Support Surfaces: Characteristics and Considerations

**Specialty Beds**

**Air-fluidized bed (also known as a “bead bed” or “sand bed”)**

**Product Characteristics:** This is a bed frame containing silicone-coated beads incorporated in Gortex® covering. When air is pumped through the beads, they behave like a liquid, creating air and fluid support. The resident “floats” on a sheet with one third of the body above the surface and the remainder of the body immersed in the warm, dry, fluidized beads. When bed is turned off, the surface becomes firm to allow for repositioning. Helps manage copious wound drainage or incontinence by absorbing fluids into bed of silicone beads. Although there is some evidence that air-fluidized beds enhance pressure ulcer healing rates, surface interface pressure remains sufficiently high to occlude capillary perfusion. Occipital and heel ulcers have been reported to develop in patients while on an air-fluidized bed (Parish & Witkowski, 1980).

**Considerations:**
- Not recommended for mobile patients, patients with pulmonary disease or patients with unstable spine
- Continuous circulation of warm, dry air may dehydrate patient or desiccate wound bed
- Bed may get too hot or make room hot
- Head of bed cannot be raised; semi-Fowler’s position achieved by using foam wedges or movable sling-type device
- Coughing less effective in mobilizing secretions
- Leakage of beads may irritate the eyes and respiratory track and make floor slippery
- Width of bed may preclude care to obese patients or patients with a contracture
- Height of bed makes some nursing care difficult, and a step is needed to facilitate care
- Transfer of patient out of bed is difficult
- Bed is heavy and not easily transferable
- Some patients become disoriented or complain of feeling weightless while on surface
- Dependent drainage of catheters may be compromised because the patient is immersed in the bed
- Sharp objects may damage the surface
- Size and weight may be too large for use in home setting
- Set up and maintenance provided by company

**Low air-loss bed**

**Product Characteristics:** A bed frame with a series of connected air-filled pillows that can be calibrated for varying amounts of pressure to provide maximum pressure reduction for residents. Dry air flow between the patient and bed surface helps control moisture and heat buildup and prevents maceration and friction. Some models are designed to counteract the effects of immobility on pooling of respiratory secretions and urinary stasis by providing oscillation therapy. Other models feature kinetic therapy (rotating slowly side to side), although this is limited to a 20-degree rotation and does not have the same effect as manually rotating the resident side-to-side.

**Considerations:**
- Head and foot of bed can be raised and lowered
- Transfers in and out of bed easily accomplished
- Portable motor available to maintain inflation during bed transfers.
  - Motor may be noisy
  - Proper inflation essential to maintain effectiveness
  - Sharp objects may damage the surface
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- Bed surface is slippery; patients may slide down or out of bed with being transferred
- Heels need to be “floated” to totally relieve pressure
- Set up and maintenance provided by company

Dynamic Overlays

Alternating air-filled overlay

**Product Characteristics:** Air is pumped through overlay chambers at regular intervals to provide cyclical pressure changes, creating a low-pressure and a high-pressure area. These surfaces constantly change pressure points and create pressure gradients that enhance blood flow. Cells with larger diameter and depth produce greater pressure relief over the body. A cell depth of not less than 3 inches is recommended.

**Considerations:**
- Surface is easy to clean
- Assembly required
- Sensation of inflation and deflation may bother patient
- Electricity required
- Motor may be noisy
- Excessive or sudden surface movement may disturb sleep
- Sharp objects may damage the surface
- Bed surface is slippery; patients may slide down or out of bed with being transferred
- Heels need to be “floated” to totally relieve pressure

Static Overlays

**Foam Overlay**

**Product Characteristics:** A foam surface applied over the surface of an existing hospital mattress. The following characteristics of foam influence the effectiveness of the overlay: base height, density and indentation load deflection (ILD). Base height refers to the height of the foam from the base to where the foam ridges begin and should be 3 to 4 inches to be effective in reducing pressure. Density refers to the weight per cubic foot and reflects the foam's ability to support the person's weight. Foam densities of 1.3 to 1.6 pounds per cubic foot are generally effective in supporting an average size adult. ILD is a measure of the firmness of the foam. It describes the foam's compressibility and conformability. It also indicates the ability of the foam to distribute the mechanical load. Measurement of ILD is expressed as the number of pounds required to indent a sample of foam with a circular plate to a depth of 25% of the thickness of the foam. An ILD of approximately 30 pounds is recommended. Optimal support and conformability of foam is achieved when the relationship between 60% ILD and 25% ILD is 2.5 or greater (Krouskop & Garber, 1987; Whittemore, 1998).

**Considerations:**
- Plastic protective sheet is usually required for incontinent patients
- Foam may trap perspiration and be hot
- Washing removes flame-retardant coating
- One-time charge, no reoccurring charges
- No set up or maintenance fees
- Cannot be punctured by needle or metal traction
- Light weight
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- Requires no maintenance
- No electricity required to operate
- May be hot and trap perspiration
- Foam has a limited life
- Lack of firm edge creates unsure surface when patient transferring on and off surface
- Heels need to be “floated” to totally relieve pressure
- Must be discarded when wet from drainage or incontinence
- Adds height to the bed

**Air Overlay**

**Product Characteristics:** Interconnected bubble-like cells that are inflated with an air blower to an appropriate pressure level. Optimum air level is defined as 1 inch or more of uncompressed support surface between bony area of the resident’s body and the caregiver’s hand when placed under the support surface. Cells with larger diameter and depth produce greater pressure relief over the body. A cell depth of 3 in. or greater is recommended.

**Considerations:**
- Easy to clean
- Low maintenance
- Repair of some products is possible
- Durable
- Can be damaged by sharp objects
- Requires regular monitoring to determine proper inflation and need for reinflation
- Heels need to be “floated” to totally relieve pressure
- Adds height to bed
- Lacks a firm edge, so transfer on and off surface may be difficult

**Water Overlay**

**Product Characteristics:** A vinyl chamber that can be filled with water to appropriate level to distribute body weight evenly over the entire supporting surface. Recommended depth is 3 in. or greater. Some models contain a baffle system to control motion effects.

**Considerations:**
- Readily available in the community
- Easy to clean
- Requires water heater to maintain comfortable water temperature
- Fluid motion makes procedures difficult (e.g. positioning)
- Patient transfers may be difficult
- Inadvertent needle punctures will create leaks
- Maintenance is needed to prevent microorganism growth
- Surface is heavy
- Cannot raise head of bed unless mattress has compartments
- Can be overfilled (causing too firm a surface) or underfilled (decreasing pressure reducing benefit)
Gel Overlay

**Product Characteristics:** A pad constructed of Silastic, silicone or polyvinyl chloride. Lack air-flow for moisture control and friction control is variable depending on the surface of the gel. Recommended depth for effective support is 2 in. or more. Gel filled pads are particularly useful in wheelchairs.

**Considerations:**
- Low maintenance
- Easy to clean
- Multiple-patient use
- Impermeable to punctures with needles
- Surface is heavy
- Expensive purchase price
- Heels need to be “floated” to totally relieve pressure
- Research on effectiveness is limited
- Some surfaces may be slippery; patient may slide down or out of bed during transfers

Replacement Mattress

**Product Characteristics:** Mattress made of foam and gel combinations or layers of different foam densities. Some models have replaceable foam shapes and some have a replaceable foam core. Other replacement mattresses contain a series of air-filled chambers covered with a foam structure. All models are covered with a comfortable, water-repellent, bacteriostatic cover that can be maintained with routine cleaning. Mattresses with foam should be antimicrobial and have appropriate foam ILD with high resiliency. Evidence is increasing that replacement mattresses are superior to standard hospital mattresses and may be more effective than some overlays (Vyhlidal, et al., 1997).

**Considerations:**
- Reduce use of overlay mattresses
- Reduce staff time
- Do not add height to mattress
- Provide certain level of pressure reduction automatically
- Multiple-patient use
- Easy to clean
- Use standard hospital linens
- Low maintenance
- Initial expense is high
- Some mattresses have removable sections which may be misplaced
- May not control moisture
- Potential for excessive delay in using other support surface
- No objective method for determining when or if product loses effectiveness
- Life of product is not known
Additional References:


Source: National Nursing Home Improvement Collaborative Coordinated by Qualis Health, Learning Session Two, January 2004