



Injury Prevention: Just the Facts

Fall-related Injuries

FACT SHEET 12-007-0116

What are fall-related injuries?

Unintentional “slips, trips, and falls” are routinely reported as one of the most common causes of injuries in both civilian and military populations.¹⁻⁷ Fall-related injuries can involve various parts of the body, such as the lower extremities (ankles, feet), upper extremities (wrist, hand), back, or head. Activities and hazards associated with fall injuries are also quite varied. For example, a fractured ankle may result from a fall that occurred when tripping on a rock during a run, slipping on an icy step, landing the wrong way when playing basketball, or while getting out of a truck. These are all considered risk factors for fall-related injuries.

Why are fall injuries a concern for the Army?

The severity of fall-related injuries can be minor, temporarily disabling, or even fatal and can have long-term adverse impacts to a Soldier’s career and medical readiness (Table 1). In 2014, one-fourth of all Army injury hospitalizations were due to falls.⁸ Fall injuries have also been a leading cause of medical evacuations from deployment settings, and are among the top causes of outpatient injuries.^{1,3,4,7} Though only a small percentage (less than 1%) are fatal or permanently disabling, the majority of fall-related injuries result in temporary disability and lost duty time.^{1,3-6}

Table 1. Types of fall-related injuries and readiness impact*

Minor*	Temporarily disabling*	Life threatening or fatal*
<ul style="list-style-type: none"> • Bruises • Cuts 	<ul style="list-style-type: none"> • Concussions • Sprained or torn ligaments • Strained muscles/tendons • Dislocated joints • Fractured bones 	<ul style="list-style-type: none"> • Severe head trauma • Spinal cord injury • Fatalities

* Minor injuries result in 0-1 day(s) of restricted or lost duty; temporarily disabling refers to a range of up to 120 days (example estimated limited duty for fractured ankle = 120 days). Severe injuries include permanent disabilities and/or justification for discharge from service.⁴

What are common Army fall injury characteristics?

Though Active Duty Army fall-related injuries are most frequently reported for enlisted males in their twenties, factors such as age, gender, and race have not been shown to affect risk.^{1,5,6,7} The most frequent injury types reported include fractures, sprains, and strains. These are most commonly reported in lower extremities (ankle or foot), followed by upper extremities (hand and wrist).^{1,5,6,7} These injuries have been associated with playing sports, parachuting, and walking on ice.¹



How can fall-related injuries be prevented?

Because circumstances vary substantially, prevention requires awareness of the activities that pose greatest risks and the associated effective prevention tactics:

+ Icy and snowy conditions

Slipping on ice or snow is a leading hazard associated with fall-related injuries for both non-deployed Active Duty Soldiers and Army Civilians.^{1,2}

Prevention: While the effectiveness has not been studied in Army settings, improved local alerts, signage indicating icy hazard areas, and mechanisms to report slippery areas are recommended, especially in areas less prone to icy conditions.^{1,9,10} Table 2 provides additional prevention strategies. The effectiveness of anti-slip footwear to reduce injuries from falls on ice has not been validated in Army settings, so specific anti-slip footwear cannot be recommended at this time.¹ However, local policy may suggest such equipment for continued operations or training.

+ Entering or exiting vehicles

Fall-related injuries while entering or exiting non-moving vehicles are common among Army active duty personnel.^{1,7} The type of vehicle is a contributing factor (e.g., in 2011 light or medium high mobility multi-purpose wheeled vehicles (HMMWVs), personally-owned vehicles, and (in deployments) mine resistant armor protected (MRAP) vehicles were most commonly associated with fall injuries).¹ Fatigue and load carriage also appear to be factors that lead to falls from vehicles.¹

Prevention: Though the reasons vehicle type may increase fall risk are not clear, familiarization with a vehicle design and height may be important measures to prevent falls, especially for taller vehicles such as MRAPs.¹ Injuries may be reduced by being alert to hazards, balancing loads, and ensuring proper 3-point contact with the vehicle (two feet and a hand, or two hands and a foot) at all times.¹

+ Sports (Basketball)

Basketball is one of the leading sports associated with fall-related injuries in the Army, including during deployments.^{1,7} This activity most frequently results in lower extremity injuries like ankle sprains or fractures.^{1,11} Other sports associated with fall-related injuries include snowboarding and football.¹

Prevention: Use of ankle braces when participating in basketball is a proven effective means to reduce fall-related ankle injuries.¹¹ This is especially true for players with a history of ankle sprains.



+ Parachuting

Military airborne training is one of the leading activities associated with fall-related injuries in the Army. The most common type of fall-related parachuting injury is associated with an improper landing and most frequently involves lower extremity injury, especially the ankle.^{1,12}

Prevention: Studies repeatedly show that outside-of-the-boot ankle braces prevent ankle injuries during parachuting.¹² This equipment is not required, but is highly recommended.

Preventing fall-related injuries inside and around facilities †

The following strategies are recommended by the Centers for Disease Control and Prevention to reduce risks from fall-related hazards in health care facilities.¹¹ These hazards are common to many Army work environments as well. Identification of site-specific causes and implementation of multiple fall prevention strategies is recommended.^{1, 10}

Hazard Associated with Fall	Prevention Strategies
Contaminants on the floor (e.g., water, grease, oil)	<ul style="list-style-type: none"> ▪ House cleaning protocols ▪ Use of signs and barriers, visual cues for wet floors ▪ Posted contacts for housecleaning to address spills ▪ Ensure adequate spill cleanup materials at appropriate locations ▪ Provide walk off mats, paper towels, umbrella bags, trashcans at entrances, water fountains/sinks, ice ▪ Mats large enough to take several footsteps before floor ▪ Secure mats from moving (tape if needed, mark location) ▪ Employees wear slip-resistant shoes*
Poor drainage (e.g., pipes and drains)	<ul style="list-style-type: none"> ▪ Ensure pipes align with drains ▪ Unclog drains ▪ Redirect downspouts away from sidewalks/pedestrian traffic areas
Indoor walking surface irregularities	<ul style="list-style-type: none"> ▪ Replace/re-stretch loose buckled carpeting ▪ Remove/re-patch blistered broken tiles ▪ Patch/refill cracks >1/4 inch in sidewalks or walkways ▪ Eliminate hazards >1/4" high – use ramps >1/2", bevel slopes no greater than 1:2 ▪ Create visual cues of changes in elevation (e.g., yellow paint) ▪ Replace smooth flooring in areas exposed to water/grease with rougher surfaces ▪ Make sure elevators align with floors
Outdoor walking surface irregularities	<ul style="list-style-type: none"> ▪ Patch/refill cracks >1/2" in sidewalks, walkways, parking lots ▪ Patch, fill, and repave outdoor areas that have deep grooves or holes ▪ Create visual cues (e.g., yellow paint on curbs) ▪ Do not use concrete wheel stops in parking lots ▪ Ensure water systems and other structures are covered or highlighted
Weather Conditions (e.g., ice and snow)	<ul style="list-style-type: none"> ▪ Maintain an aggressive program to promptly remove ice/snow from parking lots, garages, and walkways ▪ Distribute winter slip warnings via email, bulletins, other ▪ Place weather warning (freezing conditions) monitors at entrances, lots, garages ▪ Display phone # (poster sign) and encourage personnel to report icy conditions to maintenance department ▪ Place labeled bins of ice melting chemicals near entrances and outdoor stairs - provide scoops, directions, (and Material Safety Data Sheets) ▪ Provide additional mats near entrances ▪ Consider recommending slip-resistant footwear
Inadequate lighting	<ul style="list-style-type: none"> ▪ Install more light fixtures in dim areas, especially around steps ▪ Verify light bulbs work and provide appropriate brightness ▪ Install light fixtures that emit light from all sides
Stairs and handrails	<ul style="list-style-type: none"> ▪ Create visual cues (e.g., yellow paint) on each step edge ▪ Check that stair treads and nosing are slip resistant especially outside ▪ Ensure stairs kept free of ice, snow, water ▪ Ensure adequate lighting ▪ Handrails required for more than 4 steps, but recommend for less than 4 steps ▪ Ensure handrails are of adequate height (34"-38") and are continuous ▪ Handrails extend 12" beyond top step and one tread depth at bottom ▪ Handrails on both sides of stairs >44" wide, 1 handrail on right side descending for stairs <44" wide
Stepstools and ladders	<ul style="list-style-type: none"> ▪ Train employees on proper use: 3 points of contact with ladder at all times while ascending or descending (e.g., 2 hands and 1 foot, or 2 feet and one hand) ▪ Wear appropriate footwear (closed back and sufficient tread) ▪ Place on even surfaces before using ▪ Ensure ladders are fully open/locked before climbing
Tripping hazards (e.g., clutter, cords, hoses, wires, tubing)	<ul style="list-style-type: none"> ▪ Clear main walkways ▪ Organize and consider wall mounted hooks, hose spools, shelves ▪ Cover cords with beveled protective cover/tape to floor ▪ Use retractable cords, mount to desks
Improper use of floor mats	<ul style="list-style-type: none"> ▪ Ensure mats/runner sufficient large to allow multiple footsteps ▪ Use beveled edge and non-slip mats, secure from moving ▪ Replace curled, ripped, or worn mats (secure with tape if needed) ▪ Use paint/tape markers to note consistent correct positioning

†Adapted from Bell et al., 2008⁹ *Anecdotal is best if employer provides/pays for shoes⁹; as previously noted has not been validated for Army settings⁹

Information sources:

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- 4) Ruscio BA, et al. "A Process to identify U.S. Military Injury Prevention Priorities Based n Injury Type and Limited Duty Days." *AJPM*. 2010. 38 (S1):1-10.
- 5) Shuping E, et al. "Identifying modifiable causes of fall-related injury: An analysis of U.S. Army safety data." *Work*. 2009; 33(1):23-34.
- 6) Senier, L, et al. "Hospitalizations for Fall-related injuries among active duty Army soldiers, 1980 -1998." *Work*. 2002. 18(2) 161-170.
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- 8) Armed Forces Health Surveillance Branch. "Hospitalizations among members of the active component, U.S. armed forces, 2014." DoD, 2015.
- 9) Bell JL, et al. "Evaluation of a comprehensive slip, trip and fall prevention programme for hospital employees." *Ergonomics*. 2008; 51(12):1906-25.
- 10) Canham-Chervak M. et al. "Identification of fall prevention strategies for the military: A review of the literature." *Mil Med*. 2015.180(12): 1201-e1295.
- 11) Taylor JB, et al. "Prevention of lower extremity injuries in basketball: A systematic review and meta-analysis." *Sports Health*. 2015; 7(5):392-398.
- 12) U.S. Army Public Health Center (Provisional). "Injury Prevention, Just the Facts: Parachuting Injuries." Fact Sheet 12-006-0815. 2015.