

Evaluation of ceiling lifts: transfer time, patient comfort and staff perceptions

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TOPICS

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1. INTRODUCTION

Mechanical lifting devices have been developed in an effort to reduce healthcare workers injuries related to patient handling. Patient handling tasks place healthcare workers at a high risk for injury [1]. Originally, floor lifts were introduced. However, they created problems in terms of required space and time [2]. More recently ceiling lifts have been advocated as an alternative to floor lifts. Ceiling lifts run on a ceiling mounted track eliminating some of the problems associated with floor lifts. Another advantage of ceiling lifts is the repositioning sling. Ceiling lifts have been shown to be effective in reducing injury rates and to be cost-effective [3].

Healthcare workers frequently note increased time to transfer as a concern associated with the use of mechanical lifting devices [4]. There are few studies that have compared the transfer time between ceiling lifts and floor lifts.

In addition to time, both healthcare workers and authorities are concerned about patient comfort. Past studies have found no difference in comfort levels between ceiling lifts, floor lifts and manual methods of transferring [1].

Staff perceptions of mechanical lifting devices have been found to improve with use and recently, with respect to ceiling lifts, they have been noted as favourable [3].

The specific objectives of this research were 1) to measure and compare the time spent to perform various patient transfer tasks

using ceiling lifts or floor lifts 2) to determine the impact of ceiling lifts on patient comfort levels compared to floor lifts in the real hospital setting. In respect to staff perceptions the objectives were to determine healthcare workers' perceptions on patient handling by identifying key barriers and achieved successes in the optimal use of patient transfer devices in facilities with varying levels of ceiling lift coverage.

2. METHODOLOGY

A two part investigation into the use of ceiling lifts was conducted at three long-term care facilities in different stages of patient handling equipment implementation in British Columbia, Canada. The ceiling lift coverage rates were 100% for facility 1, 33% for facility 2 and no coverage for facility 3.

2.1 Transfer time and patient comfort

A prospective observational design was adopted to measure and compare three categories of patient-handling methods:

- (1) Ceiling lifts
- (2) Floor lifts
- (3) Manual lifting

Three types of frequent patient-handling tasks were observed at long-term care facilities in different stages of ceiling lift implementation:

- (1) transfers from bed to chair
- (2) transfers from chair to bed
- (3) repositioning in bed/boosting patient up in bed.

The time (preparation, actual and total time) to complete these tasks and patient comfort levels (using an observational scale) during the transfer were measured by observers. Only residents requiring mechanical aides for transfer were included.

Observers began timing at the first sign of preparation for a transfer/repositioning and stopped when the patient was safely transferred to the new surface or position.

The patient comfort observational scale rated alertness, calmness/agitation, physical movement, muscle tone and facial tension of the patient during transfer with higher scores representing increased discomfort.

2.2 Staff Survey

A comprehensive survey questionnaire was designed to provide both quantitative and qualitative evidence directly from healthcare workers' perspectives. A convenience sample was obtained by administering the survey to volunteers in the 3 long-term care facilities. The survey was designed to gather information relevant to patient handling. The workers were asked to rate various aspects of patient handling tasks and equipment on a scale from 1 to 5 with 5 representing a more favorable perception and 1 representing a less acceptable perception.

2.3 Statistical analysis

Independent-Samples t-test was used to examine the differences between the mean comfort scores observed and mean times required by ceiling lifts, floor lifts and manual methods to complete patient handling tasks. General Linear Model was used to examine differences after adjustment for facility, number of staff involved in the transferring, as well as the age, gender and weight of the client.

Analysis of Variance (ANOVA) and multiple comparisons were used to examine the difference in staff perceptions. The General Linear Model was used to examine the differences after adjustment for facility, age group, gender, title of current occupation and job status

All tests are two-sided significance levels of $p \leq 0.05$ calculated from the Statistical Package for the Social Science 14.0 (SPSS Inc. Chicago, IL).

3. RESULTS

3.1 Transfer time and patient comfort

A total of 119 patient transfers were observed in the three long-term care facilities. Of these transfers 78 were from chair-to-bed, 32 were from bed-to-chair and 28 were repositioning/boosting tasks.

The average time for bed to chair transfers were longer for floor lifts compared to ceiling lifts for preparation (99s to 173s), actual transfer (57.9 s to 100.6s), and total time (Figure 1). For chair to bed transfers ceiling lifts also required a shorter amount of time compared to floor lifts for preparation (59.7s to 183.3s), actual transfer (52.1s to 104.6s), and total time (Figure 2). The mean times were significantly different between ceiling lifts and floor lifts ($p < 0.001$).

The differences between the mean comfort scores for ceiling lifts and floor lifts were significant ($p < 0.001$). Ceiling lifts were observed to be more comfortable for patients than floor lifts for bed to chair (11.4 for ceiling lifts and 14.2 for floor lifts) and chair to bed transfers (11.0 for ceiling lifts and 14.7 for floor lifts).

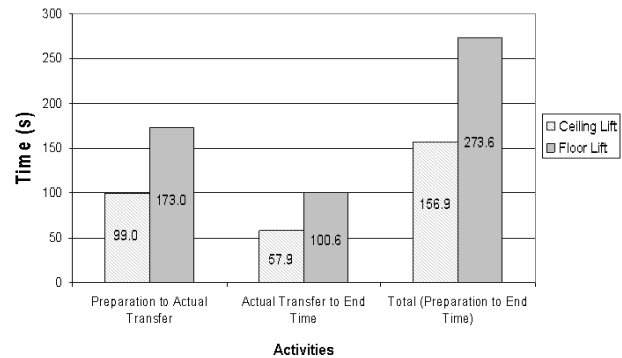


Figure 1. Average Amount of Time Required Between Activities Using Ceiling Lifts vs. Floor Lifts During Bed to Chair Transfers.

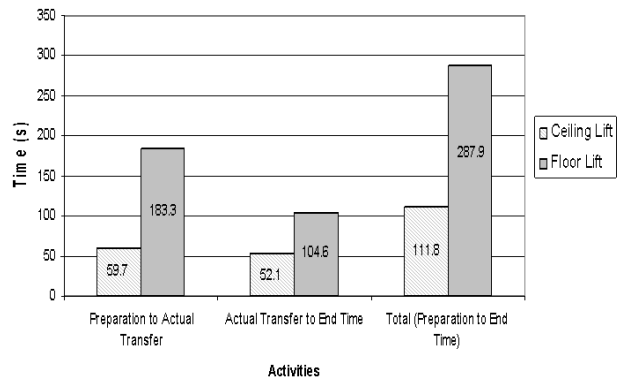


Figure 2. Average Amount of Time Required Between Activities Using Ceiling Lifts vs. Floor Lifts During Chair to Bed Transfers.

With respect to repositioning tasks, ceiling lifts took significantly longer (59.5s to 24.9s) to complete the task when compared to manual techniques (Table 1). All means were significantly different compared to ceiling lifts ($p < 0.001$).

Table 1. Comparisons of means between ceiling lifts, manual lifts with sliding sheet and manual lifts with soaker pad for the task of repositioning/boosting patients.

Equipment	N	Mean (SD)	Min	Max
Ceiling lifts	9	59.5 (17.1)	41.0	100.5
Manual lifts with sliding sheet	8	37.2 (60.6)	8.2	186.0
Manual lifts with soaker pad	11	16.0 (6.9)	8.7	29.67
Total	28	36.0 (37.5)	8.2	186.0

^aMean in seconds

3.2 Staff survey

A total of 143 subjects completed the survey. Table 2 shows the demographics of the respondents.

Table 2. Demographics of respondents to staff survey.

	Variables	N (%)
Facility	Facility 1 (Ceiling lift)	69 (48.3%)
	Facility 2 (mix)	24 (16.8%)
	Facility 3 (Floor lift)	50 (35.0%)
Age group (yrs)	20 – 29	9 (6.3%)
	30 – 39	26 (18.2%)
	40 – 49	59 (41.3%)
	50 – 59	41 (28.7%)
	> 60	5 (3.5%)
Gender	Female	119 (83.2%)
	Male	19 (13.3%)
Title of current occupation	Registered Nurse	23 (16.1%)
	Licensed Practical Nurse	9 (6.3%)
	Care Aide	99 (69.2%)
	Other	11 (7.7%)
Working hour arrangement	Daytime	61 (42.7%)
	Two-shift work	10 (7.0%)
	Three-shift work	15 (10.5%)
	Regular evening shift	30 (21.0%)
	Regular night shift	5 (3.5%)
	Other	22 (15.4%)
Employment status	Full-time	80 (55.9%)
	Part-time	42 (29.4%)
	Casual	18 (12.6%)
Total		143 (100%)

Table 3 presents staff perceptions of how physically demanding patient handling tasks were. Transferring or repositioning manually alone was perceived to be the most physically demanding and the same tasks performed with ceiling lifts was perceived to be the least physically demanding. The differences were significant ($p \leq 0.01$) with the exception of the transferring task comparison between “manually with co-workers” and “with floor lifts” ($p \geq 0.05$).

Table 3. Staff perception of how physically demanding transferring or repositioning is.

	Manually alone	Manually with co-workers	With floor lift	With ceiling lift
Transferring				
N	133	138	137	134
Mean ^a	1.74	2.51	2.62	3.46
SD.	0.88	1.00	1.09	1.21
Repositioning				
N	134	136		132
Mean ^a	1.57	2.51		3.36
SD.	0.90	1.04		1.16

^a1=extremely demanding, 5=extremely easy

Table 4 compares staff perceptions of ceiling lifts and floor lifts. Transferring a patient using ceiling lifts was perceived to be more

acceptable in every category when compared to floor lifts. All results were statistically significant ($p \leq 0.001$).

Table 4. Staff perception about transferring a patient/client when comparing ceiling lifts with floor lifts by facility.

Measure	All Facilities	
		Mean ^c (SD)
Hard	CL ^a (n=141)	4.28 (0.89)
	FL ^b (n=140)	2.57 (1.18)
Time consuming	CL (n=141)	4.11 (1.05)
	FL (n=137)	2.41 (1.17)
Access	CL (n=140)	4.65 (3.39)
	FL (n=137)	2.66 (1.24)
Increasing risk of injury	CL (n=141)	4.46 (0.93)
	FL (n=138)	2.39 (1.34)
Requiring more help	CL (n=141)	3.42 (1.21)
	FL (n=138)	2.34 (1.21)
Refused by co-workers	CL (n=139)	4.42 (1.01)
	FL (n=135)	3.47 (1.35)
Unsafe for the patients	CL (n=139)	4.45 (0.77)
	FL (n=137)	3.49 (1.18)
Uncomfortable for the patients	CL (n=139)	4.07 (1.00)
	FL (n=135)	3.04 (1.19)
Refused by the patients	CL (n=135)	4.19 (1.16)
	FL (n=133)	3.18 (1.30)

^aCL = ceiling lift ^bFL = floor lift

^c1=quality is unacceptable, 5= very acceptable

4. CONCLUSIONS

The results from this study provide additional support for the use of ceiling lifts. Ceiling lifts were found to require less time to transfer patients and to be more comfortable for the patients. Further investigation is required on the use of ceiling lifts for repositioning task before any valid conclusions can be drawn.

5. REFERENCES

- [1] Zhuang, Z., Strobbe, T. J., Hsiao, H., Collins, J. W. and Hobbs, G. R., Biomechanical evaluation of assistive devices for transferring residents. *Applied Ergonomics* 1999; 30: 285-294.
- [2] Owen, B. D., 1988. Patient handling devices; an ergonomic approach to lifting patients. In: V, F. Aghazadeh, ed. *Trends in Ergonomics/ Human Factors*. Amsterdam, Holland: Elsevier Science Publishers, 721-727.
- [3] Engst, C., Chhokar, R., Miller, A., Tate, R. B. and Yassi, A., Effectiveness of overhead lifting devices in reducing the risk of injury to care staff in extended care facilities. *Ergonomics* 2005; 48; 187-99.
- [4] Daynard, D., Yassi, A., Cooper, J. E., Tata, R., Norman, R. and Wells, R., Biomechanical analysis of peak and cumulative spinal loads during simulated patient-handling activities: a substudy of a randomized controlled trial to prevent lift and transfer injury of health care workers. *Appl Ergon* 2001; 32: 199-214.