

HOW FLOORING CAN REDUCE FALL RISK AND INJURY

GIVEN THE EFFECT OF FALLS ON A RESIDENT'S LIFE AS WELL AS THE FACILITY'S BOTTOM LINE, THE USE OF ADVANCED TYPES OF FLOORING MERITS SERIOUS CONSIDERATION.

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Approximately 30-50% of long-term care residents in nursing homes and assisted living facilities fall annually, and up to 40% of residents experience recurrent falls.^{1,2} Anywhere from 10-20% of falls are associated with injury (ranging from minor bruises, lacerations, skin tears, and sprains to joint dislocations), and up to 10% are associated with more serious events (eg, hip and other fractures and spinal cord, head, or brain injuries).¹ Injurious falls are detrimental to residents, often resulting in functional disabilities and the risk of further falls. Injurious falls can also lead to psychological distress (eg, depression, fear of falling, loss of confidence with everyday activities, and social isolation). For long-term care facilities, injurious falls can represent a substantial





financial burden on healthcare resources in terms of costs of continued and additional care and litigation. Indeed, injury due to falls is one of the leading causes of lawsuits against long-term care facilities.

Three main factors contribute to injurious falls: the resident at risk, the activity being undertaken, and the environment.³

- Resident factors associated with increased risk of injurious falls include mental and physical impairment, osteoporosis or loss of bone strength, urinary incontinence, the use of psychotropic medications, and a history of previous falls
- Most injurious falls occur during ambulation (ie, when residents attempt to walk unassisted and/or experience balance impairment) and transfer activities from bed, chair, wheelchair, and toilet
- Improper flooring (ie, surfaces that are slippery and/or fail to absorb the impact of a fall) is a major factor contributing to injury.

Since it is not possible to prevent all falls, facilities must, supplementary to the design of strategies aimed at reducing falls, consider ways to reduce the number of injuries from falls. This article will discuss the potential benefits of flooring in reducing residents' risk of injurious falls and, specifically, SmartCells Fall Protection Flooring and Mats, a new generation of cushioning material.

THE ROLE OF FLOORING AND FALL INJURY

To prevent injurious falls, long-term care facilities employ a number of potentially beneficial strategies (see Table 1). But despite the widespread use of these strategies, the fact remains that falling with injury remains a significant problem.

There are several possible explanations for this (see Table 2). Since flooring is a major factor contributing to injurious falls, using materials that substantially reduce the risk of injury merits serious consideration. But what is the best type of flooring? Long-term care facilities are typically outfitted with carpeting and/or vinyl flooring. But how effective is this flooring in reducing fall-related injury?

Table 1. Common Approaches to Reducing Injurious Falls

Technology to Reduce Injury	How Used	Benefits	Possible Risks
Hip Protectors	Pads and shields are incorporated in underwear to protect against fall-related hip fracture	If worn, hip protectors effectively prevent hip fractures	<ul style="list-style-type: none"> • Hip protectors may be uncomfortable or embarrassing for residents to wear and adversely affect skin integrity⁴
Low-Beds	Includes fixed and adjustable beds and futon beds maintained at 7–13 inches off the floor to protect against injuries associated with falls from bed	Low beds provide a shorter falling distance and decreased likelihood of suffering an injury	<ul style="list-style-type: none"> • Low beds can be restrictive and/or increase fall and injury risk for residents who have difficulty rising from a low position (eg, frail residents may be too impaired to make a safe exit attempt) • Increased risk of back injury to staff providing caregiver tasks
Mattress on Floor	Bed mattress placed directly on the floor without the bed frame	Mattress provides a shorter falling distance and decreased likelihood of suffering an injury	<ul style="list-style-type: none"> • Mattress can be restrictive and/or increase fall and injury risk for residents who have difficulty rising from a low position • Increased risk of back injury to staff providing caregiver tasks
Gym Type Mats/Bed Mattress	Placed on the floor next to the bed to lower the risk of fall injury	Gym mats/mattresses provide a soft landing area and decreased likelihood of suffering an injury	<ul style="list-style-type: none"> • Gym mats/mattresses become harder with impact, which can actually increase the risk of injury • Gym mats/mattresses may create trip hazard for both the resident and staff • Gym mats/mattresses may need to be removed, exposing staff to back and other musculoskeletal injuries
Floor Pads/Mats	Soft, thick carpet, cloth- or vinyl-covered pads/mats placed on the floor next to the bed to lower the risk of fall injury	Mats/pads provide a soft landing area and decreased likelihood of suffering an injury	<ul style="list-style-type: none"> • Some mats/pads become harder with impact, which may offer little additional protection than the floor being covered • Some mats/pads may create trip hazard for a resident and staff and offer poor wheelchair access • Mats/pads may be an infection control concern as a result of placement on the floor and difficulty with cleaning • Overly soft mats/pads may lead to balance instability

CARPETED FLOORING

Carpets offer several advantages. In addition to providing a slip-resistant surface, which can reduce falls, carpets supply a cushioned surface that may reduce the risk of injury following a fall.^{3,5} However, carpets also have their disadvantages. Residents who use rolling walkers and wheelchairs may experience difficulties moving their device on carpeted surfaces, especially over thick coverings.³ Also, canes and walker tips can get caught in carpet surfaces and lead to falls. Residents with gait impairment (eg, those with Parkinson's disease or stroke) may find that carpets impede safe mobility, leading to problems with walking and fall risk. Also, carpets that are overly soft or incorporate compliant foam cushions may interfere with a resident's ability to maintain balance.³ Thus, while carpeted floors can decrease the risk of injury, they may at the same time increase the risk of falling and injury in certain residents.

VINYL FLOORING

An advantage of hard or noncompliant floor surfaces (as opposed to soft, compliant surfaces like carpeting) is they provide a more stable surface to support balance.³

But vinyl or linoleum floor surfaces are also associated with hazards. Polished and wet floor surfaces can contribute to slip-related falls and injuries from falling onto hard surfaces. Vinyl underlays, regardless of the composition, offer little cushioning and protection against injuries.⁶

Consequently, equipping one's facility with carpeted and/or vinyl flooring may not be the best flooring solution for reducing the risk of injury. The ideal flooring has a firm surface under normal activities that softens under impact.

SMARTCELLS FALL PROTECTION FLOORING

SATECH, Inc., a company that specializes in cushioned flooring solutions for healthcare settings, developed SmartCells Fall Protection Flooring, a product that represents a promising solution for preventing fall-related injuries. The SmartCells cushioning material is designed with shock-absorbent properties that remain relatively rigid under normal walking conditions but deform elastically to absorb impact forces during a fall. The company offers two products for long term care facilities:

1. SmartCells Cushioned Flooring

This flooring is designed with SmartCells

technology (ie, it provides a stable surface supported by unstable cells that soften as needed in response to surface activity). The flooring remains firm during everyday activities but softens under high impact to absorb the force of a resident falling. It has the potential of protecting against hip fractures, head injuries, and other fall-related injuries. As an added feature, SmartCells is designed to return energy as staff or residents move across the surface, which helps to reduce fatigue. According to the manufacturer, other beneficial features include:

- Easy to install: 3'x 3' SmartCell floor pads are installed similar to regular floor tiles. The pads can be custom fit to the space and are edge-bound to create a continuous non-trip surface.
- Easy to maintain: SmartCells are made of a rubber that is non-porous, so spills are easily cleaned using standard clean-up procedures and will not penetrate through the pad.
- Slip-resistant: SmartCells provide friction between footwear and floor surface that avoids the risk of slipping during walking and transferring.
- Resident-friendly: SmartCells does not hamper the mobility of wheeled

walkers and wheelchairs or impede walking and stability in residents with gait and balance impairment.

- SmartCells flooring can stand alone or be used as a cushion beneath many commercially available floor coverings (eg, certain carpet, sheet vinyl/rubber).
- SmartCells pads are available in several colors and surface finishes, which contributes to the floors aesthetics.

2. SmartCells Fall Protection Mats

Similar to SmartCells flooring, this new generation of mats remains stable and firm under normal transferring and walking activities. But under impact, it can absorb impact shock and reduce the risk of serious injury. As opposed to current floor mats, SmartCells mats become softer as compressed and resist bottoming out and, thereby, have the potential of providing greater injury protection. As pointed out by the manufacturer, other beneficial features of the fall protection mat include:

- Absorbs impact energy and protects against injury from 2–4 foot heights, which may reduce impact pressure on areas prone to fall-related injuries
- Low-profile surface that allows resident to stand, walk, or wheel over the mat without difficulty
- Available in a 39" x 79" standard size but can be manufactured and configured to nearly any size, length or shape.
- Available in several colors (eg, black, grey, blue, green, or brown) to fit interior design needs
- While many floor mats "bottom out" and need to be replaced only after a few months or years, SmartCells mats are designed to resist damage, tearing, and premature failure of their elastic properties.

DOES SMARTCELLS FLOORING WORK?

When presented with a flooring technology that promises to be the next best thing since sliced bread, one needs to take a step back and ask the more basic question: Does SmartCells cushioning technology have the desired effect on reducing fall injuries? Without data on its efficacy, long-term care facilities may be misdirecting limited financial resources on protec-

tive flooring that may not prevent falls.

Under laboratory conditions, SmartCells flooring material provides a firm walking surface and, if a fall occurs, reduces the force of impact through the use of its energy-absorbing cushioning material. Outside the laboratory, field trials are under way in long-term care and other healthcare facilities to evaluate the effectiveness of this material in preventing fall-related injuries. Early results from several facilities using SmartCells Fall Protection flooring are favorable; reports indicate a reduction of fractures and less serious injuries requiring hospitalization or emergency room visits by almost 45% and out-of-bed-fall injuries by nearly 100% when

Table 2. Reasons for Lack of Success with Technology to Reduce Injury

- Lack of staff education and knowledge on the availability of strategies to prevent injuries
- Lack of staff training/in-services on the proper use of strategies to prevent injuries
- Considerable staff turnover and the need of frequent and repeat training sessions on the use of strategies to prevent injuries
- Staff noncompliance with the implementation of strategies to prevent injuries
- Unavailability of strategies to prevent injuries in the facility
- Lack of effectiveness; rather than preventing injury, the strategy to prevent injury may actually cause injury
- Other than hip protectors, injury prevention strategies are limited to guarding against injurious falls from bed

using the SmartCells fall protection mats. Although further research is required to determine if the flooring is truly effective in reducing risk of injury, these results suggest that it may play a significant role in preventing injuries from falls. It also appears to meet a number of criteria essential for safe flooring, including:

- Resident-friendly (ie, cushioned flooring solutions pose no safety risks or barriers for residents' dependent upon walkers and wheelchairs)
- Staff-friendly (ie, poses no barriers or safety risk for caregivers in accomplishing daily caregiver tasks)
- Safe for residents with balance impairment (ie, preserves balance stability in residents with diseases or conditions associated with altered balance)
- Easy to implement and maintain or clean; especially with respect to costs.

Although SmartCells flooring may be used throughout the facility, especially in those organizations catering to high fall and injury persons, the best use of this flooring may be in areas where residents are known to fall and injure themselves. These areas include the bedroom (especially next to the bed), the bathroom (especially in front of the toilet, by the side of the tub, or the shower), wandering areas or the lounge, and exercise and rehabilitation rooms.

CONCLUSION

Given the healthcare and financial consequences of injurious falls, reducing the number of serious injuries resulting from falls should be high on the agenda of long-term care facilities. Flooring that absorbs the impact of resident falls needs to be considered as a possible intervention for reducing injuries from falls. The use of SmartCells flooring appears to be a promising option for the reduction of injuries from falls. ■

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