KEYWORDS: PERIOPERATIVE ENVIRONMENT, CEILING LIFTS, ERGONOMICS, INJURY PREVENTION.

EVALUATING THE USE OF CEILING LIFTS IN THE OPERATING ROOM

Authors:

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Melanie Gee, BSc (Kin), has worked as an ergonomist with the Workplace Health Ergonomics Team at Fraser Health since 2008. Her main responsibility is supporting the "Safe Client Handling" program by helping provide staff with appropriate equipment and promoting staff engagement. Melanie enjoys learning about the current processes in the healthcare system and collaborating with staff on improving them. Melanie assisted with the survey creation for this study as well as recruiting staff for participation. She also assisted the OR with addressing the barriers to ceiling lift use that were identified in the study.

Deanna Harrison, BSc (Kin), BA (Psych), CPE, has over 20 years' experience in the application of ergonomics principles to injury prevention and over 10 years' experience in healthcare. Her program focus is on "Safe Client Handling" within acute care, residential care and home health. The program goals are aimed at reducing the incidents and injuries associated with patient handling so that the workplace is safe for both care providers and patients. Deanna enjoys the complexity and challenges associated with applying ergonomics in healthcare. Her role for this project was to provide injury / incident statistics related to patient handling in the ORs across the region and in comparison to the intervention unit.

Nermin Helal, BSc (Kin), CCPE, has been working in the field of healthcare ergonomics for over 10 years and also has a professional background in mining, manufacturing, and industrial ergonomics. Nermin currently works as an Ergonomist for Fraser Health and has a focus on developing guidelines, standards and evaluations to optimize safe patient handling and workplace ergonomics in facility design. She was a contributor in the early stage framework for this project and assisted in the revisions of the manuscript.

ABSTRACT:

Healthcare workers make up 11% of British Columbia's workforce and, on an annual basis, they account for over 7,500 time-loss claims, 300,000 days of work lost, and a cost of more than $50 million in health claims as a result of musculo-skeletal injuries (MSIs) that occur in the workplace relating to patient care, over-exertion, slips, trips and violence.[1] A new acute care hospital was constructed in Abbotsford, BC and opened in 2008. During this construction, extensive ceiling lift coverage was provided throughout the facility including in the operating room (OR). Given a lack of literature and research, around this important ergonomic engineering control in the OR environment,[2] a staff survey was administered to capture information on the familiarity, usage, and perception of the ceiling lifts. Findings were positive and showed that the staff felt ceiling lifts were a practical and useful ergonomic engineering control, for the OR environment, and that key patient handling tasks were now being carried out with the use of ceiling lifts.

INTRODUCTION:

Healthcare workers make up 11% of British Columbia's workforce and, on an annual basis, they account for over 7,500 time-loss claims, 300,000 days of work lost, and a cost of more than $50 million in health claims from musculo-skeletal injuries (MSIs) that occur in the workplace relating to patient care, over-exertion, slips, trips and violence.[1] British Columbia's healthcare workers remain the third largest sector, in the province, for both the number of claims and the time lost.[3]

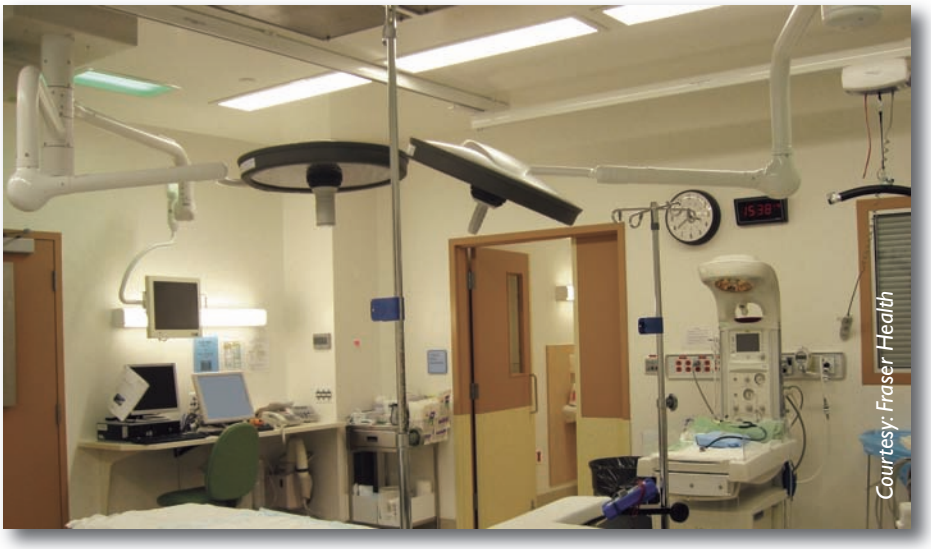
MSIs resulting from patient handling are the largest source of healthcare worker injury in BC. Workplaces with high MSI rates reported increases in lost work days, higher turnover, increased costs and adverse patient outcomes.[2] Many innovative advances in safe patient handling have, based on this high potential for injury, been developed to assist healthcare workers with their patient care and aid in minimizing healthcare worker injuries. Mechanical floor lifts and in-bed positioning aids have, for many years, been an ergonomic approach used to minimize manual patient handling. Ceiling lifts have, more recently, been introduced in many acute care and residential care areas as an ergonomic engineering control.

DESCRIPTION OF THE PROBLEM:

The reduction of manual patient handling and associated injuries can be achieved by ensuring all areas (beds), in acute and residential care, have ceiling lift coverage proportional to the patient handling dependencies of the clinical areas specific patient population. If, for example, 50% of the units' patients are typically dependent for transfers or in-bed positioning, 50% of the beds on the unit should be considered for ceiling lift coverage. Ceiling lift installation in acute and residential care is, however, a costly undertaking and, with the realities of stretched healthcare resources, the installation of ceiling lifts often occurs only in areas where high injury rates have been reported in the past. Using past injury rates is a good indicator to help predict where to direct future resources in most areas. There is, however, a key department within acute care that is often lacking in ceiling lift coverage – namely the operating room (OR). This deficit is likely the result of the costs and challenges associated with retro-fitting the equipment intensive and highly technical environment of an existing operating theatre. The operating room infrastructure, such as lights, monitors and gas lines embedded in the ceiling, make this environment much more cost-prohibitive when dealing with a retro-fit of ceiling lifts. In addition to the cost of installation there is also the cost of moving equipment which can more than double the cost as compared to an installation in a standard patient room. The perioperative environment does, nonetheless, pose injury risks related to manual patient handling especially given the fact that most patients are unconscious and often require the team to manually lift or reposition the patient, or the patients' extremities, both during and after a procedure.[2]

DESCRIPTION OF THE PROJECT SETTING:

Fraser Health is one of six regional health authorities that operate in British Columbia. The Fraser Health region has over 26,000 staff, 2,500 physicians and 6,500 volunteers who serve more than 1.6 million people. Fraser Health operates 12 acute care hospitals, about 7,500 residential care beds, and provides mental health, public health, home, and community care services.[4]



OR with the Ceiling Lift System.

Patient handling is the number one cause of injury to Fraser Health staff.[5] Every year, in Fraser Health, there are over 600 incidents, 300 claims and 8,000 lost work days as a result of patient handling.[5] A recent analysis showed that over 50% of the patient handling incidents in Fraser Health are related to repositioning a patient in bed (e.g., boosting or turning), assisting a patient to manually transfer, or doing a lateral transfer. The ORs within Fraser Health have, typically, had a low rate of claims related to patient handling as compared to other programs (i.e. medicine, residential care) but incidents do occur. In the 3 year period from January 2011 through December 2013 there were, for all the OR departments within Fraser Health, an average of 5 injury claims per year related to patient handling with each claim resulting in an average of 21 days lost time.[5]

PROJECT GOALS:

Providing a safe and healthy working environment for staff and patients is a priority. As such, substantial resources have been allocated by Fraser Health, over the past years, to address ergonomic issues in the healthcare environment. These resources include assessment tools, safe-work procedures, and patient handling equipment. To reduce the risk associated with patient handling, and increase injury prevention, ceiling lift installations have been carried out in various units throughout the health authority. A newly constructed acute care facility in Fraser Health opened in 2008. It was determined, during the building design planning phase, that there should be extensive ceiling lift coverage throughout the new hospital including in the operating room. This cost was incorporated into the building design and the construction budget. The ceiling lifts were designed into the new build, alongside other building infrastructure, and they were subsequently installed during the construction phase.

The goal of this extensive ceiling lift coverage was to be pro-active about injury prevention in contrast to the usual retro-fit installations that take place after injuries have been reported. It should be noted that installing ceiling lifts, on an active unit, rather than in a newly constructed unit, is more costly (due to increased infection control precautions) and a retro-fit can also be very disruptive in terms of noise, vibration, and patient displacement on the unit and in neighbouring units. It has been noted in the literature,[6] and observed by this study group, that providing equipment is also not necessarily enough to generate equipment use. Other essential elements such as policy, assessment protocols, procedures, processes, and training and education will impact the adoption and usage of patient handling equipment as well as staff perceptions of the equipment. It has been demonstrated that staff perceptions of the equipment will strongly influence the rates of implementation and adoption[6] so the goal, with this project, was to capture and analyse those perceptions, by way of a staff survey. The survey was implemented both to measure the success of the project itself, identify barriers that needed to be addressed in order to ensure OR staff were effectively using the ceiling lifts, and, ultimately, see a reduction in patient handling injuries to OR staff.

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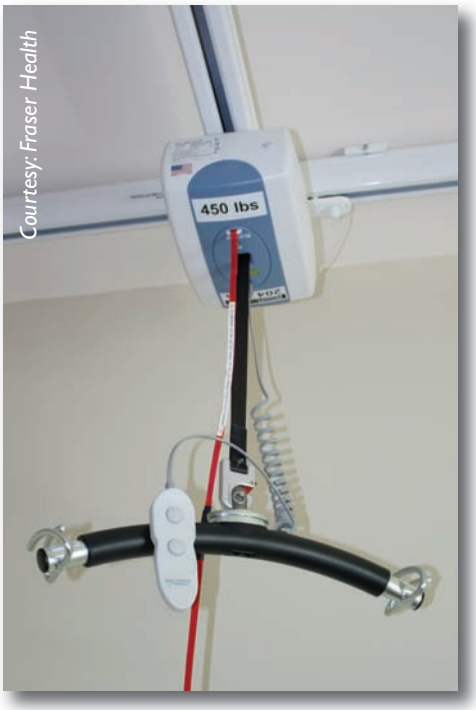

Ceiling lift motor and carry bar.

Survey questions were developed based on an extensive search related to recognized high-risk patient handling tasks as identified in the literature[2],15-17 and were aimed at capturing the use of the ceiling lifts in the OR for these specific tasks. The survey consisted of 10 open-ended and fixed questions, designed to measure prior use and confidence related to ceiling lifts and specific OR tasks involving the ceiling lift. Participants were also asked to indicate their views on the practicality and usefulness of ceiling lifts in the OR as well as their feelings regarding the number of OR theatres in which ceiling lifts had been installed. Response categories included yes/no options and reported percentages. The response from each question was reported separately.

EVIDENCE REVIEW:

There is a high rate of musculo-skeletal injuries (MSIs) within the healthcare industry, as compared to other industries, in British Columbia. The healthcare industry had 4,890 over-exertion claims in 2012 as compared to the manufacturing industry (2,750), the construction industry (2,580) and the transportation and warehousing industry (1,770),[3] The majority of MSIs experienced by healthcare workers occur in patient care environments while performing patient handling tasks such as transferring or repositioning. The OR poses unique injury risks related to patient handling and as the average size and weight of patients is on the increase there is a need for assistive devices to aid in patient handling in the OR.[7]

Literature regarding high-risk tasks in the OR has identified the moving, repositioning, and transferring of patients as well as holding patients' extremities, without assistance, as some of the main ergonomic stressors for staff in the OR.[8-13] King[8] and Waters et al[9,11] suggest the use of assistive devices to carry out these tasks but do not specifically go into any detail on how an engineering control, such as a ceiling lift, can be used to minimize the risk of injury. The Fraser Health project successfully identified that these high-risk patient handling tasks could be carried out with the use of a ceiling lift in the OR.

Holding patients' extremities has been identified as an ergonomic stressor in the OR.[7,10-12] Bartlett et al[7] note the potential for injury to staff, due to the awkward body positioning that must occur in order to perform this task, and they outline a limb suspension technique using a bandage roll and a chain, suspended from a ceiling hook, in order to lift and hold a limb during surgical preparation. This common OR task (of lifting and holding a patient's limb during surgical preparation) is a prime example of a task that can be done, using a ceiling lift with an appropriate sling, in a way that would be more comfortable and safer for the patient as well as the OR staff.

No studies were found in the literature that specifically addressed the use of ceiling lifts in the OR. The AORN Guidance Statement on Safe Patient Handling and Movement in the Perioperative Setting[2] indicated a need for more research on mechanical lifting devices in the OR. The authors believe that the project discussed in this article has addressed some of the important missing evidence in the literature and will be useful information to many in the field.

METHODS:

Purposive sampling was used to gather data from any OR staff at the new hospital who agreed to participate. Criteria were that they worked in the new OR at the new hospital. Two members of the Ergonomics team administered the survey to the majority of the OR staff at a monthly staff meeting. Extra surveys were left with the department's Patient Care Coordinator for any staff who wanted to participate but had not been in attendance at this meeting. This project was deemed to be an internal evaluation and, as per Fraser Health Research Ethics Board guidelines, Ethics Board approval was not necessary. Staff participation was

No studies were found in the literature that specifically addressed the use of ceiling lifts in the OR.

voluntary and all answers remained anonymous. Staff were also informed that they were not required to answer any questions they did not feel comfortable answering.

ANALYSIS:

Survey responses were coded and then entered into a Microsoft Excel spreadsheet. The data were reviewed for quality and survey questions left unanswered, or indicated as not applicable, were not included in the final analysis. The survey response rate was calculated as the ratio of completed surveys to the number of regular staff on the unit. In total 29 surveys were collected from the unit (from a total of 34 Full Time/Part Time regular staff) resulting in an 85% response rate. Analysis of individual survey questions included summary descriptive statistics of frequency counts and proportions. Analysis of qualitative responses involved thematic analysis where respondent statements were read to identify categories and contextual themes.

IMPLEMENTATION:

Three logistical barriers to the use of ceiling lifts were identified from the results of the survey:

1. availability of ceiling lift slings (supply and laundry turn-around time);
2. the emergency (red) pull cord on the ceiling lift motor was too long and was therefore being inadvertently engaged (which causes the lift to stop operation); and
3. the location of docking station for the ceiling lift motor was in an awkward place.

Two of these barriers to using the ceiling lift were addressed by the unit in a timely manner. Sling inventory was increased which helped to address the lag in laundry turn-around time and the emergency pull cord was shortened.

The docking station of the ceiling lift motor was not relocated as it was determined, upon further investigation, that the problem was not the docking station location itself but, rather, the fact that once it was docked staff were not raising the sling bar and therefore it was hanging down and getting in the way. Education was provided to increase staff awareness regarding raising the sling bar so it would not be in the way. It was considered critical to address these types of issues quickly in order to prevent negative feelings and perceptions about the equipment.

This study allowed for the actual staff experiences, once they used the ceiling lift for patient handling tasks, to be the facilitator for change. The ease, quickness, and convenience of use of the ceiling lift, as well as the safety aspect for staff and the patients, all reinforced a change in practice and increased use of this new patient handling equipment for the OR.

RESULTS:

The survey incorporated a total of ten questions and all ten were included in the analysis. Results of the questions included for descriptive statistics, of frequency counts, are shown in Table 1.

Table 1. Descriptive Statistics of Frequency Counts

Survey Question	n=29	Percent Response of Respondents
Used the ceiling lift in the OR	29	100%
Confident using the ceiling lift in the OR	29	100%
Indicate if you have used the ceiling lift for lateral transfers (i.e. stretcher to OR table)	23	79%
Indicate if you have used the ceiling lift for repositioning patients on OR table	11	38%
Indicate if you have used the ceiling lift for holding and lifting limbs	3	10%*
If indicated ceiling lift use for the above tasks, what is your perception of the percent (%) of time you use the ceiling lift for Lateral transfers? Repositioning? Lifting and holding limbs?	 69% of the time 31% of the time 70% of the time	
Ceiling lift is a practical and useful safety control for the OR	29	100%
Recommend ceiling lifts for use in all OR environments	28**	100%

* response reflective of clinical practice that limits use of the ceiling lift in the sterile field
** one participant left this answer blank and that response was not included in the analysis

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The qualitative data, collected during this study, shows that the perception of the OR staff is that they believe high-risk tasks can be carried out in a safer manner when the ceiling lifts are used.

Thematic analysis of the qualitative questions is shown in Table 2.

DISCUSSION:

Results showed that the OR staff were very familiar and confident with using the ceiling lifts. It was positive to see that the staff indicated usage of the ceiling lifts both prior to surgery and post-surgery, for two of the main high-risk patient handling tasks (lateral transfers and repositioning). Lateral transferring appeared to be the task with the highest use of the ceiling lifts in the OR and this is an encouraging result. Staff reports regarding using the ceiling lift for repositioning the patient on the OR table, prior to and post-surgery, was also a positive result as repositioning continues to be a task that results in high rates of MSIs for healthcare staff.

Although the literature suggests a benefit to the use of ceiling lifts for lifting and holding limbs[7] general infection control and clinical practice can prevent the use of ceiling lifts in the sterile field of the OR based on the view that the open mechanism (rails, motor) of the ceiling lift equipment can harbour dust particles and contaminants and, as such, there is a potential for those dust particles and contaminants to become dislodged during movement of the ceiling lift and to drop in to an open wound. The option of using a band sling, with the ceiling lift, in order to lift or hold a limb during surgery, as opposed to a staff member having to physically do this task, is not, as a result, allowed. Limb lifting and holding using the ceiling lift is only allowed pre- and post- surgery and, as a result, the survey results showed a very low response related to this task.

The perception of respondents, that ceiling lifts are safer and convenient for both the patients and themselves, as well as that they help prevent injuries, are very encouraging results. The members of this study group believe, as Ergonomists', that this is the case. This has been shown through our personal positive experiences in various healthcare settings but there are often practical, or perceived, barriers to successful implementation for the front-line users of this type of ergonomic engineering control. The qualitative data, collected during this study, shows that the perception of the OR staff is that they believe high-risk tasks can be carried out in a safer manner when the ceiling lifts are used. This is a very positive result.

Table 2. Thematic Analysis of Qualitative Survey Questions

Question	Overall Themes
What makes the ceiling lift a practical and useful safety control?	3 main themes: o Safer & more comfortable for the patient o Safer for staff o Prevents injuries to OR staff
What is 1 thing you like about the ceiling lift?	4 main themes o Prevents injuries (specifically back injuries) to OR staff o Convenient & safer for patients o Convenient & safer for OR staff o Fast and easy to use
What is 1 thing you don't like about the ceiling lift?	3 main themes: o Slings (supply & laundry time) o Emergency (red) pull cord is too long o Location of docking (charging) station

The OR is not an area of Fraser Health that generally sees high rates of injury claims due to patient handling but data, as reported above, shows an average of 5 claims per year from January 2011 through to December 20135 among all the OR departments in Fraser Health. This OR with ceiling lifts has, in contrast, averaged less than one claim per year in the same three year period. There were a total of two claims during the first year (2011) and there were no claims in 2012 or 2013.[5] The authors believe this speaks to the safety benefit of having ceiling lifts in the OR and that the results of the survey data complement the injury data to illustrate that, once staff incorporate ceiling lifts into their safe client handling practice in the OR, the benefit to staff is evident.

The perceptions of survey respondents, that the ceiling lift is a practical and useful safety control for the OR environment and that they would recommend ceiling lifts for use in all OR environments, is an extremely positive result and speaks to a change in practice that has optimized in this OR. The breadth of the ergonomic effectiveness and safety value of having ceiling lifts throughout the facility, including in this OR, also goes beyond this department. When the ceiling lifts are used in this OR the ceiling lift sling remains under the patient when they leave the OR unit thereby improving safe patient handling on other units, that have ceiling lifts, as the patient moves throughout the hospital. This is a positive benefit for all staff within the system and for the patients themselves.

The authors feel it is important to note that, although the survey tool created for this project contained identified high-risk OR patient handling tasks as addressed in the literature,[2,15-17] the survey tool itself was not tested and we acknowledge that the results from its use may not be reproduced in other settings. This is, therefore, a limitation of the project.

CONCLUSIONS:

The survey results, overall, showed that staff feel the ceiling lifts are a practical and effective ergonomic engineering control in the OR environment. Staff reported that they like the ceiling lifts and are finding them very useful in carrying out OR patient handling tasks including, more specifically, lateral transfers and repositioning. These are both high-risk patient handling tasks, carried out in the OR, during which the use of the ceiling lift can reduce the potential for staff and patient injury. These project findings provided evidence to support the value and effectiveness of ceiling lifts in the OR and, as such, in the design planning phase of a new out-patient surgery facility in Surrey, B.C. that has since been completed (opened in June 2011). Ceiling lifts were installed in each OR theatre during the construction phase of the new Surrey, BC, build, with the cost incorporated in to the construction and design budget of the new build. Further evaluation of the ceiling lifts in these ORs will be forthcoming.

The survey results, overall, showed that staff feel the ceiling lifts are a practical and effective ergonomic engineering control in the OR environment.

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ORNAC Standards pertaining to this article can be found in the Operating Room Nurses Association of Canada *(ORNAC) (May 2013) Standards, Guidelines, and Position Statements for Perioperative Registered Nursing Practice* (11th Edition) section 4, pgs 238 and 242-245, Standards 4.15 and 4.18.