and a home hazard assessment and modification is as important after a fall to prevent subsequent falls as it is to prevent a fall in the first place. People should also be informed of their increased future fall risk in a way that does not create unnecessary fear, but rather encourages a proactive approach to implement all relevant interventions that may mitigate that future risk.

As with the general fall-prevention interventions outlined in Section 3, different population groups who have fallen will require different kinds of targeted prevention interventions. The parents of children who have fallen may need support and information about supervision or home safety measures, particularly where environmental factors were at play in their child's fall. In workplaces, individual functional capacity evaluations and risk assessments should be conducted to determine if the worker requires modified duties or environments if and when they are able to return to work.

Where possible, referral of older people to a physician specializing in older people's needs, or a specialist falls clinic, is advisable and further actions such as modifications to living environments, the addition of support services or referral for ongoing falls prevention exercise may be required (213) (see Table 2). Fracture liaison services are coordinator-based secondary prevention services designed to ensure those with fractures related to osteoporosis receive optimal assessment and treatment in relation to bone health and falls prevention (294). This includes systematic assessment including bone mineral density testing, appropriate treatment and follow-up, education and access to self-management programmes and support systems. Fracture liaison services have been adopted to good effect in many countries and have been found to be a cost-effective way to reduce recurrent osteoporotic fractures (295,296).

The interconnected phases of fall-injury management



POST-FALL CARE AND TARGETED SECONDARY PREVENTION

Table 2: High-risk older people living in the community who may benefit from review by a geriatrician or falls clinic (213)

FREQUENCY
Recurrent falls (two or more falls in past 12 months)
CLINICAL FEATURES
Unexplained falls with syncope, dizziness or poor recall * Falls as part of downward physical, social or psychological spiral Falls occurring at low threshold (such as basic activities or daily activities) Falls with head injury, low trauma fracture or on floor > 1 hour Gait disturbance or unsteadiness present
* Consider cardiologist referral if cardiogenic syncope is suspected

While the phases of fall-injury management are conceptually distinct and have been described separately in this technical package, they are nonetheless inextricably linked and interdependent. Any one of these phases can be a weak link in the chain that undermines good care outcomes and affects the success of other phases. If ambulance services are not reliable, people may not use them and opportunities to access hospital care may be missed. Likewise, poor hospital care can discourage people from using pre-hospital care services.

If rehabilitation services are not available or are of poor quality, people may not recover their full function to capitalize on surgical procedures, reducing the benefit of surgical and other acute care investments. And if there is no follow up fall-prevention services and the person falls again, they re-enter the system of injury management, with likely additional complications and from a lower functional base. Thus, each phase of care has an important role to play in optimal fall management.

Resources on injury management

WHO and other organizations and alliances have many resources and tools



POST-FALL CARE AND TARGETED SECONDARY PREVENTION

available for people working to strengthen trauma care services.

- WHO's Emergency, Trauma and Acute Care programme is dedicated to "strengthening the emergency care systems ... and to supporting the development of quality, timely emergency care accessible to all" (297).
- The Global Alliance for Care for the Injured is a network of governmental, nongovernmental and intergovernmental organizations, including professional societies, working internationally to improve care for the injured across the spectrum of pre-hospital and hospital care and rehabilitation of the injured. The aim is to save millions of lives and minimize the devastating consequences of injuries by strengthening trauma care systems." See www.who.int/emergencycare/gaci/en/
- WHO pre-hospital care system framework infographic: www.who.int/emergencycare/emergencycare_infographic/en/

Resources on pre-hospital trauma care systems

- Pre-hospital trauma care systems: https://www.who.int/violence_injury_prevention/publications/services/39162_oms_new.pdf
- WHO basic emergency care course (open access): www.who.int/publications-detail/basic-emergency-care-approach-to-the-acutely-ill-and-injured

Further resources on the role of first responders

- CPR training courses Canada: <https://cprtrainingcourses.ca/first-aid-for-a-victim-fallen-from-height/>
- Dovemed: www.dovemed.com/healthy-living/first-aid/first-aid-fall-injuries-adults/
- Dovemed: www.dovemed.com/healthy-living/first-aid/first-aid-fall-injuries-children/
- First Aid for Life London: <https://firstaidforlife.org.uk/first-aid-falls/>
- First Aid Training Bangkok: www.firstaidtrainingbangkok.com/resources/treatments/injuries/first-aid-for-falls.html
- Healthline: www.healthline.com/health/first-aid/first-aid-for-seniors#falls
- St John Ambulance Australia: www.stjohnnsw.com.au/secure/downloadfile.asp?fileid=1584566
- WHO Basic emergency care: approach to the acutely ill and injured: participant workbook: <https://apps.who.int/iris/handle/10665/275635>

CONCLUSION

AND RECOMMENDATIONS





CONCLUSION



MOST FALLS CAN BE PREVENTED WITH APPROPRIATE ACTION AND THERE IS AN EMERGING BODY OF EVIDENCE FOR EFFECTIVE AND PROMISING FALL-PREVENTION INTERVENTIONS TO INFORM OUR RESPONSE.

Every year falls result in the deaths of 684 000 people worldwide and leave an estimated 172 million more with short- or long-term disability – huge statistics that are set to soar further in the coming decades as the world’s population ages. This demographic shift, coupled with the often fatalistic view that falls are an inevitable part of life (particularly as we age), means action is urgently required to tackle this under-recognized public health problem at local, regional, national and global levels if we are to curb the growing burden that falls place on individuals, families, health systems and economies.

Most falls can be prevented with appropriate action and there is an emerging body of evidence for effective and promising fall-prevention interventions to inform our response. Although we need to know much more about what works, particularly in low- and middle-income countries, this document provides a summary of the available evidence for three key, at-risk population groups, tailored to a systems approach that can lead to safer people, safer environments and safer policies and legislation.





There are many different types of fall, and fall prevention is not a “one size fits all” approach across the life-course, nor across different sectors or countries. However, there are key emerging principles – such as encouraging and enabling life-long physical activity, reducing environmental hazards and enforcing policies that encourage cultures and environments of safety – that echo across populations, across the life-course, and across a wide range of settings. We also know that better-organized trauma and health care systems decrease preventable deaths and improve functional outcomes among survivors of serious falls.

However, while this growing body of knowledge is key to preventing and managing falls, it is not enough on its own. We also need champions for change to ensure that falls are an ongoing priority for governments, workplaces, health and care facilities, schools and households. We therefore encourage users of this package to reflect on what practical steps they can take to prevent and manage falls in their settings and to think creatively about the partnerships and resources that might be available to them.

Whether the focus is children in the home, workers in construction or other hazardous works, or older people in hospitals, start where you are, imagine how things could be and take targeted, evidence-based steps to prevent them falling. Such fall-prevention efforts will also contribute to the achievement of three key SDGs: healthy lives and well-being, sustainable economic growth and decent work, and safe, sustainable cities.

As the numbers of people at risk of falls rises – be they older people, children living in high-rise dwellings, or construction workers working at height in our ever-expanding cities – it is clear that accepting falls as inevitable “accidents” is no longer an option. This package offers evidence-based ways to tackle this needless burden. Now is the time to act.



**ENCOURAGE AND ENABLE
PHYSICAL ACTIVITY THROUGHOUT
THE LIFE-COURSE TO IMPROVE
PHYSICAL FITNESS, STRENGTH AND
BALANCE FOR ALL.**





RECOMMENDATIONS

ENCOURAGE AND ENABLE PHYSICAL ACTIVITY THROUGHOUT THE LIFE-COURSE TO IMPROVE PHYSICAL FITNESS, STRENGTH AND BALANCE FOR ALL, INCLUDING:

1

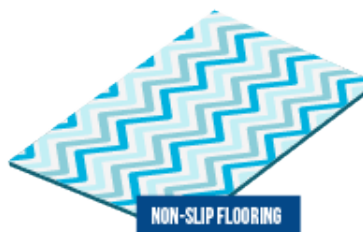


PHYSICAL ACTIVITY

- **Regular physical activity from early childhood** onwards to develop movement skills, and to strengthen bones and muscles.
- **Teaching children how to fall** in ways that reduce injury and improving awareness of hazards through education.
- Providing opportunities for children to **be active in play** and recreation with diverse activities that develop balance, strength, control and coordination.
- **Providing physical education (pe) at school** and ample opportunities for active play.
- Encouraging **active transport** – e.g. walking and cycling.
- Ensuring access to quality **green space** for all.
- Exercise focused on **improving balance, function, strength** and bone density for older people; exercise programmes specifically designed to improve gait and build internal resilience.

CREATE SAFE ENVIRONMENTS THAT ENCOURAGE AND ENABLE PHYSICAL ACTIVITY BY:

2



SAFE ENVIRONMENTS

- **Reducing fall hazards in the home** and neighbourhood environments, for example through home hazard assessments and modification, including provision of grab rails, stair guards, non-slip surfaces and improved lighting.
- **Providing soft-fall surfaces and safe equipment** heights that can reduce the risk of injury to children falling in playgrounds.
- Designing and **choosing spaces for children** with reduced fall heights;
- Ensuring that scaffolding for workers at heights includes **guard rails** and toe boards, planked platforms, and safe access points.
- **Installing barriers** near fall hazards (fences, railings, window guards, stair guards etc.).
- **Improving people's knowledge and skills** about what to modify in their own environment, and access to affordable products and services that deliver this change, for example subsidizing fall-prevention products for those on low incomes or the provision of tailored home visits to raise awareness among new parents of fall hazards for children.



STRENGTHEN LEGISLATION AND ENFORCEMENT, FOR EXAMPLE IN RELATION TO:

3



LEGISLATION

- **Construction safety**, including legislation that demands the use of safe scaffolding, harnesses or helmets.
- **Discouraging** the use of **baby walkers**.
- Requiring landlords to **install window guards** on windows in high-rise accommodation.
- Regulations that stipulate the use of **non-slip surfaces in public buildings**.

IMPROVE FALL-INJURY DATA AT GLOBAL, NATIONAL AND LOCAL LEVELS TO ENABLE MONITORING AND EVALUATION, FOR EXAMPLE BY:

4



FALL-INJURY DATA

- Establishing and improving population-level injury surveillance data to enable **monitoring of fall-related injuries and the evaluation of prevention interventions**.
- Where such injury data systems do not exist, practitioners and policy-makers should consider what options are available to collect data to **determine the effectiveness of an intervention** in their context or setting.
- **Collecting data on falls among children and adolescents** from hospitals and other health service facilities, schools, day care centres, sports clubs and other relevant organizations.
- **Collecting data on occupational falls** from insurance records, company records, labour force surveys and public health surveillance systems.
- **Collecting data on fall injuries among older people living independently** at home from mortality statistics, hospital discharge records, emergency room records, household surveys, insurance data.



TARGETED PROGRAMMES FOR HIGH-RISK POPULATIONS THROUGH, FOR EXAMPLE:


5



EXERCISE PROGRAMMES

- **Balance, gait and function exercise** programmes for older people.
- **Home safety assessments and modifications** for older people, particularly those with mobility or visual disabilities.
- **Medication reviews for older people.**
- **Targeted workplace programmes** – e.g. slip, trip and falls (STF) prevention and management and programmes to prevent and manage falls while working at heights.
- **Tailored home assessment visits** to vulnerable households such as single-parent families, young parents and families on low incomes with “giveaway” or subsidized products such as stair gates and window guards.





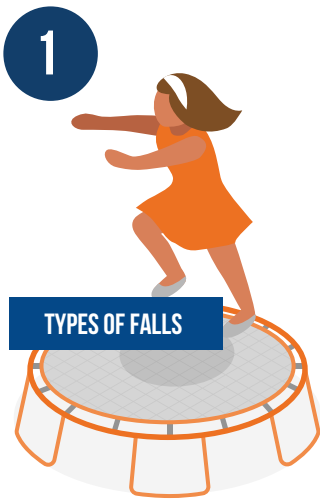
THE FALL-RELATED HAZARDS IN A CHILD'S ENVIRONMENT ARE OFTEN THE RESULT OF ENVIRONMENTS DESIGNED BY ADULTS WITHOUT CHILDREN IN MIND



ANNEX 1

SAMPLE SITUATIONAL ASSESSMENT FOR REDUCING FALLS AMONG CHILDREN

**WHAT ARE THE FALLS RISKS IN YOUR AREA?
WHAT ARE THE OPPORTUNITIES FOR PREVENTION?**



The following **six steps** are designed to enable preliminary planning for identifying falls risk to children in your area and what might be done to reduce this risk.

What are the main types of falls in young children in your area?

Consult with the community:

- Talk to children and parents of young children in your community informally or using focus groups or semi-structured interviews.
- Analyse online parent chat forums for what they are saying about fall events among their young children.

Review available data:

- Emergency department data
- Hospital admission data
- Sentinel surveys done by health practitioners/others

(If these are not readily available, could you work towards putting a sentinel survey in place?)

Talk to health professionals about the fall injuries they see among children.

Develop a list of what the key fall risks are and the population groups in which young children are at greater risk:

- What are the higher risk groups in terms of age, gender, ethnicity, geographic location, family income level among children presenting with fall injuries?
- What do you know about the environments in which children fall - at home, school, public spaces, farming areas/ fields, other?
- Are there cultural factors at play? Are there issues with supervision?



WHAT ARE THE FALLS RISKS IN YOUR AREA? WHAT ARE THE OPPORTUNITIES FOR PREVENTION?

2



2. What groups, industries or organizations can you work with to address falls among children?

Consider who has an interest in or responsibility for the children most at risk of falling, and for the protective products or the key hazards identified.

- From Step 1, consider organizations that may have experience or expertise, resources or outreach to risk groups, among: government, community groups, community leaders, businesses, not-for-profit sector, research organizations.
- Discuss with these groups their preferred approach to sharing their expertise, information, and resources.
- Identify established points of contact by the stakeholders with the risk groups and thus opportunities for checking for fall risk and awareness raising (e.g. home visit programmes, baby health care centres, sports clubs, parks associations, child care centres).
- Look for the win/win opportunities with local businesses which manufacture or sell safety products such as stair guards, play pens, table corner cushions, helmets and shin pads).

3



3. What programmes are underway and what resources may be available to use?

- **Identify local programmes and resources.** What are others doing in fall prevention? What opportunities exist to join forces or to use what they have developed?
- **Search widely for resources.** Search the Internet for the many existing initiatives, checklists, training kits, visual aids that may be useful.

4



4. What policies and regulations exist (or opportunities to introduce them where they are lacking)?

Some that have been successfully introduced are:

- Local government building codes or tenancy laws that require apartment buildings to have window locks for all apartments where children live (130).
- Mandatory product safety standards that ban baby walkers or ensure they have in-built brakes (see, for example <https://www.productsafety.gov.au/standards/baby-walkers>).
- Mandatory product safety standards for bunk beds – labelling and guard rails (see, for example <https://www.productsafety.gov.au/products/babies-kids/kids-furniture/bunk-beds>).
- Voluntary standards for playground safety (131).
- Policies in sport such as hardness of playing field (131), use of helmets (115,143).



WHAT ARE THE FALLS RISKS IN YOUR AREA? WHAT ARE THE OPPORTUNITIES FOR PREVENTION?

5



5. What can be done to create change?

Given the findings from Steps 1–4 above, consider what might work in your area. Which of the following (or which combination of the following) might gain support in your area? Which might be helped by available partners and resources?

Safer environments

- The fall-related hazards in a child’s environment are often the result of environments designed by adults without children in mind (298), or a lack of data on how children fall – even in places designed for children. Reducing the potential fall height, introducing soft-fall surfaces and erecting railings and barricades can be considered for many fall risk situations. Working with designers, urban planners, community agencies, or even families (e.g. through home visits) can result in identifying opportunities to modify a child’s environment and reduce the risk of falls.

6



Safer people

- This means building skills, awareness, motivation and access so that individuals, organizations and communities can make safer choices in the home, playgrounds, schools, sports and leisure spaces, fields and public places. Access includes affordable products that reduce fall risk. Consider opportunities for subsidized products or environments for low-income families.

6. What human and financial resources are required?

- All stakeholders and partners can consider what resources they need to work on this collaboratively. What resources are already available that may help meet their own or other partners’ resource needs?



ANNEX 2

NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL OF AUSTRALIA “BODY OF EVIDENCE MATRIX”

Component	A	B	D	D
	Excellent	Good	Satisfactory	Poor
Evidence base ¹	Several level I or II studies with low risk of bias	One or two level II studies with low risk of bias or a SR/ multiple Level III studies with low risk of bias	Level III studies with low risk of bias, or level I or II studies with moderate risk of bias	Level IV studies, or level I to III studies with high risk of bias
Consistency ²	All studies consistent	Most studies consistent and inconsistency may be explained	Some inconsistency reflecting genuine uncertainty around clinical question	Evidence is inconsistent
Clinical impact	Very large	Substantial	Moderate	Slight or restricted
Generalisability	Population/s studied in body of evidence are the same as the target population for the guideline	Population/s studied in body of evidence are similar to the target population for the guideline	Population/s studied in body of evidence differ to target population for guideline but is clinically sensible to apply this evidence to target population ³	Population/s studied in body of evidence differ to target population and hard to judge whether it is sensible to generalise to target population
Applicability	Directly applicable to Australian healthcare context	Applicable to Australian healthcare context with few caveats	Probably applicable to Australian healthcare context with some caveats	Not applicable to Australian healthcare context

¹ Level of evidence determined from the NHMRC evidence hierarchy

² If there is only one study, rank this component as “not applicable”

³ For example, results in adults that are clinically sensible to apply to children OR psychosocial outcomes for one cancer that may be applicable to patients with another cancer

Source: (7) p15



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CONCLUSION

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