The Impact Of Repositioning Slings On Support Surfaces

Sara Tackson PT, MPT, CWS; Carroll Gillespie MS, BSN, RN, CWOCN; Eur Ing David Newton M.Eng, C.Eng, MIET, MIEEE; Marie-Josee Toupin Jr. Eng

Abstract

Background: Immobility is an intrinsic factor for pressure injury (PI) development. Mobilizing a patient with a repositioning sling and lift ensures safety for the patient and caregiver. A frequent question is whether the repositioning sling can remain under the patient without interfering with the performance of the therapeutic support surface. Research has not fully addressed this question, which results in a decision based on the clinician's critical thinking and empirical data. [1]

Methods: An independent lab tested the effects of placing two different single-patient use repositioning slings (standard Type A and bariatric Type B) on two different support surfaces. Properties of the support surfaces were tested using pressure mapping and the ANSI/RESNA SS-1:2019 [2] for both immersion and microclimate management.

Results: Both A & B slings resulted in an insignificant but measurable difference in immersion on the two surfaces. Heat and moisture dissipation showed improvement by adding sling A to the non-powered surface only, whereas sling B showed only a slight change on either surface. There was a minor increase in mean sacral interface pressure but nothing that was considered as notable. The pressure mapping did not show the presence of the sling.

Conclusion: Clinicians supporting a safe patient handling (SPH) initiative may be in direct conflict with recommendations by the wound care specialist regarding layering between the patient and the support surface. This study revealed minor effects on the properties of the two support surfaces with sling application however, the data relevance is unknown. Future clinical research using the Support Surface Standards is imperative for clinical guidance on support surface decision making.

Background

Hospital-acquired pressure injuries (HAPI) continue to rise in the United States with a high cost to healthcare. Immobility plays a key role in contributing to the incidence of pressure injuries. While the National Pressure Injury Advisory Panel (NPIAP) recommends [3] frequent repositioning of immobile patients, it is a high-risk task for the caregiver.

Many healthcare facilities with a SPH program incorporate ceiling lifts with repositioning slings as a safe and readily available means of mobilizing patients while reducing the risk of caregiver injury. NPIAP has previously published a white paper [1] on the effect of slings being left under the patient.

Edupuganti and Price's study [4] of 180 healthy adults revealed no statistical significance in skin pressure, temperature or sacral pH when a repositioning sling remained on the support surface within the four test groups. Current nursing practice is to limit multiple layers under a patient which would include the repositioning sling. While the research into the impact of multiple layers on support surface operation has been undertaken by Williamson and Lachenbruch [5], to date there is a lack of consensus amongst clinical staff and industry on the compatibility of leaving a sling in place on a support surface.

This poster describes the scientific approach utilized when a multi-facility healthcare system requested manufacturer's assistance in demonstrating compatibility of their preferred SPH repositioning slings with two support surfaces. With conflicting expert clinical opinion amongst the facilities' wound care and SPH team, this evidence-based analysis was undertaken to demonstrate the lack of risk.

Fig 1. Use of Repositioning Sling 'A'

Methods and Materials

An independent lab [A] evaluated the impact of two single-patient-use repositioning slings, sling (A) and sling (B) on pressure injury (PI) prevention characteristics of a non-powered (gel hybrid) and powered (air pod/gel) pressure redistribution surface. Each support surface was fitted with a cotton sheet.

The methodology involved:

- A set of individual tests were selected based on those used in the limited examples of published existing research, notably Edupuganti [4] and Williamson [5] but the tests themselves were updated to utilize the US national standards developed by NPIAP / S3I [2]. The test methods are detailed in Table 1.
- The use of pressure mapping, despite not being a US national standard, was used specifically for clinical communication and comprehension and to identify any aspects due to the presence of the sling. It also provided a further view of the effect of the additional layer introduced and was consistent with Edupuganti's approach.
- Each test was undertaken on each individual surface alone and repeated with each sling type in place.

Test	Purpose	Test Method	Rationale
S3I Immersion SS-1:2019 Section 2	Measure immersion into the full body support surface.	Measure depth of sinking of a mannequin (Fig 2) into the support surface.	Compare the effect of the sling on the ability of the patient to immerse into the surface.
S3I Body Analog SS-1:2019 Section 3	Measure the heat and moisture at the patient interface.	Specialized indenter (Fig 3) generates temperature and humidity similar to the human body.	Identify the microclimate performance at the patient interface to show any thermal and humidity differences.
Pressure Mapping	Measure interface pressure between the mannequin and surface.	XSENSOR® pressure mapping system using the mannequin shown in Fig 2.	Specifically requested by the customer. Used to highlight any other aspects of the presence of the sling.

Table 1. Methodology for comparison of surface (control) and combination of surface + sling (A & B)

Fig 2. NPIAP 50th percentile male mannequin

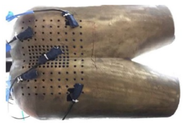


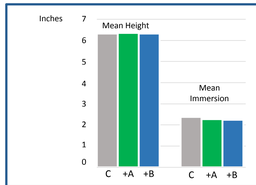
Fig 3. Indenter for the Body Analog test

Results

The immersion data in Fig 4 details the non-powered surface with a mean immersion difference of ≤ 0.13 inches when either sling was added. The powered surface had a mean immersion difference of 0.32 inches when either sling was added as shown in Fig 5.

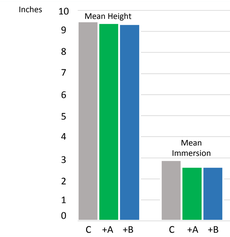
Heat and moisture dissipation as shown in Fig 6 and Fig 7 was improved by adding sling A to the non-powered surface, whereas sling B showed relatively no change. Heat and moisture dissipation shown in Fig 8 and Fig 9 demonstrates no change as a result of applying either sling on the powered surface.

The pressure mapping detailed in Fig 10, showed a minor increase in mean sacral interface pressure but nothing that could be considered as notable. There was no evidence of the underlying sling detected.



Combination	Mean height (inches)	Mean immersion (inches)	Immersion Level (%)
Non-Powered (C)	6.32	2.38	37.7%
+ Sling A	6.36	2.28	35.8%
+ Sling B	6.32	2.25	35.6%

Fig 4. Immersion characteristics of the non-powered surface



Combination	Mean height (inches)	Mean immersion (inches)	Immersion Level (%)
Powered (C)	9.49	2.90	30.6%
+ Sling A	9.41	2.58	27.4%
+ Sling B	9.35	2.58	27.6%

Fig 5. Immersion characteristics of the powered surface

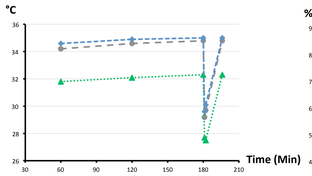


Fig 6. Temperature Results for non-powered surface

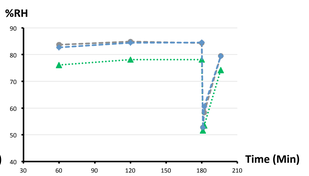


Fig 7. % Relative Humidity for non-powered surface

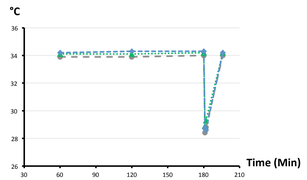


Fig 8. Temperature Results for powered surface

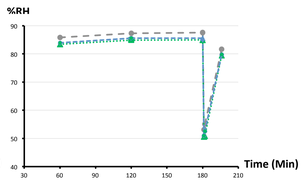
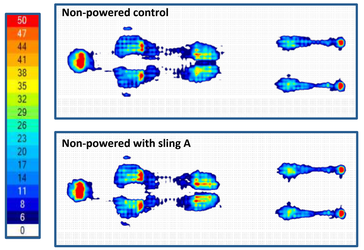


Fig 9. % Relative Humidity for powered surface

Combination	Sacral Mean Pressure (mmHg)
Non-Powered	26.7 ± 11.1
+ Sling A	29.2 ± 12.8
+ Sling B	31.3 ± 13.6

Combination	Sacral Mean Pressure (mmHg)
Powered	23.4 ± 10.0
+ Sling A	25.1 ± 11.6
+ Sling B	25.4 ± 10.4



Pressure mapping accuracy = 10%

Fig 10. Pressure mapping data and example images of slings in place with NPIAP mannequin on each surface

Discussion

The immersion testing with a sling present showed a measurable but insignificant difference (Fig 4 & 5). Due to the small differences involved, the clinical relevance of this measurement is debatable.

The testing results clearly identified an area of improvement in the microclimate performance (Fig 6 & 7). Application of sling A to the non-powered support surface enhanced the microclimate properties at the test interface whereas sling B exhibited no discernible effect. The 2.5° C improvement in temperature could provide physiological benefits for a compromised patient by reducing metabolic demand. It has been known for some time that temperature changes of only 1° C have a direct impact on metabolic activity. [6] Humidity results in moisture at the patient interface which was notably decreased with the addition of sling A to the non-powered surface. Less moisture at the skin interface can promote a more favorable environment for the patient as well as decreasing frictional forces affecting the patient during bed mobility. Our test results are similar to a previously published microclimate laboratory study [5] which analyzed multiple layers on a support surface and found examples showing either no impact or some improvement in surface microclimate performance.

The pressure mapping undertaken, while showing a measurable difference, was within the expected measurement accuracy of 10% and did not show evidence of the underlying sling. The test results were accepted and adopted as part of the customer's internal processes for leaving slings in place across their healthcare system.

The scope of our research was limited to the specific slings and surfaces tested, however the approach and methodology can be used more widely for other products found in the patient environment. This topic warranties further and wider investigation including clinical research to clearly demonstrate the benefits of repositioning with assistive devices without impacting the support surface performance.

Conclusions

Our research suggests the presence of the repositioning slings A & B, in combination with the tested support surfaces did not exhibit any negative effects while also identifying a performance improvement.

Leaving a repositioning sling in place on the support surface can improve time efficiency, decrease clinical workload and potentially result in more frequent patient repositioning.

Future technical and clinical research using standards is critical for developing the science of support surfaces and affecting clinical decision making. This research provides an example of using the S3I standards to inform and influence actual clinical practice.

References

1. Brienza D, Deppisch M, Gillespie C et al. Do lift slings significantly change the efficacy of therapeutic support surfaces? A National Pressure Ulcer Advisory Panel White Paper. March 2015.
2. ANSI/RESNA SS-1:2019 Volume 1: Requirements and Test Methods for Full Body Support Surfaces (Section 1, Section 2 and Section 3).
3. European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline. Emily Haesler (Ed.). EPUAP/NPIAP/PPPIA; 2019.
4. Edupuganti KE, Price C. Repositioning Slings: The effects on skin pressure, pH, and temperature. Am J SPHM. 2013;3(2):48-54.
5. Williamson R, Lachenbruch C, VanGlider C et al. A laboratory study examining the impact of linen use on low-air-loss support surface heat and water vapor transmission rates. OWM. 2013 Aug;59(8):32-41.
6. Rithalia S. & Kenney, Laurence. (2001). The art and science of evaluating patient support surfaces. World Wide Wounds. 2001.

Acknowledgements / Affiliations

A. Element Materials Technology, St Paul, MN, USA
B. All authors are paid employees of Arjo Inc.
C. This poster is an industry-sponsored research activity, provided by Arjo Inc.
D. Sling A: Arjo AHD001 sling
E. Sling B: Arjo VIG220044 sling
F. Support Surfaces: non Arjo products
G. Figure 2: Mannequin image courtesy of Element Materials Technology
H. Figure 3: Indenter courtesy of ANSI / RESNA / S3I

www.arjo.com

©Arjo 2020