

# Citadel Patient Care System Patient Turn and Continuous Patient Turn

## Introduction:

### Prioritising Patient and Caregiver Safety

Demographic trends over the past decade suggest that, in future, hospital patients are likely to be older<sup>1</sup>, heavier<sup>2</sup> and have a shorter planned length of stay than ever before<sup>1</sup>. These factors result in a less mobile, higher acuity in-patient population, who may be more dependent upon others for their routine care to help ensure the earliest discharge.

As a result, during manual repositioning procedures, nurses and therapists may be called upon to physically manage greater loads, with greater frequency and, quite possibly, with fewer staff<sup>3</sup>.

This situation requires a multifaceted solution that acknowledges that manual patient handling, although historically regarded as normal practice in healthcare facilities, is now often regarded as unsafe for both caregivers and patients<sup>4</sup>.

An effective solution will usually include safe patient handling equipment, staff training, early patient mobilisation protocols and organisation-wide cultural change.



#### Patient Turn

Patient Turn is a feature of the Citadel™ Patient Care System that can assist with manual repositioning by turning the patient up to 20 degrees towards the caregiver. It can be used on an ad hoc basis to help reduce the physical effort required of the caregiver during some nursing interventions.

#### Continuous Patient Turn

This is a function to automate patient repositioning by turning the patient laterally up to 20 degrees to the left and right with pauses in each lateral and the reclined position. The frequency of the pause at each bed position can be pre programmed.

# Citadel Patient Care System: Taking care of the patient.

## Why is time critical to prevent pressure injury?

Whilst periods of immobility may take many hours or days to impact general wellbeing, time is critical when considering the impact it may have on the skin.

If the patient's condition renders them less able to sense and respond meaningfully to pressure stimulus, movements become less frequent and of lower magnitude.

When this occurs, the skin and underlying tissue are often subjected to periods of prolonged pressure; if the pressure is sufficient to occlude the microcirculation (blood and lymph), irreversible tissue damage may occur within a little as two hours<sup>5</sup>.

## The benefits of assisted repositioning

Once a mobility risk has been identified, the recommended intervention includes a bespoke assisted repositioning protocol<sup>5</sup> and this can also include the use of a pressure-redistributing support surface, such as the Citadel Patient Therapy System.

Given the pathophysiology of pressure-related injuries in patients with compromised mobility, it is particularly important to physically reposition the patient regularly and this is typically undertaken every 2 to 4 hours, both day and night.

## Risks associated with assisted repositioning?

Although accepted as an essential and effective therapeutic intervention in most cases, the need for routine assisted repositioning in immobile patients can pose a significant burden on caregivers. The activity can be both time consuming and physically demanding and manual patient handling is considered to be the largest risk factor for overexertion injuries in healthcare workers<sup>4</sup>.

The reasons why a caregiver may put themselves at risk of these injuries are complex and multi factorial, but some perceived barriers to safe practice include poor access to equipment, insufficient training, and lack of space for use or storage, inadequate staffing, or increased time required compared with manual methods<sup>4</sup>.

In addition, if not done correctly, manual assisted repositioning can be unsafe for patients, putting them at risk of injury, pain and negative health outcomes<sup>4</sup>, as well as regularly interrupting their sleep.

Injuries may be immediate, incremental and/or degenerative, with acute injury often leading to long term pain<sup>6</sup>.

### Manual patient handling risk factors:

- The physical weight of the patient and the effort required
- Sudden unexpected movements
- Bending, twisting and adverse posture<sup>7</sup> affecting the spine and joints
- The duration of load-bearing postures
- Lateral positioning (pre-turn) involves higher strain than turning<sup>8</sup>
- Repetition: several times each shift for each patient

## Why is patient mobility important?

Movement, be it spontaneous and independent or physically assisted by others, is the pivotal protective mechanism by which an individual avoids the risk of pressure injuries.

Movement is an essential component of good health and one that has a beneficial impact across a wide range of physiological and psychosocial functions, including the digestive, excretory and respiratory systems.

Purposeful movement also enables an individual to interact with their environment and, critically, to maintain muscle strength and coordination, whilst reducing the risk of pressure-associated tissue damage (pressure injury).

## Citadel Patient Care System: Taking care of the caregiver.

# 13%

of the world's adult population is obese<sup>11</sup> and the repercussions of managing this pandemic are substantial and intensifying<sup>12</sup>.

When a patient is admitted to a healthcare facility, their body weight represents an immutable, but tangible, risk.

Unfortunately, obesity is now considered to be one of the most prevalent, chronic, relapsing, and ultimately fatal diseases of the modern world<sup>13</sup> and, in the last decade, data from the USA indicates a significant increase in patient weight across all care settings: the US experience is unlikely to be unique.

Even when not overweight, patients aged upwards from pre-adolescence are likely to exceed safe limits for one or more individuals to lift.

Therefore, caregivers in all healthcare settings need solutions that enable them to effectively deliver care, without exposing themselves to increased harm.

### The role of equipment in the delivery of safer patient care

There is a growing appreciation that the use of assistive devices for safe patient handling can reduce the risk of musculoskeletal disorders (MSD) in caregivers (Page 5 – Box 1), both by reducing the effort required to reposition a patient and the frequency of manual intervention: research continues in this field.

Safe practice commonly recommends the deployment of hoists (lifts) and mobility aids for activities such as bed-chair transfer and early mobilisation (Page 5 – Box 1).

However, nurses that undertake several patient transfers each day and are at an increased risk of injury<sup>14</sup> and injury rates<sup>15</sup> have suggested that interventions such as assisted repositioning and manual side-to-side rotation may still be carried out without the use of this type of equipment.

# 60%

of caregiver injuries are related to physical repositioning in bed: turning, boosting & transfers<sup>16</sup>.

## Why is patient's prolonged bed rest harmful?

Though typically a spontaneous and frequently subconscious event, natural movement may be compromised by disease, trauma, medication, sedation or other circumstances that affect the sensory, motor or cognitive function.

It may also be imposed due to treatment restrictions such as skeletal traction, concern for the wellbeing of high acuity patients or, simply, the practice of assigning a patient to bed rest as an integral part of their care.

Unfortunately, despite a growing appreciation of the benefit of early mobilisation for all patients, prolonged bed rest is still common practice; this can be particularly true in high-

dependency units<sup>9</sup> despite being associated with a number of negative sequelae.

These negative outcomes can include muscle wasting and the loss of functional independence and may last for months or years post-discharge, impacting health, employment and income, as well as healthcare usage<sup>10</sup>.

Immobility, resulting in prolonged pressure, with or without shear, is also the principal risk factor for the development of pressure injuries<sup>5</sup>. These injuries may manifest as simple erythema over intact skin (Category I<sup>5</sup>) through to extensive tissue necrosis, which can be life limiting in the worst case.

# Citadel Patient Care System: Taking care of healthcare providers.

## How can routine assisted repositioning be further supported by the Citadel Patient Care System?

Appreciation of these conflicting priorities has led to a number of innovations in the field of bed frame and support surface design.

Today, assisted repositioning using a medical bed and support surface to laterally rotate the immobile patient can be fully or partially automated and can include small but clinically relevant shifts in position.

Consequently, many of the perceived barriers associated with routine assisted repositioning using a medical device can be overcome by using the Citadel Patient Care System to complement the manual positioning of patients for periodic interventions such as pressure relief, hygiene and comfort.



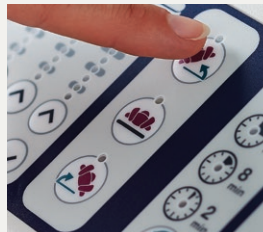
The Citadel Patient Care System is always available, easy to use, no more time consuming to operate and possibly requires fewer staff.

In physiological studies (Page 5 – Box 1), angles of rotation up to 20° compare favourably to the benefits attributed to higher angles, including the manual '30° tilt' position.

However, a thorough assessment of an individual patients requirements may still determine that assistance from a caregiver to reposition is still needed.



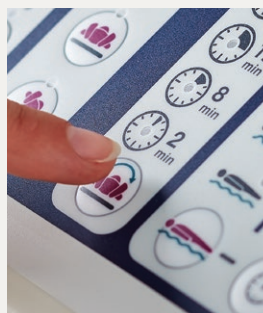
## Manual Patient Turn



The Citadel Patient Care System includes the option to utilise an integrated support surface, which offers manual patient turn of up to 20 degrees.

Beds with an integrated low angle rotation function have been shown to reduce exposure to the detrimental effects of pressure, while maintaining a comfortable and secure posture for the patient (Page 5 – Box 1).

## Automated Continuous Patient Turn



The Citadel Patient Care System also provides a continuous low-angle patient turn function, which can complement or supplement routine repositioning, whilst allowing the patient to rest.

By automating the rotation sequence, pressure can be redistributed several times each hour; a frequency that closely approximates to that observed in normal spontaneous movement<sup>17</sup> whilst reducing the physical demands on caregivers.

A study comparing 30° tilt using pillows to low angle (15° pelvic) automated rotation, concluded that both methods achieved similar mechanical and physiological performance<sup>18</sup>.

# Cutting costs through preventative measures.

Aside from the potential humanitarian cost of injuries to patients and caregivers, there can also be a significant financial cost borne by healthcare providers<sup>5</sup> when faced with adverse events that might otherwise be considered as avoidable.

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These so called 'never events', such as pressure injury, are associated with substantial treatment and lost opportunity costs<sup>19</sup> and so are increasingly being measured and targeted by national initiatives.

Similar costs are attributed to caregiver injury as a result of lost working days, individual treatment cost, workers' compensation and litigation; in the worst cases, there is loss to the profession and long term disability.

The impact can have an important and detrimental effect on healthcare systems, as anything that takes staff away from patient care creates cost issues in a system, and has the potential for reducing the overall safety of the unit, including that of the patient<sup>4</sup>.

Patient pressure injuries and caregiver musculoskeletal disorders are two very challenging, costly and common injuries, which are interrelated and yet rarely discussed in the same context<sup>20</sup>.

Although robust cost data is elusive, and will vary widely across different healthcare models, there is no doubt that there is a strong incentive to apply preventative measures in both areas.

Repositioning will reduce the duration and magnitude of pressure over vulnerable areas of the body and contribute to comfort, hygiene, dignity and functional ability<sup>21</sup>.

## Benefits for the patient...

Low angle rotation reduces pressure on the microcirculation, resulting in increased blood flow: this is important for tissue viability and can be demonstrated through physiological measurement.

- Small changes in position can reduce pressure over vulnerable areas such as the sacrum<sup>22</sup> and so significantly enhance blood flow<sup>23</sup>.
- Automated lateral rotation ( $\geq 15^\circ$ ) can reduce pressure-time exposure across important anatomical locations compared to the supine position<sup>24</sup>.
- A  $15^\circ$  angle of rotation delivers significantly lower pressures over the trochanter than a  $30^\circ$  tilt<sup>24</sup>.
- Pressure over the upper and lower body is lowest at  $20^\circ$  rotation (compared to  $10^\circ$  &  $15^\circ$ ), beyond this level, weight shift resulting in tissue friction needs to be taken into account<sup>25</sup>.
- Tilt angles that exceed  $20^\circ$  may result in an unstable<sup>25</sup> and uncomfortable<sup>24, 25</sup> position.

## Benefits for the caregiver...

Using repositioning aids to facilitate nursing interventions has a number of health benefits:

- Ad Hoc use of complimentary mechanical aids lowers the lumbar loads<sup>26</sup> and physical effort required during interventions such as assisted repositioning<sup>27</sup>.
- Utilising biomechanically optimised handling modes supplemented by small, technical aids reduces the load on a caregiver's spine and can achieve a reduction in lumbar-overload risk during manual patient handling procedures<sup>28</sup>.
- Nurses who routinely deploy assistive equipment when handling patients suffer fewer musculoskeletal disorders (MSD)<sup>29</sup>.
- Convenience: the bed is always available to assist with rotation. No waiting for additional staff, locating a mechanical lift and or inserting slings or transfer sheets.

Box 1.

## Conclusions:

As well as improved clinical outcomes, cost burden is a strong driver for change and the therapeutic features of the Citadel Patient Care System can be pivotal in supporting the delivery of safe, effective and efficient patient care.

In terms of effective interventions, lateral rotation (manual and automated) is an expanding area of research, with positive outcomes reported for both patients and caregivers. However, it is important to acknowledge that the very act that protects the patient can also place the caregiver at increased

risk of injury and so the solutions must bring together expertise, equipment and collaboration from the fields of both the tissue viability and safe patient handling<sup>20</sup>.

Although the clinical benefit in terms of pressure injury outcome and reduced musculoskeletal disorders are yet to be formally quantified, recent innovations such as the Citadel Patient Care System, with a pressure redistributing support surface and integrated lateral rotation capability, can play an important role within clinical practice.

# References

- [1] NHS Digital (Health & Social Care Information Centre) Hospital Patient Care Activity 2015-2016. 2016 <http://www.content.digital.nhs.uk/catalogue/PUB22378> accessed January 2017
- [2] VanGilder C, Lachenbruch C, Algrim-Boyle C et al. International pressure ulcer prevalence survey 2006-2015. *J Wound Ostomy Continence Nurs.* 2017; 44(1): 1-9
- [3] NHS Improvement. Evidence from NHS Improvement on clinical staff shortages: A workforce analysis February 2016. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/500288/Clinical\\_workforce\\_report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/500288/Clinical_workforce_report.pdf) accessed January 2017
- [4] Humrickhouse R, Knibbe HJJ. The Importance of Safe Patient Handling to Create a Culture of Safety: An Evidential Review, *The Ergonomics Open Journal.* 2016; 9: 27-42
- [5] National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline. Emily Haesler (Ed.). Cambridge Media: Osborne Park, Western Australia; 2014
- [6] Nolet PS, Kristmas VL, Côté P et al. The association between a lifetime history of work-related low back injury and future low back pain: a population-based cohort study. *Eur Spine J.* 2016; 25(4):1242-1250
- [7] Yassi A, Lockhart K. Work-relatedness of low back pain in nursing personnel: A systematic review. *International Journal of Occupational and Environmental Health.* 2013; 19(3), 223-244.
- [8] Wiggerman N. Biomechanical Evaluation of a Bed Feature to Assist in Turning and Laterally Repositioning Patients. *Human Factors.* 2016; 58(5): 748-757
- [9] Hashem MD, Nelliot A, Needham DM. Early Mobilization and Rehabilitation in the ICU: Moving Back to the Future. *Respiratory Care.* 2016; 61 (7): 971-979
- [10] Griffiths J, Hatch RA, Bishop J. et al. An exploration of social and economic outcome and associated health related quality of life after critical illness in general intensive care unit survivors: a 12-month follow up study. *Crit Care.* 2013; 17:R100 <https://dx.doi.org/10.1186%2Fcc12745>
- [11] World Health Organisation Fact Sheet 311 (2015): <http://www.who.int/mediacentre/factsheets/fs311/en/>
- [12] Beitz JM. Providing Quality Skin and Wound Care for the Bariatric Patient: An Overview of Clinical. *Ostomy Wound Manage.* 2014; 60(1): 12-21
- [13] Blackett A, Gallagher S, Dugan S, Gates JL, Henn T, Kennedy-Evans KL, Lutz JH. Caring for persons with bariatric health care issues. *J Wound Ostomy Continence Nurs.* 2011;38(2):133-138
- [14] Andersen LL, Burdorf A, Fallentin N et al. Patient transfers and assistive devices: prospective cohort study on the risk for occupational back injury among healthcare workers. *Scand J Work Environ Health* 2014; 40(1): 74-81
- [15] Bureau of Labor Statistics, U.S. Department of Labor. Non-fatal occupational injuries and illnesses requiring days away from work - 2014. 2015; USDL-15-2205. <http://www.bls.gov/news.release/osh2.nr0.htm> accessed January 2017
- [16] McCoskey KL. Ergonomics and patient handling. *AAOHN Journal.* 2007; 55(11): 454-462
- [17] Reenalda J, Van Geffen P, Nederhand M. Analysis of healthy sitting behavior: Interface pressure distribution and subcutaneous tissue oxygenation. *Journal of Rehabilitation Research & Development.* 2009; 46(5): 577-586
- [18] Woodhouse M, Worsley PR, Voegeli D et al. The physiological response of soft tissue to periodic repositioning as a strategy for pressure ulcer prevention. *Clinical Biomechanics.* 2015; 30: 166-174
- [19] Large J. A cost-effective pressure damage prevention strategy. *British Journal Nursing.* 2011; 20(6): S22-S25
- [20] Phillips L. Pressure Ulcer Prevention: Keep it safe, Keep it simple! Proceedings of the 5th International Conference on Applied Human Factors and Ergonomics. AHFE 2014. Eds. T. Ahram, W. Karwowski & T. Marek. 2014
- [21] National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline. Emily Haesler (Ed.). Cambridge Media: Osborne Park, Western Australia; 2014
- [22] Tsuchiya S, Sato A, Azuma E et al. The effectiveness of small changes for pressure redistribution; using the air mattress for small changes. *Journal Tissue Viability.* 2015; 25(2): 135-142
- [23] Oertwich PA, Kindschuh AM, Bergstrom N. The effects of small shifts in body weight on blood flow and interface pressure. *Res Nurs Health* 1995; 18(6): 481e8
- [24] Do NH, Kim DY, Jung-Hoon Kim J-H et al. Effects of a continuous lateral turning device on pressure relief. *J. Phys. Ther. Sci.* 2016; 28: 460-466
- [25] Yi C-H, Kim H-S, Yoo W-G. The Effects of Different Types of Automated Inclining Bed and Tilt Angle on Body-Pressure Redistribution. *Adv Skin Wound Care.* 2009; 22: 259 - 264
- [26] Jordan C, Luttmann A, Theilmeier et al. Characteristic values of the lumbar load of manual patient handling for the application in workers' compensation procedures. *Journal of Occupational Medicine and Toxicology.* 2011 DOI: 10.1186/1745-6673-6-17
- [27] W. S. MARRAS , K. G. DAVIS , B. C. KIRKING & P. K. BERTSCHE (1999) A comprehensive analysis of low-back disorder risk and spinal loading during the transferring and repositioning of patients using different techniques, *Ergonomics*, 42:7, 904-926, DOI: 10.1080/001401399185207
- [28] MATTHIAS JÄGER, CLAUS JORDAN, ANDREAS THEILMEIER, NORBERT WORTMANN, STEFAN KUHN, ALBERT NIENHAUS and ALWIN LUTTMANN. Lumbar-Load Analysis of Manual Patient-Handling Activities for Biomechanical Overload Prevention Among Healthcare Workers. *Ann. Occup. Hyg.*, Vol. 57, No. 4, pp. 528-544, 2013
- [29] Andersen LL, Burdorf A, Fallentin N et al. Patient transfers and assistive devices: prospective cohort study on the risk for occupational back injury among healthcare workers. *Scand J Work Environ Health* 2014; 40(1): 74-81

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