Research White Paper (2013): CEILING LIFTS – A SUMMARY OF RECENT EFFICACY AND COST BENEFIT STUDIES

CEILING LIFTS – A SUMMARY OF RECENT EFFICACY AND COST BENEFIT STUDIES

Overview

This document summarises the findings from 8 papers that have reported on studies analysing the effectiveness of ceiling lifts, such as the OT200, for safe patient handling. The main conclusions are as follows:

Alamgir et al. 2008 conclude that investment in ceiling lifts can be recouped within 2-6 years (depending on whether direct or indirect costs are measured) as a result of the significant decline in musculoskeletal injuries after intervention.

Chhokar et al. corroborate this conclusion by stating that economic benefits due to reduced compensation costs can be generated within 3 years. This is especially important considering that ceiling lifts have a working life of up to 12 years.

Alamgir et al. found that patients tend to prefer ceiling lifts to either floor lifts or manual handling, and that staff generally find ceiling lifts to be the least demanding method of patient handling. This is also concluded by *Dutta et al.*

Dutta et al. determined that significantly lower back loads result from use of ceiling as compared with floor lifts. *Marras et al.* similarly observes that while there is little spine biomechanical overloading risk associated with the use of ceiling lifts, floor lifts can still represent a significant risk to the caregiver, potentially producing excessive loads on the lumbar spine.

Silverwood et al state that ceiling lift use is associated with lower fatigue, pain and frustration, and also with fewer medical visits by staff.

Algamir et al. found the mean time for bed to chair and chair to bed transfers to be significantly longer with floor lifts (273.6 seconds) than with ceiling lifts (156.9 seconds); ($p<0.001$). *Alamgir et al* and *Engst et al* conclude, however, that ceiling lifts can take longer to use when repositioning patients in bed than other forms of manual patient handling. This finding must be considered against their safety advantages.

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Alamgir H, et al. Injury 2008;39:570–577

The effectiveness and cost benefit of overhead lifts in reducing musculoskeletal injury (MSI) risk among healthcare workers was evaluated in three long-term care facilities. Injury trend analysis spanned 6 years prior to intervention (1996–2001), and four years following intervention (2002–2005).

A total of 586 MSI claims were made during the study period, with a gradual decline seen in relative risk. When divided into relative risk before and after ceiling lift installation, a statistically significant decline was seen for both MSI's and working days lost per bed during the post-intervention period, compared with the pre-intervention period. A downward trend in injuries started before the ceiling lifts were installed, but time series regression analysis demonstrated a significant change in injury rates after the ceiling lifts were installed, compared with the pre-intervention period. The estimated payback period was between 6.2 and 6.3 years if direct claim-cost savings only were included, reducing to between 2.06 and 3.20 years when indirect savings were included.

This study provides evidence to support the effectiveness of overhead lifting devices in reducing MSI risk in healthcare staff, and demonstrates that intervention costs are outweighed by the associated economic savings – therefore supporting intervention with installation of overhead ceiling lifts.

Alamgir H, et al. AAOHN Journal 2009:374–380

There is a paucity of research linking ceiling lifts with quality of care indicators and patient perceptions. The relationship between ceiling lift coverage rates and measures of patient care quality in acute and extended care facilities was evaluated.

Ceiling lift coverage rates increased in acute care facilities from 2004–2006, and in extended care facilities from 2002–2006. Patient overall satisfaction with ceiling lift transfer was reviewed in 12 interviews at a complex care facility; ceiling lifts scored an average of 8.5, while floor lifts scored an average of 7.3 (score from 1–10). All patients felt safe and were not afraid during ceiling lift transfers, and felt ceiling lifts to be safer and less strenuous for staff. Staff expertise and experience was identified as an important factor in the overall comfort of a transfer.

Overall, this study did not find ceiling lifts to be detrimental to patient outcomes or the quality of care received, it find that transfer by ceiling lifts was generally preferred by patients over floor lifts and manual methods; the majority of patient perceptions of ceiling lifts were positive.

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Alamgir H, et al. Injury 2009;40:987–992

Transfer time, patient comfort and staff perceptions of ceiling lifts compared with floor lifts were reviewed in three long-term care facilities with varying ceiling lift coverage (100%, 33% and 0%). Bed to chair, chair to bed, and repositioning on bed/ boosting patient on bed transfers were investigated.

A total of 119 transfers were recorded. The mean time for bed to chair and chair to bed transfers was significantly longer with floor lifts (273.6 seconds) than with ceiling lifts (156.9 seconds); $p<0.001$. Time is an important factor to healthcare workers; increased transfer time can be an inconvenience and may also increase the amount of time spent in an injury- inducing position. For patient repositioning, ceiling lift transfers took approximately 30 seconds longer than manual transfers using either a sliding sheet or soaker pad. Ceiling lifts were perceived by patients as being significantly more comfortable than floor lifts for bed to chair and chair to bed transfers. When perceptions of patient handling tasks and equipment

were surveyed in 143 healthcare workers across the three facilities, there was a preference for using ceiling lifts for both transferring and repositioning patients (97% of healthcare staff surveyed). Transferring a patient using a ceiling lift was perceived by staff to be less difficult, more efficient, easier-access and lower injury risk, compared with floor lifts. All results were statistically significant ($p\leq0.001$). Staff in all facilities indicated that manual patient handling techniques were the most demanding, and that when the same tasks were performed with ceiling lifts, they were the least demanding.

Positive attitudes towards ceiling lifts, and an understanding of their benefits is important to increase compliance, facilitate appropriate use, and therefore reduce staff injury rates. The actual use of ceiling lifts for patient repositioning/boosting is felt anecdotally to be less than the data reported – a discrepancy which bears further further study. To achieve maximum benefits, ceiling lifts must be correctly and fully used by staff.

Chhokar R, et al. Applied Ergonomics 2005;36:223–229

The efficacy of ceiling lifts in reducing injury risk was studied in an extended care facility. Injury reports from 1995–2001 were separated into three periods – a pre-intervention period (1995–1997), a six-month intervention period, and a 3-year post- intervention period. Data from the intervention period was excluded.

When injury trends were analysed, a significant and sustained decrease was seen following implementation of the program, in days lost, compensation claims by workers, and direct patient handing injury-related cost – a decrease which continued over the 3 years post-intervention. Substantial decreases, however, were not seen until 2 years post-intervention. This could be due to cumulative exposure from pre-intervention years leading to carry-over of problems and reporting into subsequent years, and initial problems in the use of ceiling lifts for repositioning tasks, as well as the time required to alter work culture and implement changes in manual handling practices.

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Economic benefits due to reduced compensation costs were generated within 3 years of intervention. Direct cost payback was estimated to be 0.82 to 2.5 years. This relatively short period (the lifespan of a ceiling lift is 12 years) is a strong advocate for the continuing use of ceiling lifts as an intervention to mitigate patient handling-related injuries.

Dutta T et al. Applied Ergonomics 2012;43:521–531

Differences in peak external hand forces and external movements at the L5/S1 lower back joint were investigated when manoeuvring floor and ceiling-lifts. The study aimed to compare the loads experienced by older caregivers, working both alone and in pairs using floor and ceiling lifts, as there is an increasing proportion of older nurses, and the risk of back injury increases with age. Particular concern is focused on caregivers working outside institutions – caregivers in the home environment report more lost work days due to injury than nursing home or hospital caregivers. As home care services are expected to increase due to a trend in reduced hospital stays, it is important to establish best ergonomic working practices in this environment.

Biomechanical measurements, ground reaction forces and motion capture data were used in a simulated clinical environment, to estimate hand forces and external moments resulting from bed to chair and back transfers using floor and ceiling lifts. Surrogate patients of mean 90 kg mass were used to simulate a dependent patient. A total of 21 female caregivers (age 19–60 [mean 38.9 years]) with at least one year's experience in patient lift/transfer activities were included.

Use of ceiling and floor lifts resulted in similar loads for the 'legs down and legs up' activities. Use of the floor lift resultedin higher loads compared with the ceiling lift during 'Pull, turn and push' activities. Overall, significantly lower back loads resulted from use of the ceiling lift compared with the floor lift, and the majority of caregivers studied preferred the ceiling lift.

Engst C et al. Ergonomics 2005;48:187–199

Injury data and staff perceptions before and after implementation of a ceiling lift programme were compared with a similar unit that did not implement such a programme. Residents were randomly assigned to one of the two units upon admission; unit management, policies and procedures and staff training were the same, as were patient load demands. Perceivedrisk of injury and discomfort, preferred patient handling methods, frequency of resident handling tasks, perceived physical demands, work organisation and staff satisfaction were assessed by confidential questionnaire. A total of 34 staff in the intervention group and 16 staff in the comparison group completed both questionnaires.

Overhead lifts were preferred to manual or floor lifts by 71% of staff in the intervention unit. In the intervention group, a significant reduction in perceived risk of injury to the neck, shoulders, back, hands and arms when using a ceiling lift was seen. Intervention group staff showed a preference for manual patient repositioning with co-worker assistance, even following installation of the ceiling lift; only 34% of staff preferred to use a ceiling lift for repositioning, while 57% preferred manual repositioning with assistance from a co-worker. Those that did, however, showed significantly less discomfort ($p<0.001$) compared with

manual repositioning. All staff in the intervention group reported that the introduction of ceiling lifts made it easier to lift residents, and 96% reported that the introduction of ceiling lifts had made their job easier to perform.

In the intervention unit, compensation costs due to lifting and transferring tasks were reduced by 68%, while they were increased by 68% in the comparison unit.

Ceiling lifts were a preferred method for lifting and transferring patients, and were associated with reduced compensation costs due to lifting and transferring tasks. They were not, however, found to confer benefits in perceived risk or compensation costs when used to reposition patients, and were reported to take more time than manually repositioning patients. This finding must be considered against their safety advantage.

Marras WS et al. Ergonomics 2009;52:384–397

Lumber 3-D spine forces were analysed in 10 volunteers (5 male, 5 female) while manipulating ceiling and floor lifts during various typical patient handling manoeuvres; none had previous patient handling experience. Spine forces were assessed using a subject-specific, biologically-assisted biomechanical model.

The patient lift system configuration used was found to significantly influence spine compression, lateral shear and anterior/ posterior (A/P) shear values. Forces exerted upon the lumbar spine while manipulating a ceiling lift were considered to be safe, while use of a floor lift was found to potentially increase A/P shear forces to unsafe levels. A/P shear forces of sufficient magnitude to cause disc damage were not incurred at any time with use of the ceiling lift, but use of the floor lift in a confined area (such as a bathroom) and when turning generated A/P shear forces great enough to initiate disc damage, under certain conditions. A/P shear forces were particularly high when the floor lift was used on carpet, or had small wheels. Use of a floor lift under certain conditions can still represent a significant risk to the caregiver, potentially producing excessive loads on the lumbar spine.

Floor lifts are still considered to provide a benefit over manual handling of patients, and are generally associated with low levels of spine compression, but certain patient handling manoeuvres with the floor lift can lead to damaging A/P shear forces at the mid to upper levels of the lumbar spine, becoming particularly problematic upon turning. A/P shear forces were also attenuated by patient weight and on turning in a floor-based lifting system. Overall, there is little spine biomechanical overloading risk associated with the use of ceiling lifts.

Silverwood S, Haddock M. CACCN 2006;17:19–21

The effects of an installation of ceiling lifts on levels of discomfort, fatigue and frustration, plus medical visits and time-loss claims were reviewed in the nursing staff of an intensive care unit (ICU). Surveys were performed prior to installation, then at three, six and 18 months following; the survey included questions on discomfort, fatigue and frustration both before and after a 12-hour shift, plus use of any medical interventions by the participant.

Ceiling lift use was associated with lower fatigue, pain and frustration, and also with fewer medical visits. A decrease in doctor's visits, medication use and time off due to injuries was seen. Fewer nurses were needed

to turn patients following ceiling lift installation. There was a significant reduction in time-loss claims – a reduction of 70% was seen in the first year following lift installation. A shift in safety culture was observed in the unit, with staff taking a more proactive approach to injury prevention.

Sling management and availability is reported as an important factor in successful ceiling lift system implementation – the right sizes and styles of slings must be readily available and factors such as laundering and storage must be considered. The ageing nurse population increases the risk of cumulative trauma, as does the increase in bariatric patients.

Literature:

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