

What Is the WMU Lift Study?

The Situation

In 2009, Kroemer reported that the adult male patient is approximately 136 kgs.¹ As our population continues to grow in size, caregivers are required to manually reposition heavier patients and are at an increasingly substantial risk for lower back injuries. As reported in the The New York Nurses Association, “nurses lift an equivalent of 1.8 tons per shift.”² This is the approximate weight of an American mid-sized car! The demands of the nursing industry are so rigorous, in fact, that healthcare workers are 4.5 times more likely to sustain back injuries due to overexertion than any other type of worker.³

The Study

The WMU Lift Study is actually called “The Biomechanical Analysis of Nurses Simulating Frequent Patient Handling Tasks Using General Purpose Transport Stretchers.” The study is written by a team at the Department of Industrial & Manufacturing Engineering in the College of Engineering & Applied Sciences at Western Michigan University.

The purpose of this study is to evaluate “both objectively and subjectively, the effects medical equipment design may have on its intended users.”⁴

Design

The test was designed to measure two of the most repetitive movements a caregiver uses to reposition a patient on a stretcher: raising the backrest, and using the foot-operated control to raise the litter. Four stretchers of varying designs were tested with weight simulating a 136 kgs patient. Table 1 outlines the stretchers and technology used in each. To track movements and spinal loading, nurses were affixed with an ErgoPak load cell (Hogan Health Industries, West Jordan, UT) as well as a Lumbar Motion Monitor (LMM, The Biodynamics Laboratory, The Ohio State University). Compression, shear and the risk of Lower Back Disorder were tracked.

Findings

While the results of the tests measuring compression and shear helped define force values, the most impactful data is the combination of both that was used to determine the risk of Lower Back Disorder (LBD Risk). These results are illustrated in Table 2.

Stretcher 1, the Stryker Prime Electric Stretcher, presents the least risk for lower back disorder with only 1%. The electric features on Stretcher 1 allow nurses to raise the backrest with the simple push of a button. Additionally, Stretchers 2 and 3 (Stryker Prime with Big Wheel mobility and Zoom mobility, respectively) performed with a significantly lower risk of lower back disorder. The patented Lift Assist Backrest on these stretchers uses the patient’s weight to help raise and lower the backrest, helping to reduce LBD Risk. Stretcher 4 performed the worst of all subjects, posing nearly twice the risk for LBD than any other stretcher tested.

Table 2. Back Lift Activity

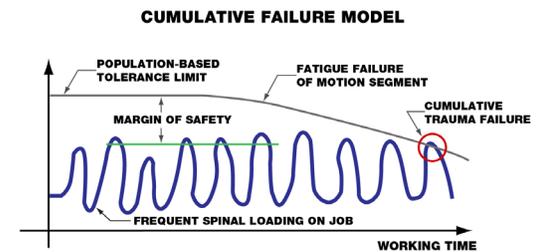
Stretcher	Compression (L4/L5) (kg)	Shear (L4/L5) (kg)	LBD Risk (%)	RPE Response (Range 6-20)
Stretcher 1	152.9 (24,6)	26.6 (6,7)	1.0% (<0.1%)	6.1 (0.3)
Stretcher 2	259.0 (16,6)	20.7 (5,6)	6.0% (3.8%)	7.5 (2.0)
Stretcher 3	272.4 (26,3)	19.2 (3,6)	8.1% (3.1%)	6.8 (2.7)
Stretcher 4	353.3 (29,7)	18.3 (2,4)	16.7% (5.9%)	12.0 (1.5)

Conclusion

The findings from the study conducted by Western Michigan University suggest that the

“The differences in spinal loading, which has been shown to influence the potential of low back injuries (Callaghan et al, 2001) was observed between stretcher designs. Furthermore, the study suggests that the implementation of an electromechanical fowler mechanism reduces the risk of low back disorders. Design features which minimise cumulative spinal loading may reduce the risk of injury and in turn may reduce the burden rate of healthcare organizations (Fredericks et al, 2009)”⁴

Stryker Prime Electric Stretcher and the Stryker Prime Stretcher with Lift Assist Backrest can help significantly reduce the risk of lower back disorder while repositioning patients in the stretcher. Furthermore, the study suggests that the Stryker Prime Series Stretcher with these advanced ergonomic solutions outperforms the Hill-Rom P8000 Stretcher with BackSaver Backrest.



When spinal loading and fatigue levels meet, an injury occurs. This can culminate from a single event or repeated spinal loading, which diminishes your safety factor.⁵

Table 1: Stretcher Models

Stretcher 1:

Stryker Prime Zoom Stretcher with Electric Backrest

Stretcher 2:

Stryker Prime Big Wheel Stretcher with Lift Assist Backrest

Stretcher 3:

Stryker Prime Fifth Wheel Stretcher with Lift Assist Backrest

Stretcher 4:

Hill-Rom P8000 Stretcher with BackSaver Backrest

Terms

Spinal Compression:

A downward force on the vertebrae which causes pressure on the discs⁶

Spinal Shear:

The application of a load parallel to the vertebral surface⁶

Lower Back Disorder:

Injury “due to cumulative or overexertion in lifting, pushing, pulling, carrying bending, and twisting”⁷

1. Kroemer, K.H.E. “Fitting the Human.” CRC Press, Boca Raton, FL, United States. 2009.
2. Genovese, Mark. “HHC Nurses File 1000 EEOC Complaints.” 2008.
3. U.S. Department of Labor, Bureau of Labor Statistics, 2000.
4. Fredericks, Tycho K., Butt, Steven E., Burns, James D., Utkan, Fehime. “Biomechanical Analysis of Nurses Simulating Frequent Patient Handling Tasks Using General Purpose Transport Stretchers.” 2011
5. McGill, Stuart M. “The Biomechanics of Low Back Injury: Implications on Current Practice in Industry and the Clinic.” 1997.
6. Fredericks, Tycho K., Butt, Steven E. “Spinal Loading.” presentation. 2007.
7. Kumar, Shrawan. “Biomechanics in Ergonomics.” 2nd Ed. 2008.

Stryker SA
Cité-Centre
Grand-Rue 90
1820 Montreux
Switzerland

t : +41 21 966 12 01
f : +41 21 966 12 00

www.stryker.eu



MTX574081111EN