

Preventing pressure ulcers in your facility: Karen S. Clay, RN, BSN, CWCN, presents a primer on how to protect frail residents—and avoid costly reprimands

Karen S. Clay

Most long-term care facilities understand the liability risk presented by pressure ulcers. And changes to CMS' Quality Measures make an effective pressure-ulcer-prevention program even more crucial.

To create an effective program for pressure-ulcer prevention, first conduct a risk assessment to identify risk factors and then focus your prevention program on minimizing their negative effects. When addressing pressure ulcers as a risk-management problem, prevention is the number one solution. It alleviates needless resident suffering, unnecessary healthcare costs, and any associated litigation. This focus should include management of pressure, friction, shear, moisture, and any other identifiable individual risk factors.

Positioning

Frequent repositioning of the resident is recommended to prevent capillary occlusion, which leads to tissue ischemia and pressure ulcers. Keep in mind that pressure-ulcer formation is a combination of the intensity of pressure and the duration of pressure. Although repositioning will not reduce the intensity of pressure, it will reduce duration, which is more critical.

The Agency for Healthcare Research and Quality (AHRQ), formerly known as the Agency for Health Care Policy and Research, recommends repositioning at least every two hours. (1) However, the frequency of repositioning required to prevent ischemia depends on capillary-closing pressures (explained under "Support Surfaces"), which vary by person and pressure point.

It is difficult to meet repositioning requirements even under normal circumstances, with full staffing, so envision trying to reposition patients properly while short-staffed or during a shift that schedules fewer staff. In addition, repositioning often accompanies incontinence care, which requires more staff time and occurs in the midst of assisting with morning or evening care, showers, rehabilitation/activity schedules, and meals. Therefore, it is very difficult for staff to provide proper care without adequate staffing.

Regardless of staffing circumstances, use the "rule of 30" when repositioning residents. This rule indicates that the head of the bed be elevated to 30[degrees] or less and that the body, when repositioned to either side, be placed in a 30[degrees] laterally inclined position. In this position, the resident's hips and shoulders are tilted 30[degrees] from supine, which prevents pressure over the trochanter and sacrum. If the head of the bed is elevated beyond 30[degrees], limit the duration of this position to minimize shear forces and pressure.

Remember to use positioning pillows, pads, or foam wedges to keep bony prominences from direct contact with one another. Also use them for residents with splints or multipodus boots, which could create significant pressure should they come in contact with an unprotected opposing limb. Doing so will help to maintain proper body alignment and reduce the potential of pressure-ulcer formation from bone-to-bone contact.

Contractures

Contracture prevention and management of contractures are important not only for their own sake, but for preventing pressure ulcers as well. Contractures, which cause shortened and flexed positions of the affected area, develop in predictable patterns, so splinting, range-of-motion exercises, and proper positioning can help prevent their occurrence. Such prevention is necessary not only because of the loss of strength and function they cause, but also

because they may compromise positioning and hygiene. In addition, a significantly contracted limb is thought to result in impaired blood supply to that limb--which should raise a red flag, since pressure-ulcer development has its origins in impaired blood flow and resultant tissue ischemia. Although a contracture will not necessarily, in and of itself, result in a pressure ulcer, healing of a pressure ulcer that does erupt will be complicated by the poor perfusion of the limb.

Heels

Heels pose a significant risk for pressure-ulcer development. They are the second most common sites of pressure ulcers (the sacrum is first) in the supine position. Because heels have small surface areas and underlying bony surfaces, redistribution of pressure is nearly impossible. Heels also have lower resting blood-perfusion levels, which are compounded by the fact that many elderly patients have compromised lower-extremity blood flow.

Beyond regularly scheduled pressure risk assessments, it is important to assess the potential for heel-ulcer formation when an acute change in status occurs. Heel ulcers often develop when there is just a brief change in mobility, such as when a resident falls and sustains a hip bruise. The resident may be less mobile for a few days either because his hip is sore or he is on bed rest awaiting the results of an x-ray. In both cases, heel pressure ulcers may develop quickly, so it is important to initiate preventive activities.

Most support surfaces cannot adequately reduce the interface pressure under the heels (explained under "Support Surfaces.") There are a few types of "zero pressure," three-cell, alternating-therapy support surfaces that will eliminate heel pressure in 7 1/2-minute cycles. There are also commercially available heel-lift products ranging from high-density foam blocks/boots to multipodus boots. When using these products, caregivers must assess the fit and provide close, ongoing monitoring to ensure that irritation or pressure does not occur at

another site on the lower extremity. The most effective intervention, however, is total "off-loading" of the heel by elevating the lower extremities on a pillow.

Contrary to popular belief, "bunny boots" do not provide pressure relief. These boots, made of soft or quilted cotton, may afford some protection from friction, but do not provide pressure reduction. In residents with very sensitive skin or at extremely high risk of pressure-ulcer development, I have seen problems develop at the seams of new and well-maintained cloth bunny boots. If bunny boots are going to be used to minimize friction, consider using those made of high-density seamless foam.

Support Surfaces

A cornerstone in reducing pressure is choosing support surfaces, such as pressure-reducing cushions, mattresses (e.g., high-density foam, gel, etc.), and specialty beds or mattress-replacement systems. The intent of these products is to reduce interface pressure, forces that act between the body and the support surface and are primarily affected by the composition of the body tissue, the stiffness of the support surface, and characteristics of the resident's body.

Interface pressure is different from capillary-closing pressure, although there is often confusion between these two concepts. Capillary-closing pressure describes the minimal amount of pressure required to collapse a capillary, which causes tissue anoxia. Commonly, capillary pressures are 32 mm Hg but, in reality, they vary depending on the area measured. For example, capillary pressures are commonly reported as 30-40 mm Hg at the arterial end, 10-14 mm Hg at the venous end, and about 25 mm Hg in the middle. Capillary-closing pressures actually range from 12-32 mm Hg.

Interface pressures, however, quantify the intensity of pressure being applied externally to the skin; studies show that the interface

pressures commonly exceed capillary pressures. The general purpose of support surfaces is to reduce these interface pressures by maximizing contact and redistributing weight over a large area. (Despite the wide range of support-surface products available and the claims of all companies, few clinical trials have been conducted.) In addition to the pressure reduction or relief support surfaces provide, many also reduce shear and friction and provide moisture control. (See table 1 for descriptions and categories of support surfaces.)

Specialty Mattresses

Professional caregivers have their own opinions and preferences when it comes to specialty mattresses. Preferences are sometimes based on the product, cost, corporate contracts, or relationship with the sales representative. Clinically, it makes sense to me that, since pressure-ulcer development is based on the intensity and duration of pressure, you need a product that addresses both. For example, a product that solely redistributes pressure (straight low-air loss) to alleviate its intensity does not address the duration component. There are combination products (low-air loss and alternating pressure), however, that can assist with both. Research on some of the three-cell, alternating-pressure surfaces has shown that they both increase circulation to the wound and are able to provide pressure elimination in cycles. I therefore recommend that you make an alternating pressure component part of the equation.

When considering the use of specialty beds, think of it as sitting in a soft, overstuffed easy chair. When you first sit down, you are amazingly comfortable, but over a period of time, simple gravity increases the pressure and you need to reposition yourself to interrupt it. The same concept applies to specialty beds, so pay attention to duration of use as well.

Understanding Foam-Mattress Characteristics

In the nursing home setting, standard green-colored hospital mattresses are outdated and associated with higher incidences of pressure ulcers. Foam ring "donuts" are also outdated because they concentrate the intensity of the pressure on surrounding tissue. They should never be used for pressure prevention.

Most facilities have replaced, or are in the process of replacing, standard mattresses with static pressure-reducing mattresses, most often with high-density foam mattresses. But not all mattresses are created equal. Facilities spend thousands of dollars each year to purchase foam-replacement mattresses, and too often these decisions are made by cost comparison. Rather, they should be based on knowledge of the characteristics of foam in the context of effective pressure reduction. Such characteristics include base height, density, indentation load deflection (ILD), ILD ratio, and contour:

- Base height measures foam from its base to where the convolution of the foam begins--not the peak of the convolution. The base height should generally be 4".
- Density, the weight per cubic foot, measures the amount of foam in the product and reflects its ability to support the resident's weight. Recommended density is 1.3 to 1.6 lbs per cubic foot.
- ILD measures the firmness of the foam and is determined by the number of pounds needed to indent it to a depth of 25% of the thickness with a circular plate (e.g., in the case of a 4" foam mattress, ILD would measure the number of pounds needed to make a 1" indentation). ILD indicates the ability of the foam to distribute the mechanical load. The goal is to have a low ILD (an ILD of approximately 30 lbs is recommended).
- ILD ratio, recommended to be 2.5 or greater, reflects the relationship between conformability and support. A relationship of 60% ILD: 25% ILD is needed (e.g., if 30 lbs makes a 1"

depression, then at least 75 lbs would be needed to make a 2.4" depression in the same foam).

- Contour is the surface of the foam, which may be either slashed, smooth, or an egg-crate design. A study by Kemp et al (2) reported few pressure ulcers when using solid-foam overlay instead of convoluted foam.

In summary, your foam-mattress replacements should include the following features:

- Base height of 4"
- Density of 1.3 to 1.6 lbs per cubic foot
- ILD of approximately 30 lbs
- Ratio of 60% ILD to 25% ILD of 2.5 or greater

"Bottoming out" describes a situation in which the pressure-reducing surface does not provide adequate support. To check for this problem, place a palm up under the mattress or cushion that is below the area at risk of a pressure ulcer. You should feel at least 1" of support material between your hand and the portion of the "at-risk" skin. If you feel less than 1", there is inadequate pressure reduction, causing the resident to bottom out.

Friction and Shear

Friction usually, but not always, accompanies shear. Friction and gravity often result in shear. Friction is the force of rubbing two surfaces against one another. Friction without force (pressure) causes damage to the epidermis and upper dermal layers and is most commonly known as "sheet burn." Shear is the result of gravity pushing down on the resident's body and the resistance between the resident and the chair or bed. Shear damages the tissue layers that slide against each other and the underlying blood vessels. Therefore, when combined with gravity/force (pressure), friction causes shear and the outcome can be more devastating than pressure alone.

Observe what happens when the head of the resident's bed is elevated: Gravity pulls the resident's body toward the bottom of the bed, and resistance occurs naturally as the bed tries to hold the body in place. The body, however, isn't held in place, but the skin tries to hold on even as the weight of the body bears down. These circumstances alone are enough to cause damage, but they are compounded in the context of an elderly resident who has dry, inelastic skin and less subcutaneous tissue. Up to 40% of reported pressure ulcers may actually originate from shear. (3)

As a mechanical force perpendicular to an area, pressure alone usually damages the point of impact and the pressure-gradient area. Shear, however, is a parallel mechanical force and therefore damages a wider plane of tissue. Suspect shear forces when the wound is shaped in an irregular pattern (e.g., a triangle), has circumferential undermining, or includes tunneling of sacral ulcers. (See table 2 for highlights of the many common practices observed in nursing homes that contribute to friction and shear.)

Table 1. Descriptions and categories of support surfaces

<p>Pressure reducing</p>	<ul style="list-style-type: none"> • Any device that lowers pressure as compared with a standard hospital mattress or chair surface • Do not consistently reduce pressure below capillary closing pressure • Redistributes pressure over a greater area -- reducing amounts of pressure at any given point • Almost any product beyond the standard products can legitimately claim pressure reduction--even pool floats (which I am not recommending)!
<p>Pressure relieving</p>	<ul style="list-style-type: none"> • Consistently reduce pressure below capillary closing pressure • Conform closely to the resident's body for support and respond to resident's movement • Can be used for prevention of breakdown and to promote healing for a resident with pressure ulcers • Example: Medicare Group 2 powered support surfaces--typically referred to as "specialty beds"
<p>Dynamic</p>	<ul style="list-style-type: none"> • Surface that decreases tissue interface pressure by altering inflation and deflation • Typically uses electricity to power the inflation/deflation modes • Some specialty beds are "dynamic"
<p>Static</p>	<ul style="list-style-type: none"> • Reduce pressure by spreading the load over a larger area • Constant inflation is maintained and the surface molds to the body surface • Typically products such as foam, gel,

	water, or some air overlays
Overlay	<ul style="list-style-type: none"> • Devices applied over the surface of the mattress • Provide pressure reduction • Increase the height of the bed which may complicate transfers • May be static (foam, gel, water, air filled, low air loss) or dynamic (alternating air)
Replacement Mattress	<ul style="list-style-type: none"> • Designed to reduce interface pressures and mattress replaces the typical facility mattress • Usually foam, gel, or air-filled chambers covered with foam • Water-repellent, flame-retardant, antimicrobial top cover • Must have an appropriate indentation load deflection (ILD)
Specialty Beds / Mattress Replacements: Low Air Loss	<ul style="list-style-type: none"> • Provide pressure relief by a series of connected mattress air-filled pillows • May have a bed frame or may be a mattress replacement • Amount of pressure can be individualized to provide maximum reduction • Contraindicated for residents with an unstable spine
Specialty Beds / Mattress Replacements: Alternating Pressure	<ul style="list-style-type: none"> • Creates high-pressure and low-pressure areas to prevent constant pressure and to enhance blood flow • Air chambers with air pumped at regular intervals that provide inflation and deflation cycles • Interface pressures lower than capillary closing on deflation and higher when

	<p>cylinders are inflated</p> <ul style="list-style-type: none"> • Helps manage both the intensity and duration of pressure
Air Fluidized Beds	<ul style="list-style-type: none"> • Contains silicone-coated beads and incorporates fluid and air support • Air pumps through beads and fluidizes the beads • Theoretically "floats" a portion of the body and requires less frequent repositioning • Continuous circulation of warm, dry air may assist with high drainage wounds but may also increase risk of dehydration

Table 2. Common practices observed in nursing homes that contribute to friction and shear

Common Observation or

Problem	Alternative
Head of bed left elevated (without clinical need to do so)	<ul style="list-style-type: none"> • Establish a facility practice for managing situations where elevation is maintained for longer than necessary periods • Example: After meals, incorporate a practice to lower the degree of head elevation when picking up the meal tray or within an hour of the meal--unless clinically contraindicated
Restless resident that moves feet in bed	<p>Minimize potential of friction by:</p> <ul style="list-style-type: none"> • Placing socks on resident (Note: you may want to use gripper socks in case the resident is someone that may get out of bed alone—to prevent falls associated with stocking feet) • Protecting heels with a transparent dressing--alone or in combination with

	<p>socks</p> <ul style="list-style-type: none"> • Providing heel protectors (preferably seamless) • Placing sheepskin at the foot of the bed-- although not pressure reducing, it may help reduce friction injury
"Boosting" a resident up in bed	<ul style="list-style-type: none"> • Use two caregivers and a lift sheet to prevent dragging of the body • Pay attention to the heels when "boosting" a resident. Even when a lift sheet is used the heels have a tendency to drag. • Place a pillow under the lower legs to "off-load" the heels then use the lift sheet to move the resident. Following the boost, the pillow will need to be repositioned • Ask resident to bend knees and position feet flat on the bed (plantar surface down)
Pulling a brief or incontinence pad from beneath the resident	<ul style="list-style-type: none"> • Turn resident side-to-side to remove the pad incontinence pad from * In no circumstance should a pad be pulled out • beneath the resident from one direction as this will certainly result in skin trauma
Assisting a "maximum assist" resident out of bed alone when two staff are needed	<ul style="list-style-type: none"> • Always use two people! • Lift, versus drag, resident to edge of bed • Resist asking the resident to "scoot" to the edge. The request to "scoot" is usually accompanied by caregiver assistance (force) of the lower extremities creating a friction/shear force
Dry, inelastic skin	<ul style="list-style-type: none"> • Moisturizing skin will reduce the incidence of friction injuries
Sliding board transfers	<ul style="list-style-type: none"> • Carefully inspect skin daily as sliding creates friction and the weight of the body

	<p>provides force Consider using a trapeze</p> <ul style="list-style-type: none"> • Consider exiting the bed from alternating sides to minimize repeated forces to the same area of skin
Sagging or sliding down in the chair or wheelchair	<ul style="list-style-type: none"> • Stand the resident and reseat him/her • Using two caregivers, lift and reposition the resident • Assure proper body alignment and posture • Employ positioning devices identified for the resident

Excerpted and adapted from Long-Term Care Risk Management: Pressure Ulcers by Karen S. Clay, RN, BSN, CWCN, and published by HCPro, Inc. (www.hcpro.com), a leading provider of integrated information, education, training, and consulting products and services in healthcare regulation and compliance. For more information, go to www.hcmarketplace.com and click on "long-term care." [c]2004 HCPro, Inc. Used with permission.

References

1. Agency for Health Care Policy and Research. Pressure ulcers in adults: Prediction and prevention. AHCPR Publication No. 92-0047. Rockville, Md.: U.S. Department of Health and Human Services, 1992.
2. Kemp MG, Kopanke D, Tordecilla L, et al. The role of support surfaces and patient attributes in preventing pressure ulcers in elderly patients. *Res Nurs Health* 1993;16:89-96.
3. Bennett LM, Lee BY. Vertical shear existence in animal pressure threshold experiments. *Decubitus* 1988;1:18-24.

Karen S. Clay, RN, BSN, CWCN, is President of Kare N'Consulting, a long-term care consulting company based in Brimfield, Mass. Clay specializes in wound management, risk management, and clinical

program development, and she has more than 20 years' experience in healthcare management. To comment on this article, send e-mail to clay0904@nursinghomesmagazine.com. For reprints in quantities of 100 or more, call (866) 377-6454.