

## THE RELATIONSHIP BETWEEN IN-BED SLIDING AND SKIN SHEAR

### Introduction

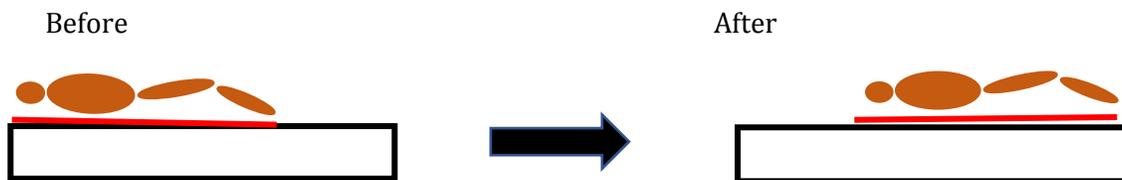
Skin shear is defined as an applied force or pressure exerted against the surface and layers of the skin as tissues slide in opposite but parallel planes.<sup>1</sup>

More simply, skin shear happens when something slides on a patient's skin or a patient slides along something. Skin shear does not occur unless the surface and the patient's skin change position relative to each other.

### Linen skin shear

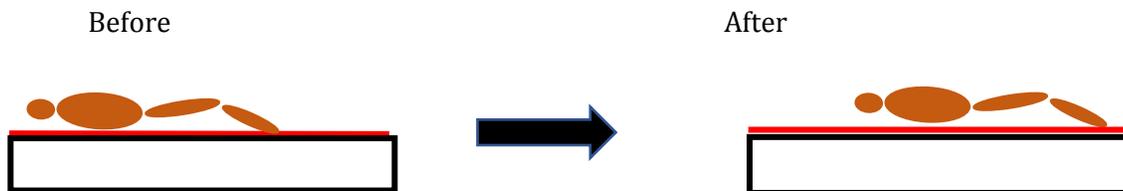
In **Drawing 1**, *no skin shear occurs* because the patient does not move relative to the linen (represented by the red line) directly under his/her body even though both the patient and the linen slide down the bed. The linen and patient move down the bed together.

Drawing 1: No Skin Shear



However, *skin shear does occur* in **Drawing 2** because the patient slides along the (red) linen. Here the patient moves while the linen stays in place.

Drawing 2: Skin Shear

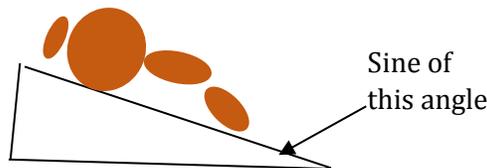


## Impact of inclining surface

Elevating or inclining a bed can prove not only more comfortable but also therapeutic, especially in respiratory and cardiopulmonary cases.<sup>2</sup> However, weight tends to move downhill. In addition, patients squirm to relieve pressure, which increases sliding by removing maximum friction contact between a patient and the surface on which he/she is lying. The greater the angle of incline, the more force (gravity) pulls the patient downhill.

Use this formula to determine the impact of the change in surface level: Force down an incline = Weight x Sine of the angle. **Drawing 3** shows the angle that is used in this calculation.

**Drawing 3: Sine of angle for formula**



**Chart 1** shows the percent of a 250-lb patient’s weight that would cause sliding down an incline of a given angle and what the force would be on that patient.

**Chart 1: Sliding due to incline**

Incline angle (in degrees)	Sine of angle	Force pulling down incline (in lbs) for 250-lb patient
0 (flat and level)	0	0
5	8.7	21.75
10	17.3	43.25
15	25.9	64.75
20	34.9	87.25
25	43.6	109.00
30	50	125.00

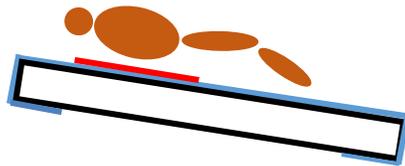
When weak patients slide down in bed, caregivers usually have to reposition them or move them back into a desired position. Repositioning can be difficult and strenuous, sometimes resulting in caregiver injuries<sup>3</sup> if assistive devices, often referred to as safe patient handling equipment, are not used.

Healthcare organizations may look for a solution to prevent sliding, which usually is one of two items: harnesses/straps or higher-friction surfaces.

1. Harnesses or straps can prevent sliding. However, they can cause shear and create pressure points, which can lead to skin injury<sup>4</sup> for patients.
2. Higher friction surfaces reduce sliding, but when sliding does occur, skin shear is greater.

Consider a patient lying on an incontinence pad as shown in **Drawing 4**. The pad (red) is on top of fitted sheet (blue), which covers a mattress (black).

**Drawing 4: Impact of linen layers on inclined mattress**



If the pad has a high-friction top surface preventing the patient from sliding on it and the patient moves down, the pad will move with the body. If the pad has a high-friction bottom surface preventing it from moving down the mattress and the patient slides down, the body will slide down the pad (changing position relative to the pad). In this case, it might be better for the pad to move with the patient so that it can absorb any body waste.

## Conclusion

It is nearly impossible to comfortably and therapeutically prevent patients from sliding when they are on a pitched surface for long periods of time. It's often better to plan for the following factors: what will stay in place (relatively so), what will move, and how to safely reposition them all.

## References

1. The Free Dictionary. <https://medical-dictionary.thefreedictionary.com/>. Accessed March 16, 2018.
2. National Coverage Determination (NCD) for Hospital Beds (280.7). CMS.gov Centers for Medicare & Medicaid Services. <https://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=227&ncdver=1&DocID=280.7&SearchType=Advanced&bc=IAAAABAAAA&>. Accessed March 16, 2018.
3. United States Department of Labor. Occupational Safety and Health Administration. <https://www.osha.gov/SLTC/healthcarefacilities/safepatienthandling.html>. Accessed March 16, 2018.
4. "Pressure Injuries and Medical Device Dilemmas." *WCEI - Blog*, 11 July 2017, [blog.wcei.net/2017/06/pressure-injuries-and-medical-device-dilemmas](http://blog.wcei.net/2017/06/pressure-injuries-and-medical-device-dilemmas).