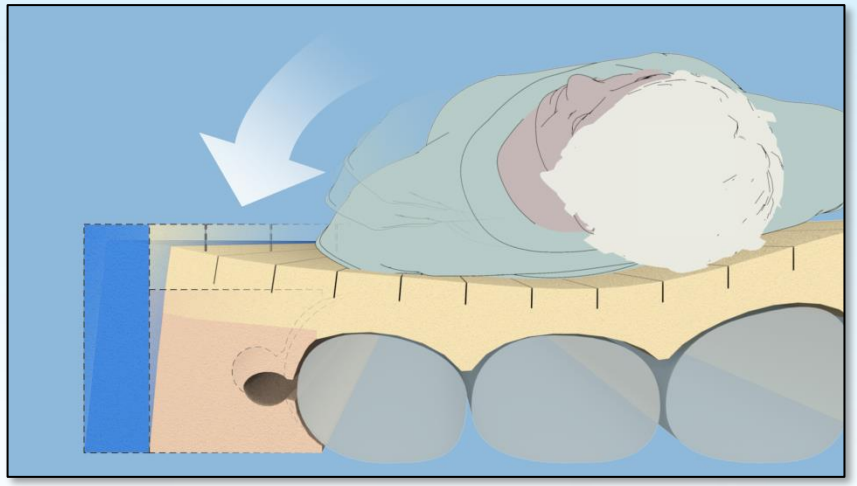
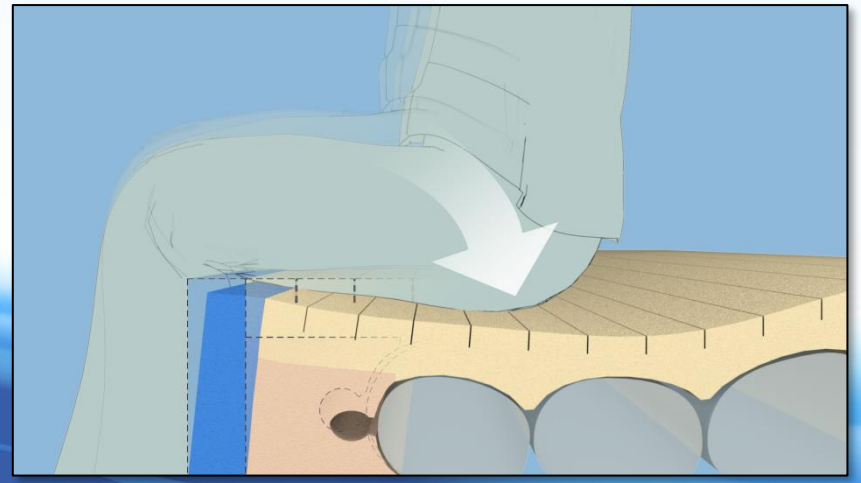
SAFETY EDGE™: Firm Sides on a Support Surface Can Reduce the Risk of Injury…



… by preventing edge collapse in order to keep the patient on the support surface and away from the siderails.



Patented Safety Edge™ is a two-part safety bolster built-in to all Span therapy surfaces.

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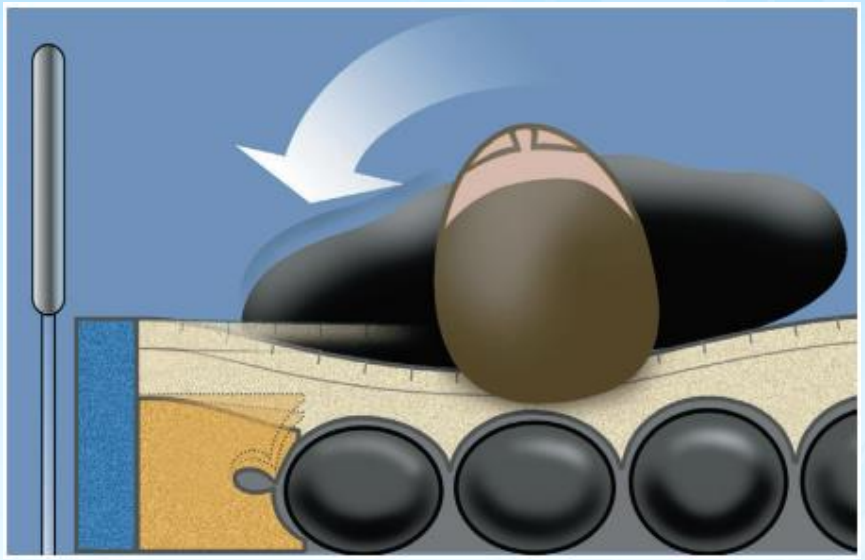
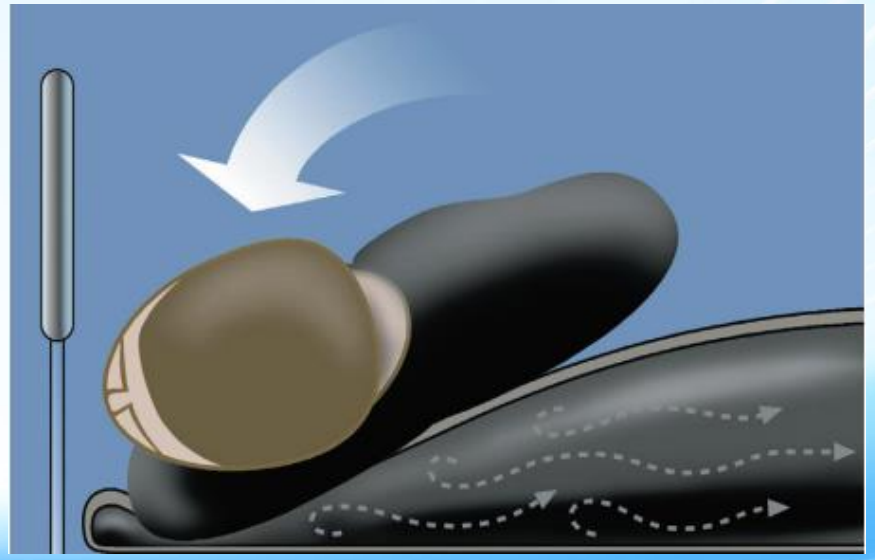
- ✓ Directs resident *away* from siderails or edge and toward the center of the mattress.
- ✓ *No need for added bolster cover*



- Standard air-filled mattresses collapse as the patient rolls *toward* the edge.
- *Bolster cover needed for patient safety*



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Objectively Testing Edge Stability of Support Surfaces

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Support surfaces are often assessed for their ability to affect tissue by managing pressure, shearing, heat, and moisture. However, the support surface must also **keep the patient safe** as they ingress, egress, and roll in order to prevent falling to the floor or entrapment against the siderail.[1-3]

As a **patient sits** on the edge of a mattress, instability of the edge causes patients to fall.[2] As the edge collapses, the resilience of the inner part of the mattress, in effect, pushes the patient off of the edge, causing the patient to push back with their lower extremities. Which mattresses are safest for edge sitting, as indicated by those that cause the least pressure at the knee?

As a **patient lies** on the mattress, there is balanced compression as the body immerses into the surface. As they move toward the edge and initiate a sideroll in order to sit up, the mattress compresses in an unbalanced manner as the edge collapses, the resilience of the mattress center pushes up and the patient is pushed from the mattress. This would incite either a fall from the edge, or entrapment into the siderail. Again, which mattress is safer?

Goals: To pilot two laboratory tests to objectively measure the stability that a mattress provides the patient as they 1) sit on the edge of the mattress to get in (ingress) or get out (egress) of the bed, and 2) roll toward the edge either during sleep or in preparation for egress.

Five mattress styles were used for each test:

(1) Visco-elastic or memory foam

(2) Alternating air with horizontal cylinders and air filled side bolsters

(3) Alternating air/ low-air-loss combination with horizontal cylinders

(4) Foam – high density open cell

(5) Alternating air with high density open cell foam side bolsters and top surface

References:

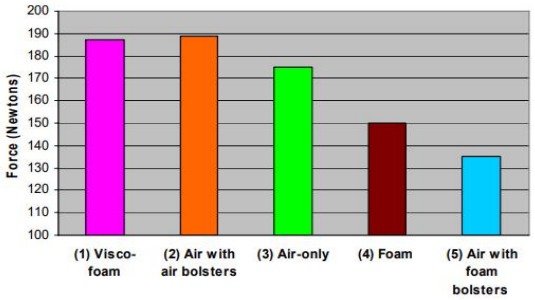
1) Miles S. Deaths between bedrails and air pressure mattresses. Jrnl of Am Geriatric Soc 2002:50:1124-5.
2) Rubenstein LZ. Preventing falls in the nursing home. Journal of the American Medical Association 1997;278(7):595–6.
3) Ejaz FK, Jones JA, Rose MS. Falls among nursing home residents: an examination of incident reports before and after restraint reduction programs. Journal of the American Geriatrics Society 1994;42(9):960–4.

1) Stability in sitting on the edge of the mattress:

The test: A testing rig was designed to mimic a female 5'10" tall, 110# with a knee height of 19" from the floor. The rig consists of a wooden form of a buttocks and thighs that can be lowered to the edge of the mattress, with a force gauge set at the 19" knee height. The force gauge records pressures exerted as the form is placed on the mattress edge. Bed height set at 15", all powered mattresses set at Medium.

Force gauge at knee height

Data: Average maximum force generated at the force gauge at knee height.



Results: Lower force means less patient effort and less force pushing occupant out of the surface.

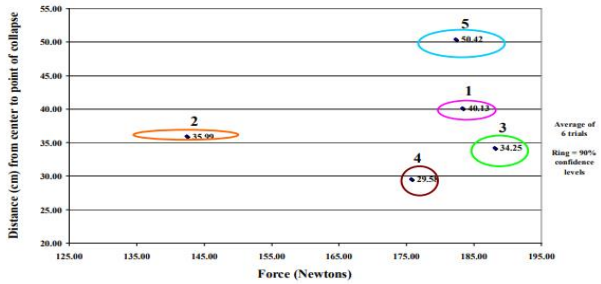
Mattresses with high density open cell foam edges require the least force at the knee joint and are safest for edge sitting.

1. Tempurpedic
2. SelectAir
3. Air Lift
4. Foundation Foam
5. PressureGuard APM2

2) Stability in rolling to the edge of the mattress:

The test: A mannequin of the 50th percentile male form – 6'0", 170# - is secured to an over-bed frame. The frame moves the mannequin toward the edge of the mattress and initiates a rolling movement as if the legs are being swung over the edge of the mattress. Gauges at the connection points record 1) the distance from the center of the mattress to the point that the mannequin reached instability and compressed the edge, and 2) the force of compression at the moment the mannequin reaches the point of instability and begins to roll off the edge.

Data: Force (Newtons) = amount of force that collapsed the edge of the mattress
Distance (cm) = from the center of the mattress to the point that roll off occurs



Results: The higher the force the more difficult it is to collapse the edge of the mattress in rolling. The larger the distance from the center line at roll-off, the more area of safety there is for the patient.

A combination of the most force needed for edge collapse at the widest distance from the center of the mattress may be the safest mattress.

Discussion: In sitting, there are definite differences between the foam edged products and the air or visco edged products. Mattresses with high density open cell foam edges require the least force at the knee joint and are safest for edge sitting. The air with foam bolsters mattress was 30% more stable than air-only, 41% more stable than air with air bolsters, and 37% more stable than visco-foam.

When rolling from supine, two data points must be combined to measure edge safety. It is the combination of the most force with the widest point that gives the patient the largest safety range. As the "patient" rolled toward the edge of each product, the air mattress with foam bolsters kept the patient safe over a wider width of the mattress and with more support at the edges than the air or visco-edged mattresses. This support might be reflected in more stable bed positioning and more independence in ADL's.

The distance measurement also showed marked differences between products. The air and visco edged mattresses had 26-47% less width than the air with foam bolsters mattress; that is, they collapsed sooner.

Conclusions:

1) These two tests seem to be sensitive enough to show differences between products.

2) Mattresses with high density open cell foam edges appear to be significantly more stable for edge-sitting than mattresses with air-filled or viscoelastic foam edges.

3) Mattresses with high density open cell foam edges appear to give the safest combination of a high force at the widest points of the mattress surface needed for edge collapse.

Future investigation:

1) Different materials are used for the covers. Some of these materials seemed to cause less friction than others, and may have influenced the test results. Testing the friction of the test mannequin and sitting form against the covers, or testing the products without the covers may help to discern this effect.

2) We did not use sheets on the mattresses. Sheets could have an effect on the application of these results to the patient care setting.