RESEARCH REPORT

Evaluation of Ceiling Track and Lift Systems

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EVALUATION OF CEILING TRACK AND LIFT SYSTEMS

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Prepared for CMHC

by

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GLOSSARY

Ceiling track and lift systems	Mechanical devices designed to assist in the movement of people with disabilities, who would otherwise have to be lifted and moved from one position to another by people. Typically a track is attached to the ceiling in the room(s) in which the lifting and movement is to be performed, and a hoisting device and sling is attached to the track. Portable systems are also available, and may be quite simple or complex, allowing movement through several rooms or levels of a building. For purposes of this report, the acronym CTLS is used to describe generic systems, with additional words to define a specific style. Depending on the context, the acronym may be singular or plural.
No-lift policies	Policies adopted by health care administrations or community health worker organizations prohibiting lifting of people without mechanical assistance of a ceiling lift—that is, no manual lifting is allowed by professional caregivers.
Non-mechanical moving aids	A device to transfer a person manually, such as a transfer board, slide sheet or belt that does not provide mechanical lifting assistance.
Reacher bar	Devices used to extend the reach of caregivers when attaching the main webbing of a portable ceiling lift to the central suspension point of a ceiling track. Typically comprised of a simple 61–91 cm (24–36 in.) bar with an open-loop hook.
Through-floor lifts	Lift devices typically comprised of small platforms to lift people in wheelchairs from one level of a house to another. Unlike elevators, they are smaller and not enclosed.
Transfer	Moving people manually or mechanically. For people with disabilities who use ceiling lifts, this is usually moving from wheelchair to bed, wheelchair to bath and so on.

EXECUTIVE SUMMARY

This study researched difficulties experienced by people who have CTLS installed in their homes and best solutions to those difficulties.

CTLS make it easier to move an individual safely from one room to another. In particular, as children get older parents have increasing difficulty carrying and moving their children. Caretakers of adults with severe physical disabilities also have the same difficulties. Using a CTLS eases many of the problems parents and caretakers face. While a CTLS is useful and practical, there are a number of existing and potential problems about the safety, user satisfaction and other aspects of a system.

RÉSUMÉ

Cette étude visait à relever les difficultés éprouvées par les personnes dont la maison comporte un lève-personne fixé au plafond et à trouver les meilleures solutions pour résoudre ces difficultés.

Le lève-personne fixé au plafond facilite le déplacement d'une personne en toute sécurité d'une pièce à une autre. L'appareil s'avère particulièrement utile lorsque les enfants vieillissent et que les parents ont de la difficulté à les transporter. Les aidants d'adultes ayant des déficiences physiques lourdes font également face aux mêmes difficultés. Un lève-personne fixé au plafond vient en aide aux parents et aux aidants. Bien qu'un lève-personne de ce type soit utile et pratique, il peut entraîner un certain nombre de problèmes liés à la sécurité, à la satisfaction de l'usager et à d'autres aspects du système.

Study Objectives

The research objectives were to:

- Assess the range of CTLS available in Canada, including their common features, installation and possible building code issues;
- Provide insight into psychological issues about CTLS in homes;
- Identify existing difficulties and best solutions for preparing a home for a CTLS; and
- Provide recommendations to help overcome the difficulties faced by people who need, or who have installed, CTLS.

Methodology

There were four phases to the research:

1. A review and comparison of CTLS currently available in Canada.
2. A review of peer-reviewed research literature about user perceptions of CTLS in the home.

3. Interviews with installers and users of CTLS.
4. Analysis and recommendations about renovations and other options for obtaining and installing a CTLS in homes.

The researchers conducted 13 interviews, with a combination of semi-structured and open-ended questions, between April and August 2005. The interviewees were users of CTLS and either their primary caregivers or the occupational therapist who suggested the system. Interviewees lived in 10 different communities in B.C. and Saskatchewan. Their age range was 13 to 92 years old and they had used CTLS from two months to seven years. There was a wide range of circumstances that made CTLS necessary.

The researchers photographed and collected observational data about the type of housing, installation and features of the systems.

Literature Review

A review of current, peer-reviewed publications related to CTLS found that client perceptions are not well documented.

A number of publications described factors relating to the perception of lift devices held by occupational therapists; the experiences of users who installed through-floor lifts; maternal caregivers; and, people using moving aids.

The researchers generalized these factors to develop a set of interview questions in three main conceptual dimensions: material, spatial and psychological–physiological.

Findings

How are CTLS used?

Twelve of the 13 people interviewed use a CTLS for lifting in and out of bed and from bed or wheelchair to a commode or toilet. CTLS were most commonly installed in bedrooms and bathrooms.

Use of CTLS included moves from:

- bed to wheelchair,
- bed to commode,
- wheelchair to bath,
- wheelchair to toilet,
- wheelchair or bed to floor for exercise,
- wheelchair to sofa or chair,
- wheelchair to scooter,
- repositioning in bed,

- lifting between different floors,
- wheelchair to dining area.

Caregivers are the primary operators of CTLS. However, in some cases the person with the disability uses a remote control for repositioning in bed.

Has installation of a CTLS helped?

CTLS can have significant positive benefits for parents and caregivers, including:

- lifting with less physical strain,
- allowing partners or children to live at home,
- enabling family members to contribute more to caregiving,
- allowing the familial caregiver to leave the home for short periods as home-support workers can provide assistance in no-lift areas.

None of the people interviewed had been injured from operating a CTLS or from the system.

Nine family or live-in caregivers said that the CTLS did not take away from available living space.

The people interviewed said they needed from one to two months to feel safe with the lift operation and become used to new routines.

What are the negative effects of CTLS?

Parents and caregivers noted two main negative effects of CTLS:

1. Lengthening the time for daily routines, such as toileting or bathing
2. Complicating daily routines as a result of having to fit the person being moved with a sling and using the CTLS.

While most of those interviewed were generally satisfied with the basic up-and-down motion of the CTLS, they did have a number of problems.

A number noted that there was little or no attempt to integrate the device with the look of the home; it was described as "patched on" without regard to home esthetics.

All interviewees noted that there was at least one problem with their slings. Problems include mild to moderate discomfort, poor head support and toileting problems.

Several believed that using a sling other than the manufacturer's would void their warranties.

Five caregivers said they still transfer manually, even though they have CTLS. The main reasons given for continuing with manual transfers were:

- Time for toileting (two said that a lift transfer often takes too long or, depending on the fit of the sling, can compress a person with a disability in a way that makes toileting difficult);

- It is often the only option when travelling; and
- One parent is still physically able to lift manually.

Preparing a home for installation and renovation requirements

Only two of the people interviewed said their houses needed renovations for installation of a CTLS. Eleven said that nothing had to be done; four said that they had to move furniture.

One interviewee had to heighten and add support to doorways for the CTLS. (*see* figure 1). The primary caregiver said the renovations were not difficult and he did them himself.

Another interviewee's home required moderate renovations to a bathroom, including moving doors, installing specialized hinges (figure 2) and adding a split shower rail (figure 3). Of more concern to the primary caregiver was being unable to provide a complete track from the toilet to the bathtub because of an old door jamb (figure 4). The primary caregiver could not install the track because he could not get funding for the renovation, in part because the house was rented.

None of the people interviewed had to do major renovations to their homes. Installing a CTLS has a low impact on house structure.

Figure 1—Doorway header renovation

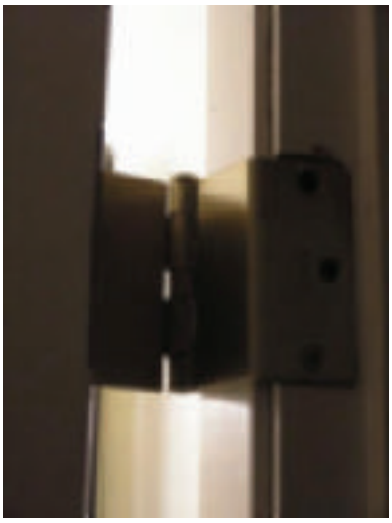

Figure 2—Bathroom door renovation

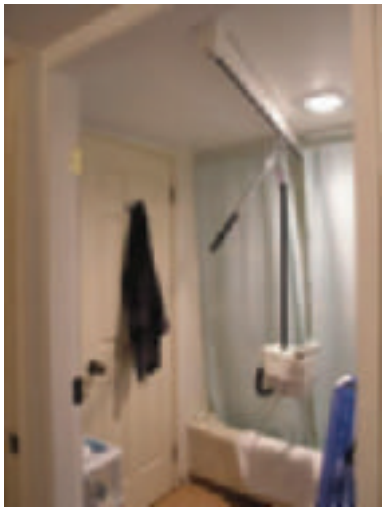

Figure 3—Shower rail renovation

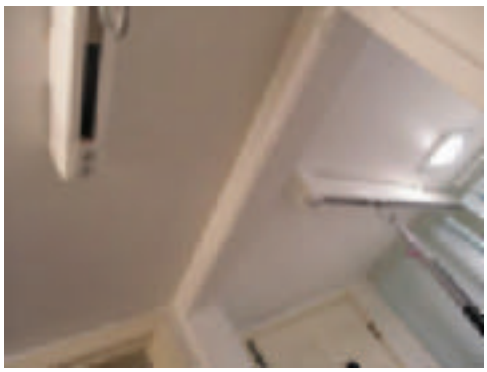

Figure 4—Incomplete bathroom track

Three of the people interviewed who rent their homes had limited renovation options. They were on fixed incomes and believed there was no funding available to help them with renovation costs, or they had difficulty persuading their property managers to allow renovations.

Professional installation and building code issues

The most common renovation was reinforcement of joists with steel plate to ensure that the user's weight is distributed over a number of joists. Installers note that there is a trend in newer homes to smaller joist sizes (some 2×4 or 2×6) and "silent flooring," which requires reinforcement with a steel bar attached across all joists that will be connected to the ceiling track. For the installation crew, older homes are actually easier for installation because of their significantly larger joist sizes.

Other typical renovations included removing light fixtures, cutting through door headers if track is continuous from room to room, rods or brace extensions for vaulted ceilings and removal of drywall for joist connections.

The installation crew was not aware of any building code issues. The crew relied on manufacturer's installation guidelines, which they believe are in accordance with all Canadian building codes.

The installation crew was, however, aware of specific guidelines set by the Workers' Compensation Board of BC for installation of CTLS. The crew also relied on its judgment of the construction of a particular home.

Design Recommendations

Following are recommendations for further research for building-related issues and sling design

Esthetics

Interviewees indicated that the esthetics of the track system is a key factor in not expanding the system outside of the bedroom and bathroom to other more public areas of the home or that they did not like how the existing system looked.

While track systems are typically relatively simple to install, they are not designed to integrate into the esthetics of a home. Areas for further research could explore options such as placing track above ceiling drywall or other ways to create a better esthetic fit.

Placement of power supplies and support poles was described as being undesirable and interfered with placement of furniture.

Slings and related devices

All interviewees indicated at least one problem with the slings provided with their lift systems.

Issues related to discomfort included poor head support, muscle spasms or difficulties during toileting. Interference with clothing, such as bunching or pressure from seams, were also given

as difficulties. Two female interviewees noted that slings had not been designed to accommodate female physiology, particularly in regard to toileting.

Further research opportunities and innovations exist for providing slings that do not create discomfort. The lift-hoist-and-track may work well, but without a reasonably comfortable sling there will continue to be user issues.

Slings are included here along with track design recommendations to encourage viewing sling-and-track systems as single systems. A change in track design may affect slings, hoists and other related elements of the system, or vice versa.

User Recommendations

Table 1 outlines what users would like to see in CTLS and ways to meet those requirements.

Requirements	Solutions
Ceiling track must not protrude from attachment surface	Flush-mount ceiling track that does not have any protrusions from ceiling surface
Power supply and power cords must be integrated and not visible	Above-ceiling installation of power supplies
Power supply and power cords must be integrated with the lift system and not visible	In-track installation of power cords
Supports or reinforcements must not interfere with furniture placement	Supports or reinforcements- flush mounted with walls
Ceiling track extensions for dropped or vaulted ceilings should be integrated with the home where possible	Ceiling track extensions flush-mounted with walls Where ceiling track extensions are required, flush-mount with walls and use steel cord or other low-visibility options

Table 1—Design Criteria for CTLS

Recommendations, Suggestions for Further Research

The research study shows that benefits from a CTLS in the home include a high level of satisfaction with the basic function of the system; safety; few renovation requirements; general satisfaction with suppliers and installation personnel; and, positive effects on family and caregivers —in particular, the freedom for primary caregivers as a result of the expanded options for home-care support.

People interviewed raised a number of other issues about related effects of installing a CTLS The following are recommendations and suggestions for further research in these areas.

Knowledge of Device and Funding Options

Twelve of those interviewed did not know about the range of lift devices available or where they could look for options, such as new slings or extra tracking. A guidance document or website would describe available options and funding possibilities. Occupational therapists, on whom users rely for information about CTLS, could promote the information resources.

Options for Renters

Landlords resist renovations for CTLS, according to interviewees who rent. There are funding options for both homeowners and for landlords for renovations; however, if renovations are unusually difficult, other options are required. Alternatives, such as funding fully portable ceiling-lift systems that do not require renovations, should be explored as a feasible option for renters.

Issues for Clients to Consider

Those interviewed raised a number of items for new and current users of CTLS:

- Obtaining secondary financing—for example, for additional track pieces —was at least as difficult as or more difficult than obtaining funding for the initial installation. Clients and occupational therapists should anticipate how many rooms require ceiling track for the first installation (for example, bedroom, bathroom and living room; not just one room.) After several month of living with a CTLS, a user may want more ceiling track, but it can be difficult to get funding to expand the system.
- Users should make sure that they know what is safe installation and operation of a CTLS, particularly if they have more than one support workers or when reacher bars are used.
- Occupational therapist organizations should know about the variety of slings available for functions such as bathing or toileting. Some manufacturers will guarantee their products only if their slings are used. Users should be aware of each manufacturer's options for slings and the company's warranty policies before purchasing a CTLS.
- There are many funding sources for the cost of obtaining a CTLS.

Users should be aware of resources such as CMHC financial assistance programs

www.cmhc.ca/en/co/prfinas/index.cfm[1]

and the online Government of Canada Services for People with Disabilities

www.pwd-online.ca/pwdcontent.jsp?&lang=en&contentid=28[2]

EnableLink, at

www.enablelink.org/index.html[3]

also lists financial and information resources.

Occupational therapist and home support organizations can also be very helpful in locating funding sources, particularly from service and not-for-profit groups.

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[1] Retrieved June, 2006, English and French

[2] Retrieved June, 2006, English and French

[3] Retrieved June, 2006, English

CTLS available in Canada

Models	Location	Information available
Noram Solutions Inc		
Noram fixed ready track Noram por ready track	5510 Mainway Drive Burlington, Ontario L7L 6C4 U.S. head office P.O. Box 543 Lewiston, New York 14092-0543 http://www.norampatientcare.com/lifting.html	Product specifications; installation instructions not available
BHM Medical Inc.		
Voyager Portable fixed Voyager series 420 fixed Voyager series 550 fixed Voyager series 800 Easytrack	2001, Tanguay Street Magog, Quebec J1X 5A8 http://www.bhmmedical.com/tracklifts.html	Product literature; installation examples
Gaper Products Ltd.		
Universal Patient Lift System – portable Universal Patient Lift System – fixed model	18-4060 Ridgeway Dr. Mississauga, Ontario L5L 5X9 http://www.gaperproducts.com/	Product information and specifications
Waverley Glen Systems Inc.		
Fixed Transactive system Transportable portable system Griffin portable system Sequoia portable system	116 Rayette Road, Unit 1, Concord, Ontario L4K 2G3 http://www.waverleyglen.com/	Product literature
Arjo Canada Inc.		
Maxi Sky system 440 Maxi Sky system 600 Maxi Sky system 1000	1575 South Gateway Road Unit C Mississauga Ontario L4W 5J1 http://www.arjo.com/int/Page.asp?PageNumber=247 Parent Company: Arjo International AG Florenzstrasse, 1D Postfach CH-4023 Basel, Switzerland	Product literature
Gestion Techno-Medic, Inc.		
Techno-lift	GESTION TECHNO-MEDIC, INC. 6900, avenue choquette St-Hyacinthe, Quebec, J2S 8L1	Product information and specifications
Chiltern Invadex Ltd		
Wispa 100 Wispa 200 Wispa 300 Wispa portable	Chiltern House 6 Wedgewood House Bichester, Oxforshire England http://www.chilterninvadex.co.uk/movingandhandling/ceiling_hoists.htm (distributed through Jacques Pilon Medical Inc, QC)	Product brochure; technical data
Mirtek Medical		
Liberté overhead lift	110 Chemin du Tremblay Boucherville, Quebec J4B 6Z6	Product brochure

Models	Location	Information available
Pinnacle fixed lift Stratus portable lift	322 Shadow Way, Longwood, FL 32779 (distribution for Canada 526 Bryne Drive Barrie, Ontario http://www.themedical.com/main.htm)	Product brochure
Guldmann Inc.		
GH2 F GH2 GH2 HD DH 1000 DH 4000 HD	5505 Johns Road Suite 700 Tampa, Florida 33634 http://www.guldmann.com/	Product brochures and datasheets
Horcher Lifting Systems (Germany) also known as Barrier Free Lifts in North America		
PC-2 portable ceiling lift C-series fixed	http://www.horcher.com/us/product_list.php?category=1	Product brochure
Hani-Move International		
HM50 HM 2000 - track-to-track	Ten Beukenboom 13 9400 Ninove België Tel 32/54 31 97 26 Fax 32/54 32 58 27 info@handimove.com http://www.handimove.com/mission_int.html Canadian dealer: Allan Nissen 905-648-7522.	Product information
MoLift Inc.		
HiTrack HiTrack+ HiTrack Trapese	http://www.molift.com/ Peter Castelli: pcastelli@mindspring.com	Product information
Liko Inc.		
Likorall 242 Likorall 242 R2R Likorall 243 Likorall Multirail Masterlift Ultratwin Freespan	Peridot Group Inc. 9-6720 71st St. Red Deer, Alberta T4P 3Y7 Phone: 800-306-5438 http://www.liko.com/na/	Product brochures and data sheets
LiftAid Transport LLC		
LiftAid 2000	LiftAid™ Transport LLC 100 Bloomfield Hills Parkway-Suite 195 Bloomfield Hills, Michigan 48304 Phone 248-203-0066 Fax 248-203-1166 – no Canadian distributor but does sell into Canada http://www.liftaid.com	Product brochure
Human Care Lifts		
Roomer Singel	Höstbruksvägen 14 226 60 Lund Sweden http://www.humancare.se/Lifts/ Looking for Canadian sales now	Technical and operator manual

Table 2—Systems and manufacturers

APPENDIX A: CEILING TRACK AND LIFT SYSTEMS

Anticipated Difficulties

Most information was in the form of product literature, and there was not a single list of all suppliers, although industry directories of varying accuracy were available. Also, most information was in the form of product literature that is not peer reviewed, which means product descriptions were inconsistent. Instructions are a mix of verbal, demonstration in the home and written.

Proposed Mitigations

Methodology for searching for CTLS was based on the Cochrane method for health care to identify bias and inclusion and exclusion criteria to ensure a consistent and transparent method of locating the information.

In order to analyze the system data, a filter for data gathering that allows objective analysis is required. A comparison chart was developed based on ISO 10535 *Hoists for the transfer of disabled people – Requirements and test methods*, which lists all of the standard elements required for a CTLS, including basic instruction requirements. This chart was used to describe the different features of the ceiling lifts in a repeatable and objective way.

Forty-six models of CTLS are marketed in at least one province. Five Canadian, six European and four U.S. manufacturers sell directly or through distributors or representatives in Canada. There is a high level of uniformity among the ceiling-lift models.

Canadians have access to dozens of CTLS with essentially the same functional design and pricing. Most variations occur in small differences in load rating, esthetics, control pad design, track shape, power source (battery or mains), hoist-to-sling attachment methods (for example, carabiner and hooks) and spreader bar shape. The conclusions from a comparison of the 46 models available in Canada were:

- The significant uniformity of CTLS available in Canada allows generalization of in-home interview findings.
- There is a wide array of custom tracking options for configuration of CTLS. Some do not require any renovations.
- There is a wide range of options for type of spreader bar (2, 4 or 6 point) and for attaching them.
- Industry leaders are adopting ISO and CE Marking[4] compliance and offer a wide range of options and adaptability.
- Manufacturer or distributor service and in-home experience with CTLS will likely be a greater factor for users and caregivers than a particular ceiling-lift model.

4 CE Marking, "CE," or X is "Conformité Européene," a manufacturer's declaration that a product complies with the essential requirements of the relevant European health, safety and environmental protection legislation.

A literature review tried to identify all CTLS available for purchase in Canada. The ceiling-lift models were compared and analyzed by identifying their key features and differences, including installation and use instructions. Any industry standards used were identified. Building code issues were investigated during the installer interviews.

Due to the nature of the industry, this literature review may not have located all models available from manufacturers' representatives who do not have an industry or Web presence in Canada. There is a possibility that there are manufacturers' representatives who are selling devices that cannot be identified in publicly available information sources. For example, a European manufacturer may have a representative who calls on hospitals or residential care homes but is not listed in a telephone directory, assistive device directory or have a Web presence at the time of the search.

An attempt was made to contact companies in the United States and Europe that could potentially be selling in Canada, and two European and one American manufacturer were selling or trying to sell in Canada but not listed in any Canadian information source.

Health Canada was also contacted for a list of companies that hold establishment licences for selling ceiling lifts; however, unlike the U.S. FDA, Canada does not keep records of the types of Class 1 devices that it provides establishment licences for, and it was not possible to obtain information on who is licensed to sell CTLS in Canada.[5] Because of the lack of Canadian data, U.S. FDA databases were searched for companies licensed to sell CTLS, given the high probability that companies selling in the U.S. may also be selling in Canada.

Forty-six models of CTLS from 16 manufactures are available in Canada. Given the wide range of information sources used to locate the products, this is believed to be a representative sample of the kinds of ceiling lifts currently available for sale in Canada.

Following is a description of the literature review methodology and results.

Inclusion and Exclusion Criteria

Inclusion criteria: device must be available for purchase in Canada, must be sold through a publicly listed manufacturer or distributor, manufacturers must have an establishment licence with Health Canada and be for residential use. Fixed and portable lift devices are included.

Exclusion criteria: devices not currently on the market and custom-made devices.

Type of Information

Installation and use instructions; device brochures; Web-based information; use and installation videos; published corporate device descriptions and literature, including operating instructions; and, peer-reviewed data.

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5 Personal communication, Patti Searl, Establishment Licensing Unit, Health Products and Food Branch Inspectorate, Health Canada, 3 March 2005. Health Canada is aware of the lack of ability to cross-reference establishment licenses with product types in Canada, and may be upgrading its databases to obtain this kind of information in the future.

Search Strategy

Health Canada Establishment Registration Database to find companies in Canada licensed to sell CTLS, Industry Canada Strategies Database of Assistive Device Manufacturers, the Canadian Assistive Device Directory, which includes both manufacturers and distributors (FSC Technical Services 2004), and an Internet search based on the inclusion criteria. The U.S. FDA device listing database was also examined.

Methods of Review

Reporting of features was compiled in a matrix based on the standard features listed for ceiling lifts, found in ISO 10535 *Hoists for the transfer of disabled people*.

Description of Manufacturers

This CTLS industry is a mature industry that has seen some recent revitalization with the current emphasis in many jurisdictions on "no-lift" policies, leading to significant sales potential in professional clinical settings, such as hospitals and care homes. Home sales will increase or decrease with demographic need or as new funding sources for home care become available. The range of product offerings found still reflects many characteristics of a mature industry, including:[6]

- marginal cost difference between products,
- few functional variations in product design,
- wide, well-established distribution,
- increasing emphasis on service over cost, and
- increasing international competition and influence.

Canadians have access to dozens of CTLS of essentially the same functional design and pricing. Most variations occur in small differences in load rating, esthetics, control pad design, track shape, battery vs. mains powered, hoist-to-sling attachment methods (e.g., carabiner vs. hooks) and spreader bar shape.

Five Canadian, six European and four U.S. manufacturers were found to be selling directly or through distributors or representatives in Canada. The search methods and results used to locate the 16 manufacturers either selling or actively trying to sell in Canada are described below.

Results

Industry Canada

The Industry Canada list of Assistive Device Companies in Canada, "Assistive Device Companies, Aids to Daily Living" database
http://strategis.ic.gc.ca/ccc/search/cccSearch.do?language=eng&portal=1&tagid=025028012&x=50&y=20
and the Industry Canada list of all Assistive Device Companies in Canada, "Assistive Device Companies," database
http://strategis.ic.gc.ca/ccc/search/cccSearch.do?language=eng&portal=1&tagid=025028&x=

6 Arthur A. Thompson, Jr. and A.J. Strickland, III. *Strategic Management*. McGraw-Hill, 2003.

66&y=43
were searched for ceiling-lift manufacturers and distributors.

The search terms "lift" and "ceiling" were searched for all of Canada. Thirty-nine matches were found. A review of all company websites listed in the "Aids to Daily Living" category showed that only one had ceiling-lift devices available for sale in this category, Noram Solutions Inc. Seven companies that distributed and/or manufactured ceiling lifts were identified from the Industry Canada Database.

It should be noted that this database was out of date and not representative of the market in Canada, probably because it is a voluntary registration service offered by Industry Canada.

Company Name	Location	Type of business	Ceiling-lift Products	Product Information Available
Noram Solutions	5510 Mainway Dr. Burlington, ON L7L 6C4; Head office in the United States, P.O. Box 543, Lewiston, NY14092-0543	Manufacturer and distributor	Noram "fixed ready track;" Noram "portable ready track"	Product specifications; installation instructions not available
Access 2000 Elevator and Lift	626 Weldon Ave. Saskatoon, SK S7M 2T9	Dealer for BHM Medical	See BHM description	
BHM Medical Inc.	2001, Tanguay St. Magog QC J1X 5A8	Manufacturer and distributor	Voyager Portable; fixed Voyager series (420, 550, 800); Easy-track	Product literature; installation examples
Gaper Products Ltd.	18-4060 Ridgeway Dr. Mississauga, ON L5L 5X9	Design and Manufacture	Universal Patient Lift System – portable and fixed model	Product information and specifications
Gold Care Medical	Now part of SHHC – see below			
Shoppers Home Health Care (SHHC)	Canada-wide	Distributor for Waverley Glen Systems Inc		

Table 3—Industry Canada Search

Canadian Assistive Devices & Technology Industry Directory[7]

The *Canadian Assistive Devices & Technology Industry Directory* was searched for ceiling-lift manufacturers and dealers, using the following search terms: "lift," "lift and transfer" and "ceiling."

Distributors of products listed already from a manufacturer are not provided, as the purpose of this review is to identify products available for sale, not determine the specific locations of every distributor. Only the manufacturer or importer company name and products are listed.

7 FSC Technical Services (2004). Canadian Assistive Devices & Technology Directory 3rd Edition, March 2004. Mississauga, Ont.

Company	Location	Type of business	Ceiling-lift Products	Information Available
BHM Medical Inc.	2001, Tanguay St. Magog, QC J1X 5A8	Manufacturer and distributor	Voyager Portable; fixed Voyager series (420, 550, 800); Easytrack	Product literature; installation examples
Waverley Glen Systems Inc.	116 Rayette Road, Unit 1, Concord, ON L4K 2G3	Manufacturer	Fixed Transactive system; portable Transportable system; Griffin portable system; Sequoia portable system	Product literature
Arjo Canada Inc.	1575 South Gateway Road, Unit C Mississauga, ON L4W 5J1	Manufacturer and distributor (parent company: Arjo International AG Florenzstrasse, 1D Postfach, CH-4023 Basel Switzerland)	Maxi Sky system 440, 600, 1000	Product literature
Gaper Products Ltd.	18-4060 Ridgeway Dr. Mississauga, ON L5L 5X9	Design and manufacture	Universal Patient Lift System – portable and fixed model	Product information and specifications
Noram Solutions	5510 Mainway Dr. Burlington, ON L7L 6C4 U.S. head office P.O. Box 543, Lewiston, NY 14092-0543	Manufacturer and distributor	Noram "fixed ready track"; Noram "portable ready track"	Product specifications; installation instructions not available
Chiltern Invadex Ltd	Chiltern House, 6 Wedgewood House, Bichester, Oxforshire, England (distributed through Jacques Pilon Medical Inc, Quebec)	Manufacturer	Wispa 100, 200 & 300 & portable series overhead lifts	Product brochure; technical data
Mirtek Medical	110 Chemin du Tremblay, Boucherville, QC J4B 6Z6	Manufacturer	Liberté overhead lift	Product brochure
T.H.E. Medical	322 Shadow Way, Longwood, FL 32779 (distribution for Canada, 526 Bryne Dr., Barrie, ON	Manufacturer and distributor	Pinnacle fixed and Stratus portable lifts	Product brochure

Table 4—*Canadian Assistive Device Directory* Search results

Web search

A general Web search was conducted to find manufacturers or distributors selling in Canada not listed in standard industry information sources. The search included industry association websites.

Company	Location	Type of business	Ceiling-lift Products	Information Available
From general web search using the terms: "ceiling" and/or "lift" and/or "Canada," "ceiling lift," "ceiling lift for handicap"; "patient transfer device," "lift devices for patients"; [Ixquick, 20-28 Feb 2005]				
Guldmann Inc.	5505 Johns Road Suite 700 Tampa, FL 33634	Manufacturer and distributor	GH2 F, GH2, GH2 HD, DH 1000, DH 4000 HD	Product brochures and datasheets
Horcher Lifting Systems/Barrier Free	(www.barrierfreelifts.com)	Manufacturer and distributor	PC-2 portable ceiling lift	Product brochure
Hani-Move International	Canadian dealer, Allan Nissen, 905-648-7522.	Manufacturer	HM50, 2000 series track-to-track	Product information
MoLift	Peter Castelli: pcastelli@mindspring.com; currently looking for a rep in Canada; sells floor lift models and looking at selling ceiling lifts	Manufacturer	HiTrack, Hi-Track+, Hi-Track Trapese	Product information
Other lifts found already noted elsewhere: Waverley Glen, BHM, Barrier Freee/Horcher, Guldmann, Gaper, Liberté/Mirtek, T.H.E. Medical, Molift				
From Industry Associations; From industry trade show information: MedTrade http://www.medtrade/com; From trade publications: Thomas Register http://www.thomasregister.com				
Liko	Peridot Group Inc., 9-6720 71st St., Red Deer, AB T4P 3Y7 Phone: 800-306-5438	Manufacturer and distributor	Likorall 242, 242 R2R, 243, multirail, masterlift, ultratwin, freespan	Product brochures and data sheets
LiftAid	LiftAid™ Transport LLC 100 Bloomfield Hills Parkway, Suite 195, Bloomfield Hills, MI 48304 Phone 248-203-0066 Fax 248-203-1166 – no Canadian distributor but does sell in Canada	Manufacturer and distributor	LiftAid 2000	Product brochure

Table 5—Web search

Health Canada Database, Statistics Canada, Industry Canada Trade Data

Companies or individuals licensed to sell ceiling lifts in Canada cannot be identified from Health Canada databases (specifically the Health Canada Database, "Companies that hold a Medical Device Establishment License," http://www.hc-sc.gc.ca/hpfb-dgpsa/inspectorate/mdel_tc_e.html). Unfortunately, Canada does not track Class 1 devices, and companies that hold an establishment licence to sell lifts are not traceable through Health Canada records at the time.

Statistics Canada and Industry Canada Trade Data Online were searched. The Statistics Canada http://www.statcan.ca/trade/scripts5/define_query_form.cgi/file.htm and Trade Data Online databases http://strategis.ic.gc.ca/sc_mrkti/tdst/engdoc/tr_homep.html are not detailed down to the level of "ceiling lift" products and yielded no information.

U.S. Food and Drug Administration (FDA) Search

Because of the lack of data available from Health Canada, Industry Canada and Statistics Canada on ceiling lifts, the U.S. FDA device listing database was queried for companies or individuals licensed to sell ceiling lifts in the U.S., given the likelihood that companies licensed to sell in the U.S. would also be selling in Canada. Table 5 lists are the companies confirmed to be selling or actively trying to sell in Canada. Fourteen of the 16 manufacturers licensed to sell in Canada were also located in the U.S. databases. The only other lift companies found selling in Canada and not listed with FDA were Chiltern-Invadex and Mirtek Medical. They are likely selling in the U.S., but under different product names or through other distributors.

Product description	Regulation number	Company	Selling or trying to sell in Canada
Lift, patient	880.5500	Nor-Am Patient Care PR	Yes
Bianca	880.5500	Arjo Med AB Ltd.	Yes
Lift, patient, AC-powered	880.5500	Gestion Techno-Medic, Inc.	Yes
Handi-move	880.5500	T.F. Herceg, Inc.	Yes-through Canadian dealer
Mulitiple	880.5500	Guldmann	Yes
Mulitiple	880.5510	Human Care	Yes
Mulitiple	880.5510	Hoyer	Yes
Mulitiple	880.5510	Arjo	Yes
Mulitiple	880.5510	Liko	Yes
Mulitiple	880.5510	Waverley Glen	Yes
Mulitiple	880.5510	BHM	Yes
Mulitiple	880.5510	T.H.E. Medical	Yes
Mulitiple	880.5510	Gaper	Yes
Mulitiple	880.5510	Lift-Aid	Yes

Table 6—U.S. FDA Search

APPENDIX B: KEY FEATURES OF CTLS

ISO 10535:1998 *Hoists for the transfer of disabled people: Requirements and test methods* is the basis for the 20 criteria for comparison listed in this Appendix. This standard provides consistent and objective terms and feature descriptions for the comparison. All terms used to identify the key features are based on the definitions found in Clause 3 of ISO 10535:1998.

Features for comparison are based on the requirements in the standard that can be examined by literature review—that is, stated conformance to a safety standard or a load rating. Features requiring physical observation are not included (for example, no sharp edges or actual handle sizing). Physical review of all lift devices is outside the scope of this study. Clause 5, "Mobile Hoists," applies to mobile, floor-based hoists, not CTLS and is not used for comparison.

The researchers added the heading terms "client interface," "function," "performance" and "housing interface" to the features for comparison to differentiate features associated with clients and users and parts of lifts that interface with the home from features that affect the function and performance measures.

After the in-home interviews, problems identified with the lift can be related to the type of feature—for example, most problems identified by lift users may be in one area, such as patient interface, and there are few problems with the function or performance of lifts. The features listed under "Housing Interface" are not part of the ISO standard. The researchers assessed the features to address potential renovation issues raised by users of CTLS.

Comparing CTLS available in Canada revealed a number of trends.

Manufacturers are producing a wide range of bariatric[8] products. Their installation requires more renovation than smaller lift devices. There are companies marketing portable bariatric systems that do not require renovations, but they take up a lot of floor space.

Industry leaders in North America show the influence of European designs, adding room-to-room transfer capability and more esthetics treatments. It is not clear if design elements such as smaller size, esthetics, room-to-room mobility and minimal impact on installation are the result of users demanding the features or the increased presence of European CTLS manufacturers in Canada.

There is an effective, common, minimum baseline of functions. Every CTLS claims:

- hand-held operation,
- clearly marked, simple controls,
- easily identifiable body support attachment (although not all prevent accidental release),
- one-person operation
- safety interlock for moving from one section of track to another,

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8 The branch of medicine dealing with the causes, prevention and treatment of obesity.

- wide range of slings, including custom options,
- emergency lowering capability,
- simple H-track installation options,
- minimum lift capacity of 120 kg (265 lb.)

Even though ISO compliance is voluntary, nearly half the CTLS analyzed meet all requirements of ISO 10535:1998 *Hoists for the transfer of disabled people: Requirements and test methods.* Most also meet CSA/UL electrical safety requirements The researchers believe that more companies follow most, if not all, CSA and ISO requirements but don't make their adherence to the standards prominent in their company literature.

The greatest variation between the lift devices was:

- the split between ISO compliance and non-compliance,
- the range of options for spreader bar attachment —carabiners, quick-release catches, bolted configurations to two-, four- and six-point spreader bars,
- esthetic attributes —few models vary from the "white box" look,
- instruction information available online, and
- lifting capacity.

The CTLS industry has a number of elements of a mature industry, particularly in uniformity of models. There is a wide variety of companies selling essentially the same product. With the high level of product similarity, local service (including installation) is probably more important than a particular lift.

In relation to the requirements regarding the central suspension point, potential users of CTLS should be aware of the safe use of open-loop reacher bars. Reacher bars are intended to make attachment of portable ceiling lifts to track-gantry attachments easier for caregivers. Reacher bars extend the reach of lift installers when attaching the hoist to the central suspension point on the gantry. There are potential combinations of improper use, lifting and twisting combinations that can cause the accidental release of the central suspension point and cause a client to fall. When using a reacher bar, clients and caregivers should ensure that the reacher bar is attached properly to the central suspension point according to the manufacturer's guidelines.

All manufacturers recommend custom installation and advice over a "standard" tracking design, other than for portable track systems. Given the difference in home layouts, this is one of the only major variable aspects of CTLS.

Most portable models are modified versions of fixed lifts. "Portable" can mean one of two things: either the lift device itself can be removed from the track or both the track and lift can be moved.

Industry leaders are providing modular systems with a wide range of options for spreader bars, slings, weight requirements and accommodation for rail options, with some lifts even offering "automatic docking" when the lift is not in use.

Available instructional literature available follows the "ISO split." Companies that are ISO-compliant also had all of the instruction elements required by ISO available in their product documentation (manufacture contact information; full operating, installation and assembly; intended use; service contacts; cleaning and maintenance; technical specifications). Companies that did not have ISO or CE Marking compliance did not necessarily have all this information available online.

This simply means that companies with ISO or CE Marking compliance had the information easily available for comparison.

Installation of a CTLS includes instructions for both clients and caregivers in using the system.. Given the potentially high degree of difference in client situations, this phase of instruction is critical and likely much more meaningful for caregivers than the written instruction set, particularly when the instructions were not available in the caregiver's primary language. The kind of instruction and client–caregiver understanding of how to use the devices is discussed further in the interview results.

Eight models of portable or free-standing CTLS provide full-room coverage without the need for renovations.

Table 7—Ceiling Lift Comparison Summary

No.	Feature	# (n) reporting (total lift models n=46)	summary data	baseline/mean	Max	Min	Other
			Client Interface Features				
1	Ergonomic design (e.g. meets EN614)	27	EN/ISO 10535, n=22; CE Mark, n=3; claim of ergonomic design, n=2	ISO 10535 certification (59%)	EN/ISO 10535	no compliance	2 not quantified claims of "quiet"
2	Sound level (i.e. <65dB)	27	EN/ISO 10535, n=22; CE Mark, n=3; claim of "whisper quiet", n=2	ISO 10535 certification (59%)	EN/ISO 10535	no compliance	
3	CE, CSA or UL electrical safety standard compliance	33	CSA/UL, n=25 CE, n =8	CSA/UL or CE Mark (72%)	CSA/UL/CE	no compliance	
4	Easily accessible and operable controls	46	hand-held	100% hand-held control	---	---	all lifts have hand held "pendant style" controls
5	controls clearly marked	46	clearly marked membrane or button controls	100% hand-held control and features on lift clearly identified	---	---	all lifts have clearly marked controls
6	Instructions include: manufacture contact info.; full operating, installation and assembly; intended use; service contacts; cleaning and maintenance; technical specs.	25	ISO 10535 or CE Mark	ISO/CE Mark compliant instructions (54%)	full instruction set as per ISO 10535	single page/verbal instruction	clear split between manufacturers who have ISO/CE Mark and those that did not; compliant companies have comparable full instructions sets available, others have
7	method of body support attachment clearly identified	46	carabineer, n=18 fixed to gantry, n=3	100%	full positive lock	possibility of accidental release	
			d-ring, n=2 pinned/positive lock, n=2 bolted slot, n=8 non-locking or quick release catch, n=10 integrated with body of lift, n=3				
No.	Feature	# (n) reporting (total lift models n=46)	summary data	baseline/mean	Max	Min	Other
			Functional Features				
8	connection points cannot become advertently detached	46	all models have safe connections if used properly, however 7 models offer the use of attachments that could become inadvertently detached*	carabineers & other quick release catch (61%)	full positive lock	possibility of accidental release	* 7 models are offering "reacher" bars - these items are typically used for easier attachment of portable lifts, however they pose a potential fall hazard
9	need for repositioning optimized	46	all models are considered to have equal potential here, given that 45 models offer a range of sling types				
10	operable by one person	46	all models operable by one person	100%			
11	prevented from moving from one rail to another with safety interlock	46	all models have safety interlock for movement from room to room, if applicable	100%			
12	spreader bar configuration	46	45 models offered a wide range of slings, including custom options	full range of support, positioning, hygiene and custom slings (98%)	---	---	

13	emergency lowering capability	46	all models have emergency lowering capability	100%	---	---			
No.	**Feature**	**# (n) reporting (total lift models n=46)**	**summary data**	**baseline/mean**	**Max**	**Min**	**Other**		
				Performance Features					
14	capable of lifting min. 120 Kg	46	all capable of lifting at least 120 kg	median = 440lb; average =507lb	1000	286			
15	operating forces <5N by finger, <105N by hand	22	only those models compliant to ISO 10535	22/46 (48%)	unknown	<5N; <105N	other models likely meet this, however operating forces not reported and ISO compliance not met		
16	lowering speed not to exceed 15cm/s; raising 25cm/s; horizontal 15cm/s	24	only 10 of 22 ISO compliant reported data	24/46 (52%)	37/s lifting	5cm/s lower			
				Housing Interface					
17	renovation required	46	10 models required no renovation; 1 model offered both free standing and ceiling options; remaining models required ceiling renovation	35 require ceiling renovation (75%)	custom installation and renovations required	no renovations			
18	tracking interface	46	44 models some form of "H" style gantry	"H" style gantry (96%)	---	---	---		
19	size and weight of system	18	most manufacturers did not report weight or size	average 20lbs; median 16lbs.	64 lbs	6.5 lbs	low size and weight reporting probably due to permanent installation of lifts, and custom installation required		
20	mobility afforded by system	46	range of coverage varies between full room and spot portable coverage	full single room coverage (82%)	multi-room "Tarzan" or multi-room track	spot coverage (e.g. over bed or bath)			

APPENDIX C: QUESTIONNAIRE AND INTERVIEW DESIGN

The researchers developed 50 interview questions and referenced them to each factor associated with the transfer of people, as shown in Table 8.

Material	Spatial	Perceptual —Psychological and Physiological
Noise associated with transfer;* mechanical noise¶	Space constraints to accommodate equipment;§ loss of living space;¶ fitting the lift in the home;¶ poor fit with housing structure¶	Pain associated with transfer equipment;‡ Level of comfort during use§ , ††
Smoothness of transfer*	Manoeuvrability of transfer equipment;§ portability*	Transfer time;* Duration of mechanical assistance (for both client and caregiver);§ time constraints to perform transfer; ** duration of transfer; ** frequency of transfers**
Ceiling-lift esthetics (shape and colour);* appearance§	Placement of the equipment¶	Perceived safety of equipment§
Range of ceiling-lift options (e.g., slings and track options)†	Pre-installation preparation¶	Feelings about being moved with mechanical assistance§
Quality of installation of equipment¶	Problems with house-lift interface (e.g., structure unable to safely support device)¶	Perceived level of effort to use equipment; § Mechanical function – ease of use*
Mechanical failure¶	Loss of functional space for others in the home¶; number of other people in the home who require caregiver attention**	Suitability of transfer equipment for the required task§
Poor service from manufacturer/installer¶	Ability to position equipment under client††	Restoration of self-care¶
Equipment cost*, **		Effect on family members¶
Physical dimensions of equipment 5,**		Fitting the lift into the daily routine¶
Ease of cleaning and storing equipment ††		Effect on relationship with key professionals¶ Change in perception of device after installation (e.g., change in confidence with learning curve)¶ Caregiver ignoring own needs to assist client** Awareness of safe transfer techniques; ** experience with equipment/techniques** Physical energy required for transfer; ** perceived reduction in effort by using device*, †† Physical characteristics of client (e.g., age, weight)** Likeliness of using new device*

* Heacock et al. (2004)
† Hall (2002)
‡ Rush (2004)
§ McGuire (1996)
¶ Grisbrooke (2003)
** Griffin and Price (2000)
†† Pain et al. (1999)

Table 8—Factors Associated With Transfer of People

Daykin and Stephenson (2002) provide an overview of questionnaire-based research design. While based on studies of pain perception, the development flow lends itself to developing questionnaires and interviews for perceptions of other conditions, in this case the problems associated with the use of CTLS in the home. Figure 5 shows the questionnaire and interview design flow for this study.

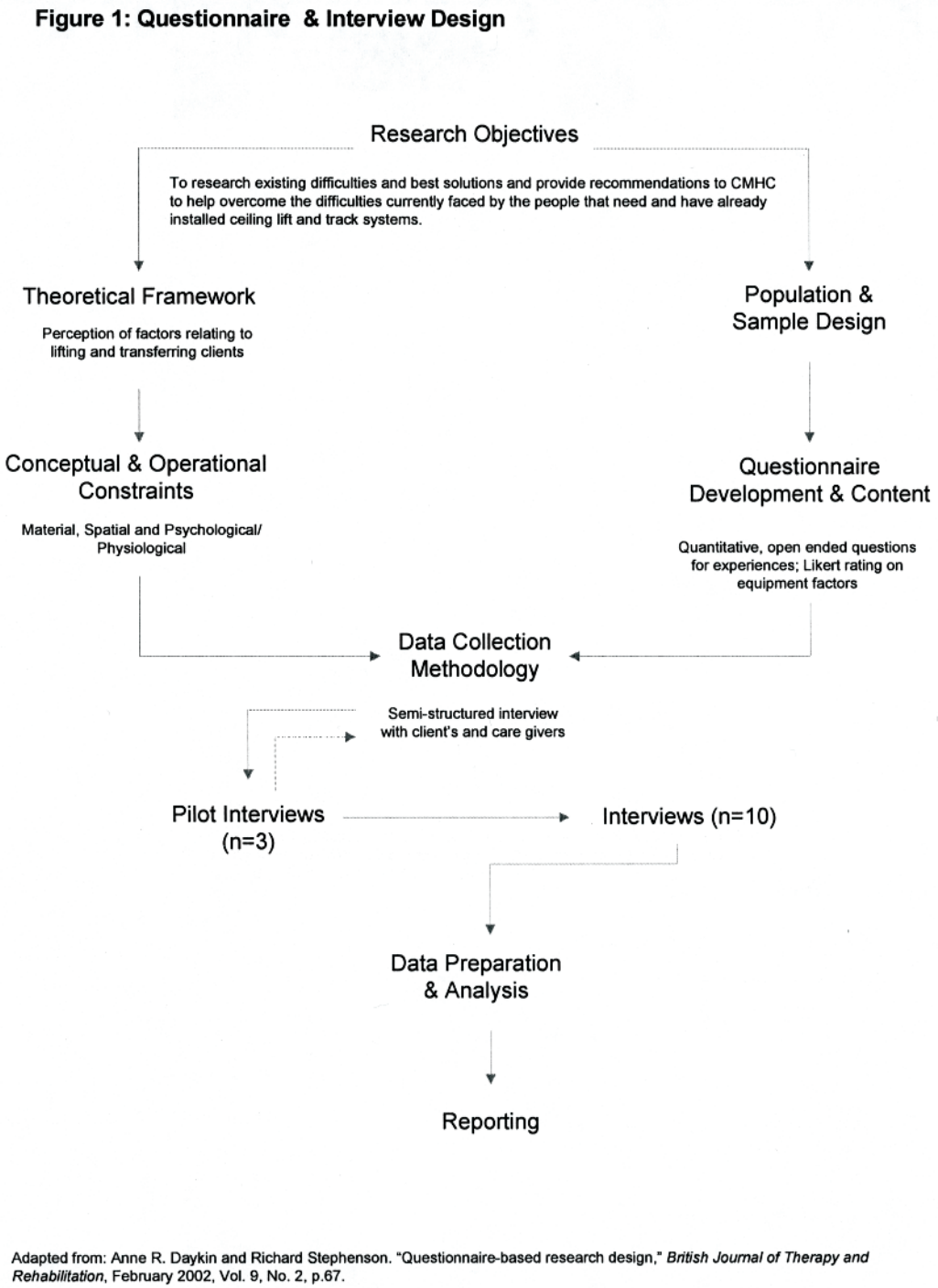

Figure 5—Questionnaire and interview design

First, the research objectives are defined to guide the questionnaire development. Next, the theoretical framework is supported by a literature review and identification of beliefs and variables that could influence the beliefs. Once the theoretical framework is developed, operational

and conceptual parameters are defined. Questionnaire content, data collection methodology, interviews, preparation, analysis and reporting are conducted.

The following describes each element in development of the questionnaire and interview development.

Research Objective

To research existing difficulties and best solutions and provide recommendations to help overcome the difficulties currently faced by the people who need and have already installed CTLS.

Theoretical Framework

The benefits of lifting equipment have been well documented, particularly from the point of view of assisting caregivers and in much-needed injury reduction (Stacey, 1994; Silvia et al., 2001; Heacock, 2004). However, clients do not always agree with the reported benefits [9] and the client's perspective is much less documented in the literature. The framework for this study will take into account factors relating to the perception of lift devices by occupational therapists; experiences of users who installed through-floor lifts; maternal caregivers; and, people using non-mechanical moving aids.

While there were publications that addressed client perceptions in lifting (Griffin and Price, 2000; Grisbrooke, 2003; McGuire, 1996), researchers found only one publication that addressed client perceptions of CTLS directly. This publication specifically address a prototype design for a ceiling lift versus a commercially available lift (Heacock et al., 2004). No publications were found that dealt directly with installation or renovation issues, or both, for CTLS.

While the factors and the results of the studies come from a wide range of user requirements, there are a number of functional similarities associated with moving people that are applicable to the current study of perceptions of CTLS. These functional similarities of lifting and transferring methods and equipment will be grouped below to develop a generalized framework for question development. For example, transfer time is a factor common to all person-transfer situations, but the client and caregiver may have different perceptions on the length of time for a particular transfer operation.

Questions should be developed from a general set of factors, rather than trying to fit the findings from one particular case to another, particularly in this research where there are few publications dealing directly with client perceptions of ceiling lifts.

Client's Perspective

The publication that addressed client perceptions of ceiling-lift systems directly (Heacock et al., 2004), asked three clients to rate the following factors in comparison to another lift design:

- the likeliness of using the new design,
- noise level,
- smoothness of ride,

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9 "Lifting aids: the patient's opinion," Correspondence, *British Journal of Therapy and Rehabilitation*, June 1995, Vol. 2, No. 6, p. 331.

- shape,
- colour,
- transfer time,
- mechanical function, and
- portability.

This group plans to publish more information that more directly addresses client needs and perceptions of ceiling lifts in 2006.[10]

Occupational Therapists

While the current study focuses on the home setting, there are issues in the clinical setting about the use of lifts and hoists that can be informative for potential issues in the home.

For example, ceiling lifts offer a range of slings, tracking options and portability and are often promoted as eliminating the need for manual handling by occupational therapists (Hall, 2002; Heacock et al., 2004). Indeed many health-care agencies have policies that make mechanical lifting assistance for health workers mandatory, given the reduction in musculoskeletal injury from lift technology.[11] Heacock et al. (2004) provide a summary of the ergonomic issues and costs that can be associated with caregiver injuries when lifting devices are not used. There are a large number of publications dealing with the issue of lifting and the physiological effect on professional caregivers.

A survey of the current literature on lift devices, particularly ceiling lifts, yielded few accounts of the perceptions of clients or non-professional primary caregivers who use ceiling-lift technology. There were, however, publications of perceptions of other types of lift devices; occupational therapist experiences, such as those with through-floor lifts; manual lifting and maternal care; and non-mechanical lifting aids such as sliding sheets.

General Perceptions about Being Lifted

While there is an undeniable need for lift devices to protect caregivers from injury, lift devices are not without their problems and can have unintended impacts on clients, such as pain associated with poorly fitting slings (Rush, 2004). McGuire et al. (1996) have conducted a study of clients' perspectives on mechanical aids, including lifting devices used in a clinical setting, mostly moving patients from bed to bath. The main client perception factors identified by McGuire et al. (1996) were:

- level of comfort during use,
- perceived safety,
- appearance, and

10 Personal communication, Nancy Paris, Director, Health Technology Research Group, British Columbia Institute of Technology, Vancouver (http://www.bcit.ca).
11 The Workers' Compensation Board of BC, "Ceiling Lift Resources," Worksafe BC website, http://healthcare.healthandsafetycentre.org/s/CeilingLiftResources.asp?ReportID=32350, retrieved February 2005, English

- feelings about being moved with mechanical assistance.

It was also noted that most clients received explanations on what was going to occur prior to lifting, which provided a sense of reassurance (McGuire et al., 1996).

The duration of mechanical assistance was important to both the client and caregiver; nursing staff reported that the added time required to use a mechanical lift was one of the major reasons for not using one (McGuire et al., 1996).

Space constraints and manoeuvrability were also factors in the choice of mechanical aids.

Finally, the level of physical effort required, as well as suitability of the device for the task, affected caregivers' choice about using devices.

Through-floor Lifts

Grisbrooke (2003) has conducted a study of people's experiences with through-floor lifts. Similar to CTLS, the through-floor lifts were prescribed by occupational therapists based on an evaluation of client's needs. Factors identified in previous studies on the perception of through-floor lifts included:

- restoration of self-care,
- loss of living space,
- effect on family members,
- quality of installation, and
- placement of the equipment.

Grisbrooke also notes a lack of outcome measures for specific home adaptations like lift devices, with most health care agency and manufacturer evaluations centered only on safe installation of the lifts rather than living with lifts. Grisbrooke used a semi-structured qualitative approach to gather the widest range of experience possible (2003:77).

Grisbrooke (2003) covered four main areas:

- background information,
- experiences with the lift (user and caregiver),
- installation (including fitting and maintenance issues), and
- living with the lifts, including how reality met expectations and whether the choice of lift would be different if done a second time.

Five themes that emerged from Grisbrooke's (2003:77–78) work:

- pre-installation preparation,
- fitting the lift into the home,
- post-installation experience,
- fitting the lift into the daily routine, and

- relationships with key professionals.

The problems experienced with the lift itself are generalized into four types:

- mechanical noise and failure,
- poor fit with the housing structure,
- problems due to housing-lift interface (that is, structure unable to support lift), and
- unsatisfactory service from the manufacturer or installer, or both.

Other issues reported by Grisbrooke (2003) included:

- lift mechanism requiring time to allow confidence in the equipment to develop; that is, operating problems during the learning curve that dissipated later,
- loss of functional space in the home,
- support and maintenance from the lift manufacturer–installer, and
- issues with occupational therapists helping to smooth learning curve.

Maternal Care

Griffin and Price (2000) studied issues surrounding mothers' perceptions of lifting and back pain associated with care for children younger than three. While not focused on children with disabilities or ceiling lifts, the study did highlight that mothers tended to ignore safe ergonomic techniques and transfer equipment, focused on the perceived best interest of the child and only addressed their own needs once strain or injury occurred. Factors identified by Griffin and Price (2002) were grouped into two areas, contextual and decision influencing.

Contextual factors included:

- the number of other children that required care,
- time constraints,
- awareness of lift techniques,
- energy conservation,
- duration of the task, and
- frequency of the task.

Decision influencing factors included:

- equipment cost,
- duration of use of the equipment,
- experience,
- age and weight of the child,
- space in the home, and

- physical dimensions of the equipment.

Non-mechanical patient moving

Pain et al. (1999) examined factors in techniques for moving disabled people in bed in clinical and home-based settings using technology other than lift devices, such as rollers and sliding sheets. The problems they identified are useful for this study, in that they highlight issues in moving clients regardless of technology type, including similar back injuries to caregivers discussed in lift equipment studies. For example, Pain et al. found the following factors emerged as important when moving people:

- positioning of the product under a person,
- perceived reduction in effort during a transfer out of or into bed,
- ease of cleaning and storing equipment, and
- comfort of the person being transferred.

Conceptual and Operational Considerations

This study examined three main factor groupings, each with a number of sub-factors or issues relating to client and caregiver perceptions of the use of ceiling lifts. Dunn (2004) has outlined three conceptual dimensions in housing and health research: material, spatial and psychological.

Material dimensions include the physical design features found in the home.

Spatial dimensions include the size, layout and usage conditions (for example, inter-generational or other shared housing).

The psychological dimensions include how people relate to their home, including the different views of ownership and. rental and the length of time people have spent and plan to spend in the home they are in now. Physiological factors have been added, because along with the perceived risks of using lift devices, there are physiological effects that need to be accounted for. The psychological and physiological factors are grouped as "perceptual" factors.

Each of the three conceptual dimensions was addressed:

- **Material:** in the observation and description of the ceiling-lift devices and through the issues raised in the literature review,
- **Spatial:** in the observation of the physical constraints of the home during interviews, and,
- **Perceptual:** including the psychological and physiological factors with being lifted and with the experiences of clients with community health workers or primary caregivers or both.

The conceptual framework in Table 9 guided the questionnaire content and development. All of the factors identified in the theoretical framework have been placed in one of these three conceptual dimensions. By grouping the identified factors under the three dimensions, a framework is provided that assists in evaluating how one dimension (for example, housing spatial constraints) may affect others (for example, psychological or physiological).

Conceptual dimension	Factors associated with transfer equipment	
Material	Mechanical noise Smoothness of transfer Esthetics Range of options Quality of installation Quality of service	Probability of mechanical failure Cost Physical dimensions Cleaning Storing
Spatial	Ability of living space to accommodate equipment Loss of living space for client Loss of living space for others Fitness of living space structure to support equipment Manoeuvrability of equipment in living space	Placement of equipment Pre-installation preparation Number of other people besides client in the living space Ability to position equipment under/near client
Perceptual	Level of discomfort during use Transfer time Transfer frequency Perceived safety of equipment Actual safety of equipment Willingness to use mechanical assistance Willingness to adopt new equipment Perceived effort to operate equipment Actual effort required to operate equipment	Suitability of equipment for transfer task Level of restoration of self-care and/or function Fit of equipment to daily routines Effect on relationship with others in living space Effect on relationship with key professionals Learning curve required to operate equipment Awareness of safe transfer techniques Willingness to use safe transfer techniques Physical characteristics of all users of the equipment

Table 9—General Conceptual Factors

Population and Sample Design

In Grisbrooke's study of through-floor lifts, the criteria were broad and included all people who had been living with a lift, of any product style, for at least one year and maximum of five years (2002:77). Participants were identified through housing agencies. A similar approach was used for this study; however, the time using a ceiling lift ranged between two months and seven years.

Due to project constraints, particularly the small sample size, an ethnographic approach with semi-structured interviews and observations was determined to be appropriate (as in Wood,2001:79–83). The interviews had three separate components:

- Semi-structured with open-ended questions on their experiences and feelings about the systems (approximately 30 minutes),
- Short structured Likert rating section for numerical analysis about performance and time-related issues (approximately 15 minutes), and
- Observational data collection on the type of housing and ceiling-lift features, including type of installation.

Other interview structure considerations included:

- Problems and issues raised according to the type of ceiling structure and whether the individual rented or owned. The type of home was documented (for example., 1, 1½, 2 or 3 storeys, bungalow, apartment and so on);
- Interview questions used non-technical language (that is., interviewees were not asked technical questions about how the devices function, rather they focused on experiences using it);
- Observations and photographs were made during lift procedures while the community health worker or parent was there (typically under 15 minutes);
- Invitations and consent forms for clients, community health workers and other caregivers were required, highlighting confidentiality particularly due to the photographic requirement;
- The semi-structured interview questions started with a few simple, personal data questions to help develop a rapport before getting to CHMC questions; and
- A single interviewer was used for all interviews.

Three pilot interviews were conducted to seek areas for final improvement in questions and technique prior to conducting the 10 main study interviews. All of the interview data is used in the analysis and discussion below. It was found during the pilot interviews that clients were quite comfortable with the questions and able to answer them without difficulty. The questions were not changed for the remaining 10 interviews.

Sample Design

Interviewee Search Criteria

Inclusion Criteria

- Must have both a bedroom and bathroom ceiling track installed,
- Short term/temporary users (less than one year or temporary) to include palliative and acute care recovery if possible,
- Long-term users (more than one year or permanent) to include paraplegic or quadriplegic and chronic acute care users due to other illness or disability if possible,
- Either gender,
- Any age,
- Must have had system installed and have been using for at least 30 days, and
- At least one community health worker or primary caregiver who operates lift devices should be present.

Exclusion criteria

- New installations of less than 30 days

Sources of Interviewees

Twelve home support agencies were contacted in the Vancouver area for distribution of letters of invitation to participate in the study. The British Columbia Society of Occupational Therapists was also contacted, and an invitation to participate in the study was sent out in its weekly e-mail newsletter. Finally, Cosmopolitan Industries Inc. was contacted in Saskatoon for interest in participating in the project.

Contacting and Inviting Interviewees to Participate

The interviewer contacted the agencies listed above for assistance in locating community health workers, occupational therapists (who actually prescribe ceiling lifts) and clients. All potential interviewees received an invitation to participate from a member of one of these organizations prior to contacting the interviewer directly with their interest in the study.

Interview Bias

The semi-structured interview approach allowed for some variability and influence by the interviewer; however, it also allowed pursuit of more in-depth information about the particular experience of the user. For example the question "Is the lift helping you?" is closed and leads to a yes or no type response, but a more open-ended question such as "In what ways has the lift helped?" elicited a more detailed response. The structured questions were added with a Likert scale for objective comparison.

Final selection of interviewees

Final selection was based both on the greatest number of lift types and client conditions as well as client interest in participating.

Questionnaire Development and Content

The interviews conducted for this study were intended to address the following research questions:

1. How are ceiling track systems being used? (e.g., bath care, room transfer, etc.)
2. Has the installation of a ceiling track system assisted parents and/or caregivers?
3. What are the problems encountered in installing and using ceiling track systems?

The questionnaires were based on the general factors identified in Table 2, and are included in Appendixes D and E.

Interview questions were written in plain language and designed to be short, direct questions regarding user experiences. This was to help ensure the understanding of the question by interviewee and caregiver for the possible different care scenarios.

The questions were also linked directly to the theoretical framework. Where possible, the questions were phrased in the positive. Where a question could be asked in a positive or negative way, for example "I like how my lift looks in my home" versus "I do not like how my lift looks in my home" the question has been phrased as "like" instead of "dislike."

Questions have been phrased in the positive so as not to lead a respondent to express or overemphasise a problem with the lift system. Questions were either open-ended, or where a yes or

no response could be given, the interviewees were asked to rank how strongly they agree or disagree with a statement on a scale of 1 to 5.

Data Collection

Similar to Grisbrooke's study (2002), interviews with lift users and their primary caregivers were conducted in the home, using a semi-structured qualitative approach. Responses were recorded on the interview forms, and photographs of lift system installations were taken. Following is a description of the data collection methodology.

Conducting the Interviews

As noted in the interview constraints above, the interviewer conducted both the pilot interviews and final interviews in the client's home with a community health worker or primary caregiver present.

The semi-structured open-ended questions were transcribed and read back to the interviewee to ensure accuracy.

The structured Likert scale questions were recorded on the interview sheet.

Installation Expert Interviews

Installers from a ceiling-lift supply and installation company were asked a series of questions based on the client interview form to further assess the range of experiences incurred with installing ceiling lifts (that is, instead of asking the user "What was your specific experience?" installers were asked about the range of experiences they have encountered).

The results of the user interviews were not discussed with the installation company. No interviewees were located using the lift installation company records or recommendations.

Interview Data

Thirteen interviews were conducted between April and August 2005 with users of lift devices and either their primary caregivers or the occupational therapist who initially prescribed a ceiling lift. Interviews were conducted in the following 10 locations: in B.C.: Campbell River, Comox, Courtney, Deep Cove, North Vancouver, Richmond, Vancouver, and West Vancouver and in Saskatchewan in Corman Park and Saskatoon

Home styles ranged from mobile homes to large, five-bedroom homes. Three of 13 homes were rented and ranged in age from three years to more than 60 years old. Table 8 shows the demographic and personal data collected about each interviewee.

Table 9 shows the location and housing type for each interviewee.

A wide range of interviewees were willing to participate in the study. The study group had the following characteristics:

- ages ranged from 13 to 92,
- eight female and five male,
- nine single and five married,
- time living in current location ranged from two to 45 years, and

- eight of 11 participants had completed at least some post-secondary education (two participants were still in secondary school at the time of the interview).

Study ID	Age (years)	Weight (lbs)	Height (in.)	Sex	Marital Status	Time in Current Location (years)	Education and/or Work Experience	Condition Precipitating Need for Lift
006	13	160	64	F	S	2	student (secondary)	Cerebral Palsy
010	18	93	56	M	S	6	student (secondary)	Cerebral Palsy
002	24	180	68	F	S	8	student (undergraduate)	Viral meningitis
007	28	170	71	M	S	2	student (undergraduate)	Quadriplegic
011	29	148	61	F	S	22	student (undergraduate)	Cerebral Palsy
09	43	130	64	F	S	23	Part-time work at special needs facility	Downs Syndrome
004	50	200	66	F	M	5	Office worker	Spinal Aneurysm
001	53	200	74	M	S	24	Steam fitter	Multiple Sclerosis
005	62	195	74	M	M	9	Navy officer (retired)	Amyotrophic lateral sclerosis
003	69	155	66	M	M	18	Pattern maker (retired)	Diabetes amputations
013	75	145	66	F	S	9	secondary	Cerebral Palsy
008	86	150	66	F	M	45	Clothing Designer/Artist	Stroke
012	92	95	63	F	S	9	Teacher (retired)	Rheumatoid Arthritis
MEAN	49	155	66	Female:	Single:	14	Some or completed post-seconday education: n=8	
MEDIAN	50	155	66	n=8	n=9	9		
MAX	92	200	74	Male:	Married:	45		
MIN	13	93	56	n=5	n=4	2		

Table 10—Demographic and Personal Data

The conditions that contributed to the need for a lift included:

- Cerebral palsy,
- Viral meningitis,
- Automobile accident,
- Down syndrome,
- Spinal aneurysm,
- Multiple sclerosis,
- Amyotrophic lateral sclerosis,
- Amputation due to diabetes,

- Stroke, and
- Rheumatoid arthritis.

The time that each participant had used a lift ranged from two months to seven years.

ID#	Location	Approximate Population 2001*	Type of Home	Own or Rent	Age of Home (years)
3	Campbell River, BC	33,872	2 bed bungalow; 1 floor w/basement	own	40
5	Comox, BC	11,172	duplex. Single level. 2 bedroom. (Raised ceilings)	own	8
10	Corman Park, SK	8,093	3 bedroom, single level	own	11
4	Courtenay, BC	47,051	Mobile Home, single width, own	own	N/A
6	North Vancouver (Deep Cov	82,310	2 bed apartment (concrete), 1 level	rent	~20
1	North Vancouver, BC	82,310	2 bed bungalow; 1 floor + basement	own	50
12	Richmond, BC	164,345	4 bedroom, two level	own	29
9	Saskatoon, SK	196,811	4 level split, 4 bedroom	own	45
11	Saskatoon, SK	196,811	3 bedroom, bi-level	own	25
7	Vancouver, BC	545,671	1 bed apartment, 1 level, rent, wood frame (co-op housing)	rent	3
13	West Vancouver, BC	41,421	2 bedroom, apartment (concrete)	rent	~30
8	West Vancouver, BC	41,421	5 bedroom, 2 level home	own	47
2	West Vancouver, BC	41,421	4 bedroom rancher 1 level with basement	own	60

* Statistics Canada, "2001 Community Profiles," Statistics Canada web site, <http://www12.statcan.ca/english/profil01/PlaceSearchForm1.cfm>

Table 11—Interviewee Location and Housing Type

Each interview participant answered between 40 and 50 questions depending on the level or type of home care required. Two participants (ID#s 009 and #008) required the primary care-giver to assist with providing responses.

Common Use and Location of Ceiling Lifts

The most common use of a lift was for lifting in and out of bed and from bed or wheelchair to a commode or toilet—12.

The most common areas where ceiling track was installed were the bedroom—12—and bath-room—seven.

When asked if they wanted ceiling track in other areas, eight said no or they did not think any other rooms could accommodate a lift in their current home.

All interviewees used the lift at least once per day and up to as many as 16 times per day (one use constitutes raising from bed or chair and then lowered down on to something else), with an average of seven times per day.

Initial Condition or Need for a Ceiling Lift

In eight interviews, the inability of the caregiver to manually lift the client precipitated the need for a lift device.

Three types of situations were observed where a caregiver could no longer perform a manual lift:

1. parents no longer able to lift an adult or adolescent child safely
2. an adult no longer able to lift a disabled parent
3. instances of aging partners or live-in caregivers no longer being able to perform manual lifting due to age

The other conditions precipitating the need for a lift had to do directly with traumatic injury, congenital conditions or the advanced stages of a particular disease or condition, such as diabetes or arthritis.

Knowledge of Costs of the Device

Funding for ceiling lifts can be complicated and varies according to factors such as the condition that precipitated the need for a lift or the value of the home. Nine interviewees knew the approximate cost of the device. Four had no idea what the cost of a system would be.

Knowledge of Device Options

Seven interviewees did not realize that there were options available, such as more track, different slings or different models, than those that came with the original installation.

Occupational therapists often have knowledge of at least one local source of lifts; however, no caregivers interviewed knew of the large number of models or slings available in Canada. Most occupational therapists knew of one or two major manufacturers or local distributors.

Interviewees were generally satisfied with the basic up-and-down motion of the device, but seven were unaware of any other options on the market. Only one interviewee was aware of the large number of lift devices and slings available for sale in Canada.

Three interviewees believed that they were limited in the type of sling that they could use. They believed that if they used a sling other than that of the hoist manufacturer then their warranty would be void. One interviewee noted that she was unable to find a sling design from her lift manufacturer that accommodates female physiology in regard to transfers for toileting activities, but she was unwilling to use another manufacturer's sling due to concerns of losing the warranty on her lift.

Knowledge of funding sources

Most interviewees obtained their lifts through government or charitable funding sources. Several interviewees noted that they felt that they "had no choice" in the type of lift and sling provided to them, in part due to third party funding of the devices.

One caregiver did not realize that he could order more track for other rooms and assumed that the configuration prescribed by the occupational therapist was the only option.

The three interviewees who rented their homes all had limited options for renovations. All were on fixed incomes and believed that there was not a funding source available to assist them with the costs of renovating a rental home, or they had difficulty with property managers agreeing to allow renovations.

Perceptions and Feelings about Being Lifted with a Ceiling Lift

There was a high level of feeling of satisfaction with the general operation of the ceiling hoist; however, a number of issues were raised in other related areas, such as esthetics, discomfort with slings and the effect on others in the home.

Interviewees did not associate a sometimes high level of discomfort with a sling with the operation of the lift device. The hoist-and-track operation was viewed separately from sling discomfort. Once discomfort with a sling was dealt with, the satisfaction with the lift procedure was generally high.

A number of interviewees noted that there was little or no attempt to integrate the CTLS with the look of the home; it was described as "patched on" to the existing structure without regard to esthetics.

Safety and Mechanical Failure

None of the interviewees had suffered any kind of injury from the operation of the ceiling hoist device itself or from the track system.

Six interviewees had experienced minor to moderate mechanical failures. Five issues related to the lift device itself, most due to battery failures. There was one jammed hoist webbing. One issue related to the slings, with failure of stitching occurring on one webbing loop requiring replacement of the sling.

All interviewees noted at least one problem with their slings. Slings were viewed as a particular problem separate from the basic operation of the hoist and track.

Three interviewees did incur injuries from improper placement in a sling by a caregiver. Most problems included mild to moderate discomfort, poor head support or problems with toileting. One interviewee suffered a broken femur due to improper placement in a sling and subsequent fall during a lift.

Seven interviewees indicated being put in considerable discomfort from a poor fit with the sling provided with the CTLS, including leg spasms from seams sewn in to the slings and toileting issues as the result of compression in the sling.

Interviewees noted that they needed approximately one to two months to feel safe with the lift operation and to become used to the new routines that are part of using a ceiling lift, such as putting on a sling, attaching the sling to the hoist, lifting and so on.

Effect on Others

Interviewees were asked to describe the impact that the lift system had on other people in the home that did not use the lift. The effect on others in the home was described as having both positive and negative elements.

Positive effects on others in the home included:

- They were able to lift with less physical strain (13),
- Partners or children were able to live at home and not be in long-term care (5); the lift allowed all users to remain at home, but in particular interviewees mentioned the ability to keep spouses or families together as being very important to them,
- Family members were able to contribute more with care giving (4), and
- Home support workers were able to provide assistance in no-lift areas.

Seven interviewees indicated that they strongly disagreed with the statement that "My lift system has helped to restore abilities or options that I did not have without a lift."

When asked to explain the disagreement, the respondents indicated that the ceiling lift made some activities less strenuous, but their ability to perform tasks (for example, bathing) were still possible for them with or without a lift. They did not see ceiling lift technology as a personal "restorative technology," e.g., as with a scooter or a wheelchair restoring mobility. Ceiling lifts were perceived to provide assistance as much or more for the caregiver than for the client.

Familial caregivers also indicated that having a ceiling lift provided them with a "break" or "some freedom" by allowing community health workers to provide some care and allow the family caregiver to leave the home for short periods of time.

Negative effects on others in the home included:

- lengthening the time for daily routines such as toileting or bathing (5), and
- complicating daily routines (3).

Awareness of Safe Transfer and Operation of the Lift

Five interviewees received a separate explanation on how to transfer a person safely with a ceiling lift from their occupational therapist in addition to an explanation from the installation company or sales representative. Four interviewees said that they did not receive any information on safety. One respondent indicated that he simply "assumed that what he was shown was safe."

Occupational therapists also played a significant role in the basic instruction of operating a lift device. Eight interviewees noted that their occupational therapist was present for the installation or added to the usage instructions provided by the installation company or sales representative. Twelve interviewees agreed or strongly agreed with the statement "My lift is easy to operate."

Cleaning and storing the lift was not complicated for users. Typically, portable lifts were left on a track and only slings were hand-washed.

Effect of the Ceiling Lift on Community Health Workers and Primary Caregivers

Nine family or live-in caregivers felt that the ceiling-lift system did not take away from the amount of living space in the home. One caregiver said that furniture placement needed to be adjusted but they "learned to adapt," even though the situation was not optimal for them.

A spouse caregiver did say that the installation of a portable ceiling lift required the removal of her bed from their bedroom, and she could no longer sleep in the same room as her husband,

which was troubling for her. Both situations were in homes with portable track systems that required poles to hold the track system in place (see figures 10.1 and 10.2 below). The poles required moving the furniture. When coupled with the space requirements for a wheelchair in the home, the options for furniture placement can be limited.

Five caregivers said that they still perform some manual transfers even though a lift is available in the home. The main reasons cited for continued manual transfers were:

- Time for toileting activities (two respondents said that a lift transfer often takes too long or, depending on the fit of the sling, can compress clients in a way that makes toileting difficult or prone to toileting accidents);
- It is often the only option when travelling; and
- One parent is still physically able to manually perform lifts.

Positive effects for caregivers included daily tasks being less physically strenuous and safer.

Negative aspects of the lift included adding too much time to daily routines and esthetic dislike of the systems.

Relationship with Professional Caregivers

Three interviewees noted a strong unwillingness to complain about their experience with some community health workers' operation of the lift devices, particularly in terms of positioning in a sling or workers bumping clients' heads on the hoist during a lift.

It was noted that due to the high level of dependence on community health workers they found it difficult to complain. It should also be noted that these cases were the exception, and interviewees were very happy with most of their experiences with community health workers and occupational therapists.

One interviewee had as many as 16 different community health workers per month for assistance and felt that the skill level was often quite variable depending on the community health worker operating the lift.

Renovation Requirements

Table 5 summarizes the range of renovation problems and issues for installation of ceiling track. Only two interviewees required moderate renovations of the home itself to install the track system in their homes; however, all systems have a significant impact once installed, particularly on the esthetics of the home.

User situation	Ceiling Type					
	No obstruction	**Obstruction (e.g. dropped sections)**	**Non-standard ceiling configuration (e.g. vaulted)**	**Non-load bearing or reinforcement required**	**Undesirable esthetic, furniture or door placement changes**	**Non-standard use of track**
Rent		1) unable to complete ceiling track from bath to toilet (ID#06)			1) removal of door and non-standard shower curtain required (ID#06) 2) track not installed due to undesirable esthetics (ID#07) 3) placement of power supply (ID#07) 2) pole required in bedroom for reinforcement interfering with furniture placement (ID#13)	
Own	1) unable to position track fully over toilet in bathroom (ID#01)	1) rods required to level track due to different ceiling heights (ID#02, ID#08)	1) track not installed due to undesirable renovation (ID#05)	1) pole required in living room for reinforcement interfering with furniture placement (ID#01) 2) pole required in bedroom for reinforcement interfering with furniture placement (ID#01) 3) reinforcing added to the track system directly (ID#04)	1) pole required in living room for reinforcement interfering with furniture placement (ID#01) 2) pole required in bedroom for reinforcement interfering with furniture placement (ID#01, ID#05, ID#12) 3) placement of power supply (ID#02, ID#03)	1) lift used as "elevator" in four level split (ID#09) 2) use as base for other exercise equipment (ID#07) 3) high level of integration with track in most areas of the home (ID#10)

Table 12—Renovation Issues Matrix

Eleven clients said that either nothing had to be done or in four cases furniture had to be moved to accommodate the placement of the lift.

No major structural renovations were required to install the track system in any of the interviewees' homes. Typically, installation of ceiling track has a low impact on the home structure itself. A typical ceiling track installation is detailed below.

The most common effect of the installation of a lift is in the area of esthetics and door and furniture placement issues. Both renters and owners experienced undesirable configurations of furniture due to the use of poles, either as part of portable pole systems or with pole ceiling supports used for housing reinforcement. Choice of furniture placement in the home was not perceived as a trivial issue by three interviewees—particularly concerning spouses being able to share a bedroom and for privacy issues around shower curtains. Other issues in this category included a dislike of the esthetics of power supplies bolted to walls and the general look of the home once a pole-type installation had occurred.

Three installations required reinforcements to be added to the home or to the track system itself or rods to accommodate dropped ceilings.

In one unusual case, renovations required moving a toilet to accommodate the placement of ceiling track.

In another case for a renter, a complete section of track was not possible due to inability to receive permission from the landlord to remove a door jamb, which would have allowed a complete section of track from toilet to tub (see ID#06 below).

Most of the renovations for a ceiling lift required additions of lift components to a home, rather than removal or alternate placement of existing home structures.

APPENDIX D: DETAILED INTERVIEW RESULTS

Following is a brief description of the key elements of the installation or renovations or both required for each interviewee.

Interview ID#01

Interviewee ID#01 owns a 50-year-old, two-bedroom bungalow with one main floor and a basement. Three issues arose in the installation of the ceiling track:

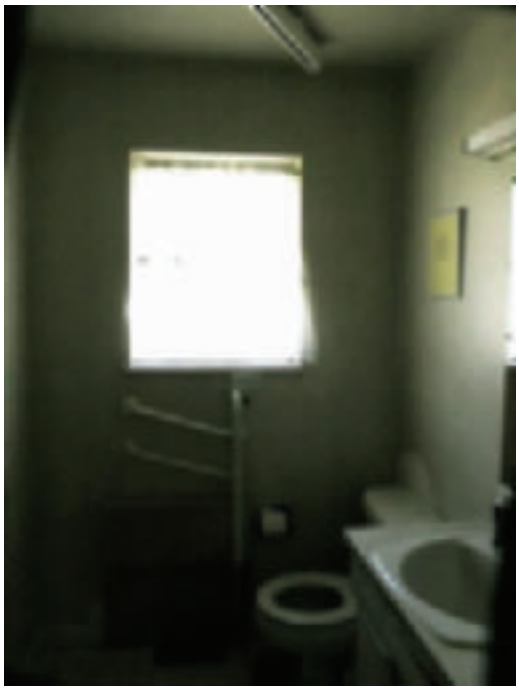

Figure 6—ID#01 bathroom

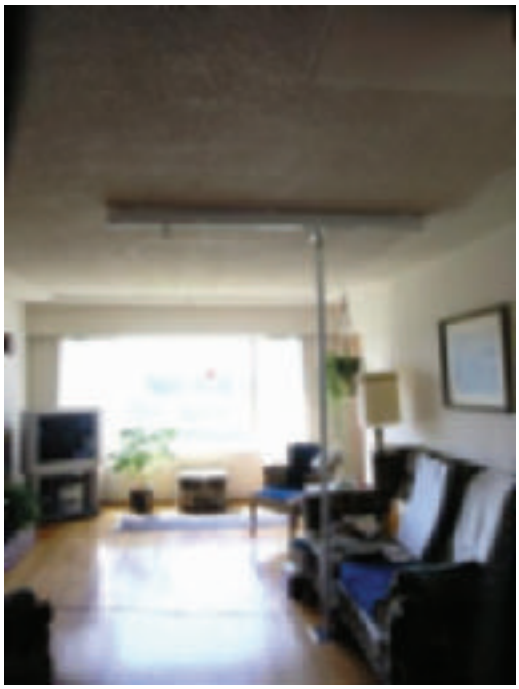

Figure 7—ID#01 living room

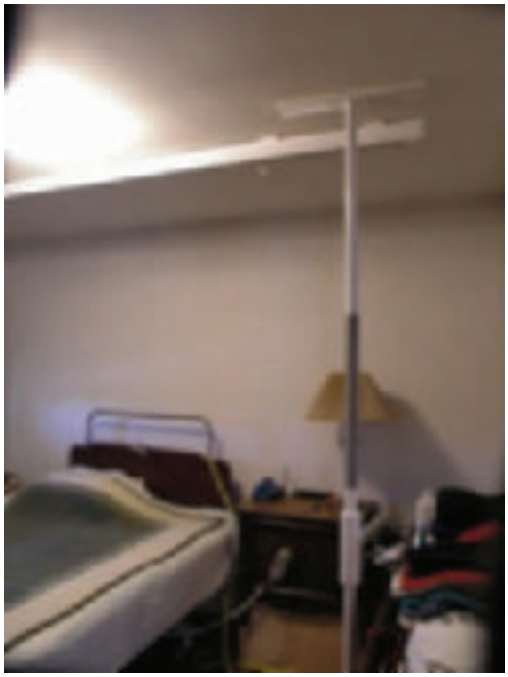

Figure 8—ID#01 bedroom

- The toilet had to be moved to accommodate the placement of the ceiling track (figure 6),

- A reinforcing pole was installed in the living room to support the track system, effecting the placement of furniture in the room and the esthetics of the room (figure 7), and
- A similar reinforcing pole was installed in the bedroom (figure 8) with similar furniture placement problems to the living room.

This interviewee attempted to obtain funding from CMHC; however, the home is located in an area of Vancouver where the value of the home placed the situation outside of the CMHC funding criteria, even though the interviewee is on a low fixed income. He did not know of other financing options other than a local service club that assisted with the costs of the installation.

Interview ID#02

Interviewee ID#02 owns a 60-year-old, four-bedroom home in West Vancouver. The installation issue in this home involved a dropped ceiling in a bathroom (figures 6.1 & 6.2).

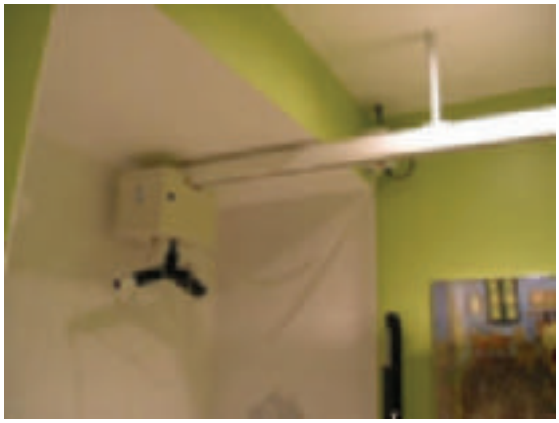

Figure 9—ID#02 bathroom

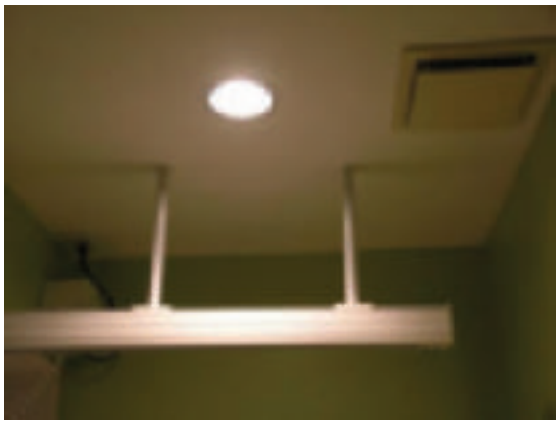

Figure 10—ID#02 Sunken ceiling extensions

The main issues for renovation were placement of the rods into the ceiling joists and the removal of a standard shower curtain. The installation had to be adjusted several times to find the appropriate levelling points so that the system would not slide to one end of the track. Other is-

sues raised were the placement of the power supply in the bathroom and the effect on the esthetics of the room (figure 11).

Figure 11 —ID#02 Power supply

Interview ID#03

Interviewee ID#03 owns a 40-year-old, two-bedroom home. This home has a single piece of track in a bedroom (figure 12). The main installation issue was the esthetics of the placement of the power supply components.

Figure 12 —ID#03 Bedroom

Interview ID#04

Interviewee ID#04 owns a two-bedroom mobile home (age not known). This type of home required significant reinforcement of the track; however, the home structure itself did not allow for additional home reinforcements. The installation solution was to reinforce the track system, as figure shows.

Figure 13—ID#04 Trailer home installation

Tracking was added to create a gantry-style configuration to prevent the ceiling from bearing a load when the lift was used.

Interview ID#05

Interviewee ID#05 owns an 11-year-old, three-bedroom home with vaulted ceilings. Only one piece of portable tracking was installed in this home (figures 14 and 15). Because of the vaulted ceiling in the living room, rods about 2.4 m (8 ft.) long would have been required to provide a track system, which the family did not want due to the esthetic effects.

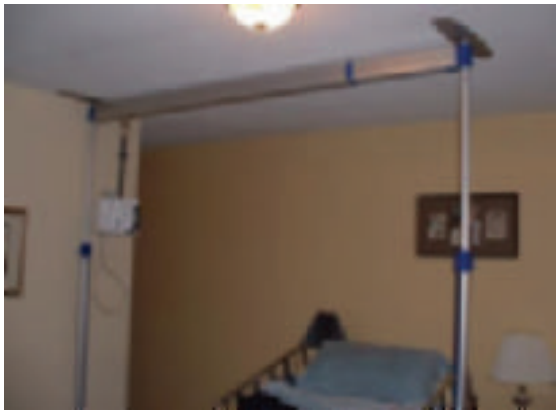

Figure 14 —ID#05 Portable lift

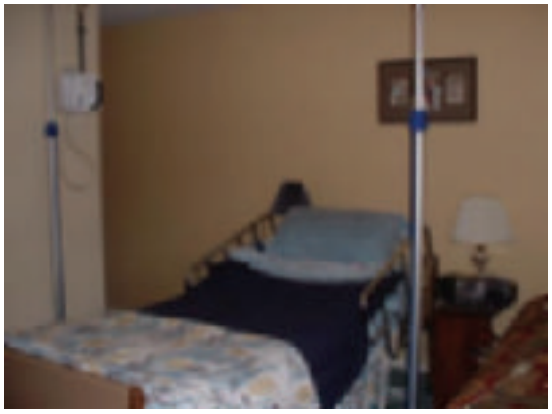

Figure 15 —ID#05 Track poles

The main effect of the portable pole system was the requirement to move some furniture out of the room, in particular the spouse's bed, which was a cause for some distress.

Interview ID#06

Interviewee ID#06 rented a two-bedroom home in a concrete structure building.

The home required some moderate renovations of a bathroom, including moving doors, installing specialized hinges (figure 16) and adding a split shower rail (figure 17).

Because of an old door jamb (figure 18), renovations would be needed to provide a complete track from the toilet to the bathtub. The primary caregiver could not find funding for the reno-

vation, in part because the caregiver who rented the home did not know about funding options for renters. The concrete ceiling did need concrete anchors to attach the track system.

Figure 16 —ID#06 Hinge

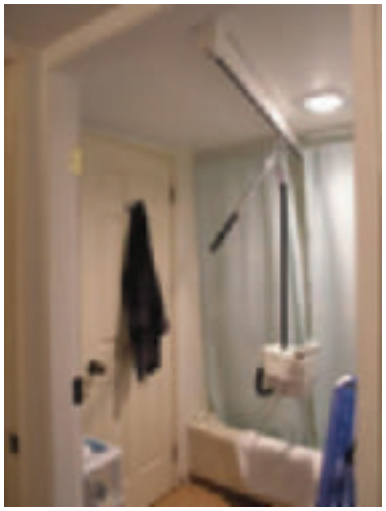

Figure 17—ID#06 Shower

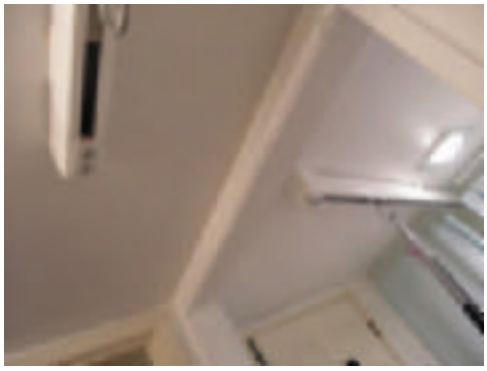

Figure 18 —ID#06 Incomplete bathroom installation

Interview ID#07

Interviewee ID#07 rents a one-bedroom apartment in a three-year-old, wood-frame building. It has issues similar to those of ID#02 and ID#03 —esthetics and placement of the power supply (figure 19). There were no other installation issues for the one piece of track in the bedroom. The interviewee did not want another track in the main living are because of the esthetics of the track system.

Figure 19—ID#07 Bedroom and exercise equipment

Interview ID#08

Interviewee ID#08 owns a 47-year-old, five-bedroom, two-level home. Track was installed in the bedroom (figure 20), living room (figure 21) and bathroom (figure 22). The dropped ceiling in the bathroom is similar to the dropped ceiling in ID#02.

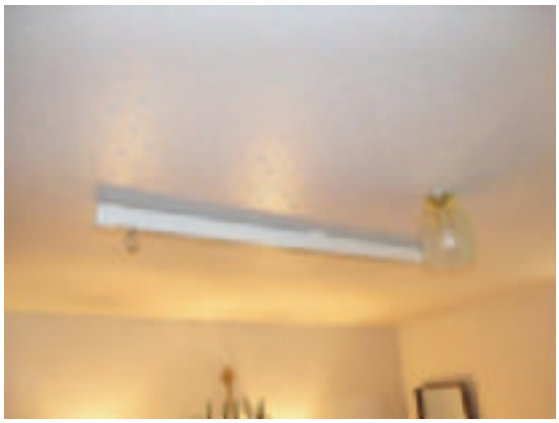

Figure 20 —ID#08 Bedroom

Figure 21 —ID#08 Living room

Figure 22 —ID#08 Bathroom with sunken ceiling

Interview ID#09

Interviewee ID#09 owns a 45-year-old, four-level split, four-bedroom home. Ceiling track was placed in the main entranceway (figure 23) and in the bedroom.

Figure 23 —ID#09 Ceiling lift used as an elevator

Because of the four-level split configuration, the initial installation of a ceiling lift was used as an elevator-type lift to move their daughter from the main living area to the bedroom level of the home, rather than installing a more costly home elevator.

Interview ID#10

Interviewee ID#10 owns an 11-year-old, three-bedroom home. This was a very unusual situation in that the family decided to install track in the home in as many areas as possible, to allow their son as much integration as possible into the family's daily routines (figures 24, 25 and 26). Ceiling track was installed in every room except the parents' and siblings' bedrooms and the basement.

Doorway headers required renovation both for height and for support of the track system (see figure 27). The primary caregiver said that the renovations were not difficult —he did the renovations himself.

Figure 24 —ID#10 Living room area

Figure 25—ID#10 Kitchen and dining area

The actual cost of track was under $30,000. This included the assistance of a professional track installer.

Figure 26 —ID#10 Bathroom

Figure 27 —ID#10 Door jamb

Interview ID#11

Interviewee ID#11 owns a 25-year-old, three-bedroom home. No renovations were required other than standard installation for track in both the bedroom and bathroom; however, the family did invent a simple system that allowed for the use of a standard shower curtain and allowed a standard level of privacy to be retained (figures 28 and 29).

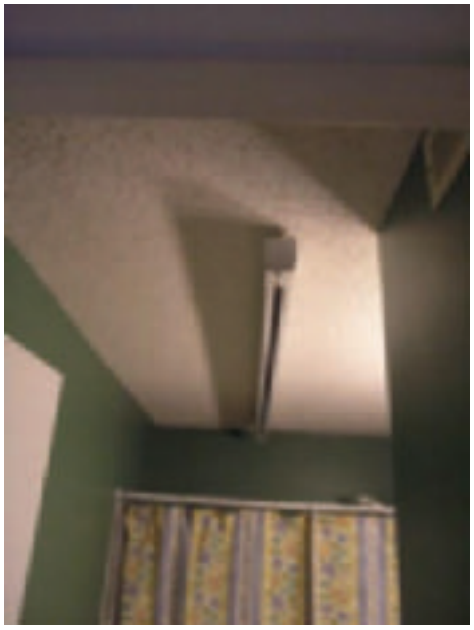

Figure 28 —ID#11 Bathroom

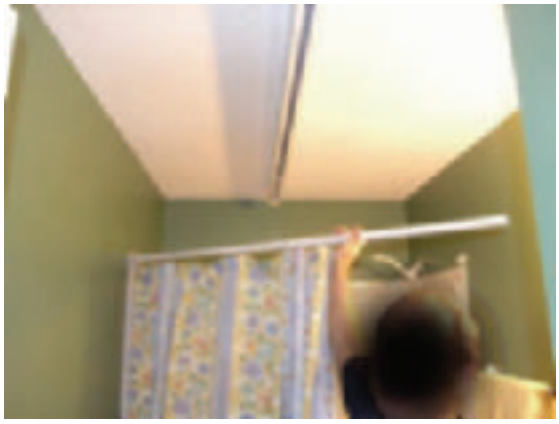

Figure 29—ID#11: Shower rod innovation

Interview ID#12

Interviewee ID#12 owns a 29-year-old, two-level, four-bedroom home. A portable track system was installed similar to the system in ID#05 (figure 22). As in ID#05, the pole system limits the type and placement of furniture in the rooms.

Figure 30 —ID#12 Bedroom installation

Interview ID#13

Interviewee ID#13 rents a two-bedroom apartment. A portable track system was installed, similar to the systems in ID#05 and ID#12 (figure 23) in which the pole system limits the type and placement of furniture.

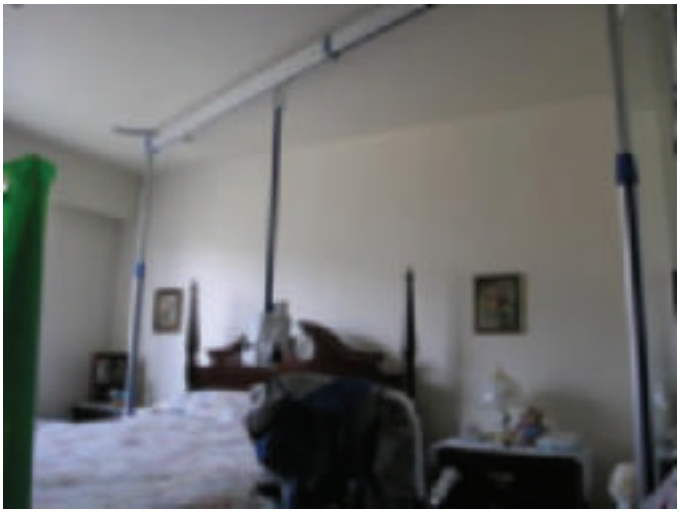

Figure 31—ID#13 Bedroom installation

Installation Professional

A ceiling-lift installation crew was interviewed during installation of a CTLS to identify the basic renovation requirements for a typical installation and the range of installation issues, including possible building code issues, which the company had experienced.

The installation tasks below are representative of 80 to 90 per cent of the crew's installations. The basic tasks are:

- The work area is inspected and compared to diagrams provided by sales staff (figure 32),
- Joist locations are determined,
- Location lines for joist connections are marked,
- Small pieces of drywall are removed and joist size determined (figure 33),
- Ceiling-track joist hangers are bolted to the joists (the size of hanger depends on the size of joist) (figure 34), and
- The track is bolted to the joist hangers and levelled (figure 35).

A typical installation takes less than two hours for a single piece of track (figure 36) and the installation crew says an installation rarely takes more than four hours.

The most common renovation is reinforcement of joists. The installation crew noted that there is a trend in newer homes to smaller joist sizes (some 2×4 or 2×6) and "silent flooring," which require reinforcement with a steel bar across all joists that will be connected to the ceiling track.

Other typical installations include removing light fixtures, cutting through door headers if track runs from room to room, adding rods or brace extensions for vaulted ceilings (figure 37) and removal of drywall for joist connections. The crew says older homes are easier for installations because they usually have larger joist sizes.

The installation crew was not aware of any building code restrictions for ceiling lifts. The crew relies on manufacturers' guidelines for installation, which they believe have been developed in accordance with all Canadian building codes.

The crew was aware of specific Workers' Compensation Board of BC guidelines for the installation of ceiling track.[12] The crew also relies on its judgment of the construction of a particular home for reinforcing joists in unusual situations. As one crew member noted, "You have to get up there and look."

The installation crew noted that it rarely has contact with the client before or during an installation—the client is often not home for the installation.

Typically, the only construction information that the installation crew receives is a sketch of the installation area and desired layout of track as described by sales staff (figure 30). The crew must

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12 See "Properly Install, Inspect, and Load Test Overhead Patient/Resident Track Lifts WS 02-02," WorkSafe BC website,
http://www.worksafebc.com/publications/health_and_safety/bulletins/worksafe/default.asp

rely on its own visual inspection of joist condition and sizing for reinforcement decisions. Installers typically do not go with sales staff to assess the renovations that are needed.

The installation crew described a "difficult" installation (less than 10 per cent of all installations) as one that requires the removal of a large (for example, 1m²—10 sq. ft.) piece of drywall in the ceiling to reinforce smaller joists. The hole in the ceiling is often replaced with a plastic cover instead of new drywall and paint.

Most typical materials used for renovations were ordinary: wood shims, lag bolts and thin steel plate. The crew says that "The expense is in our labour, not in the materials."

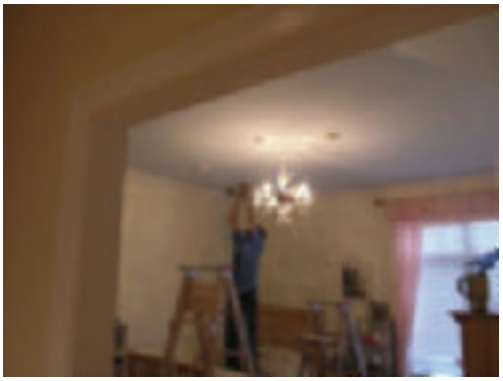

Figure 32

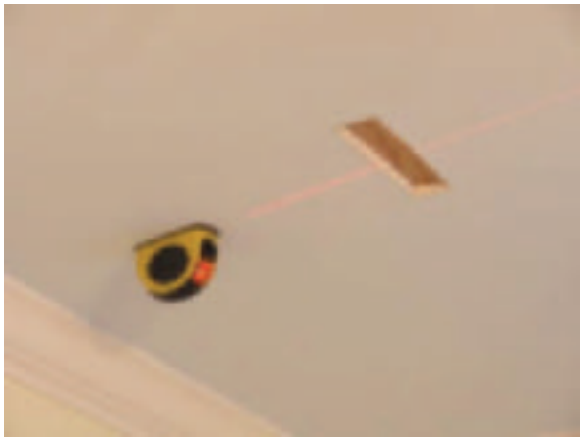

Figure 33

Figure 34

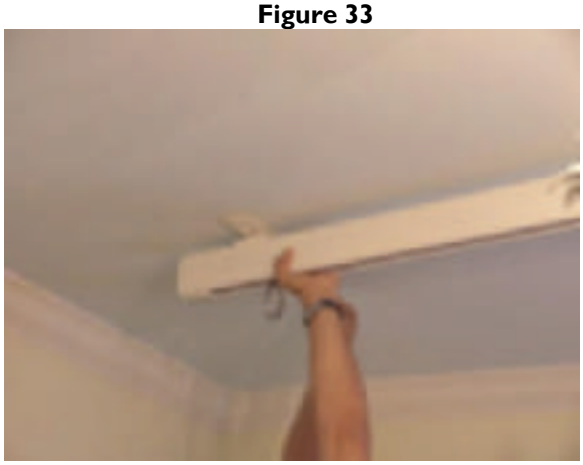

Figure 35

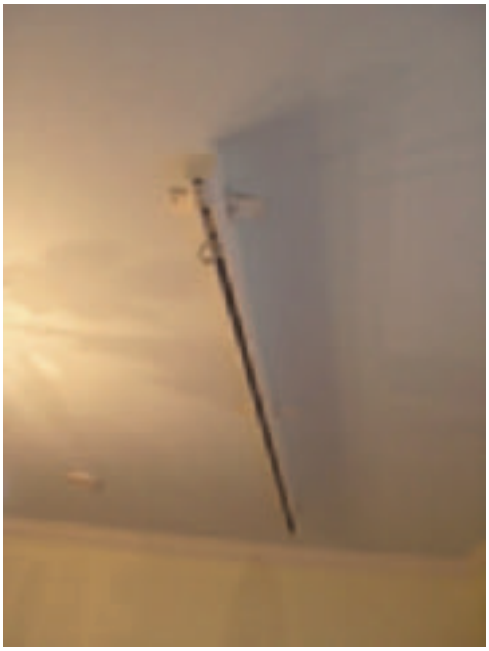

Figure 36

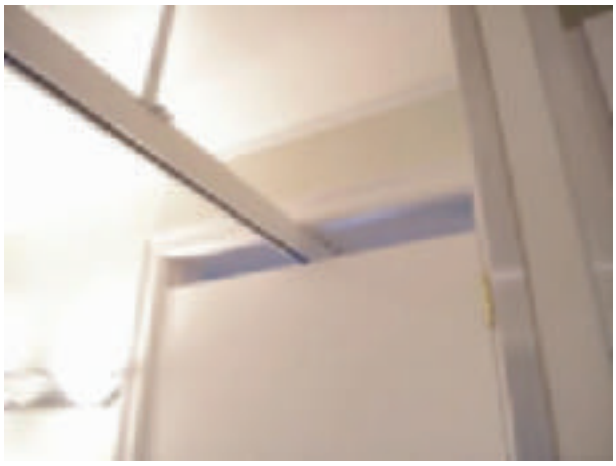

Figure 37

Figure 38

APPENDIX E: DRAFT QUESTIONNAIRES

The following interview questionnaire is designed to address the following research questions:

1. How are ceiling track systems being used? (e.g., bath care, room transfer, etc.)
2. Has the installation of a ceiling track system assisted parents and/or caregivers?
3. What are the problems encountered in installing and using ceiling track systems?

Interview Form

Study ID#_____ Date:_____ (dd/mm/yy)

Location (by community only – no specific addresses) _____

Lift system (manufacturer and model)_____

Questions 1 to 40 are to be addressed to the client only.

Questions 41 to 50 are for the primary caregiver only.

How are the track systems being used?		
Personal Data about the Client		
Question #	**Description**	**Response**
1	Age	
2	Weight	
3	Height	
4	Sex	
5	Education and/or work experience	
6	Marital Status	
7	Current Time Living at Current Location	
8	How many people live here with you?	
9	Do you have the assistance of a Community Health Worker?	
10	Does the CHW help on a daily basis?	
About Your Ceiling Lift		
11	How long have you used a lift?	
12	What are the main things that you use a lift for?	
13	How may times per day do you think you use your lift?	
14	Which rooms have ceiling track?	
15	Are there any other areas where you think a ceiling track system would assist in your daily routines?	
16	How did you obtain your track system? Why are you willing to use a lift?	
17	Do you know what it cost?	

Has the installation of a ceiling track system assisted parents and/or caregivers?

	How you feel about using your lift					
		1 Strongly Agree	2	3 Somewhat Agree	4	5 Strongly Disagree
18	It feels comfortable when I use my lift (e.g., I don't feel uncomfortable in my sling)					
19	I like how my lift system looks in my home					
20	My lift system is quiet					
21	When I am moved from one place to another it generally feels smooth and not too bumpy					
22	I am happy with the range of options my lift has					
23	I feel safe when using my lift equipment					
24	I am happy with the quality of installation of my lift					
25	I am happy with the quality of service from my lift installer					
26	My lift and track system fits well in the home I live in now					
27	My lift and/or track system is easy to move around					
28	My lift is easily positioned where I need it to be					
	What are the problems encountered in installing and using ceiling track systems?					
29	If you have ever been hurt using your lift equipment, can you tell me what happened?					
30	Tell me about times when your lift failed or had a mechanical problem that needed a service call.					
31	What did you (or anyone else) have to do to your home to prepare for the lift installation?					
32	What kind of effect do you think the lift and track system has on others that live here?					
33	How has the lift and track system changed the way professionals are able to assist you?					
34	Are you aware of the ways that you can be transferred safely? (If not, do you assume that your caregiver is trained for this?)					
35	What kind of explanation did you get on how the lift system works when it was installed?					

		1 Strongly Agree	2	3 Somewhat Agree	4	5 Strongly Disagree
36	The time it takes to transfer me (e.g., from chair to bath) is fast enough					
37	My lift is easy to operate					
38	My lift system has helped to restore abilities or options that I did not have without a lift (e.g. full baths or movement in the living space)					
39	What other problems have you had with your lift?					
40	What other benefits have you had with your lift?					
Questions for Community Health Worker, Primary Caregiver or Parent						
41 (for CHWs only)	Is this situation typical of what you see with your clients that need ceiling-lift devices?					
42	How do you clean the lift system?					
43	How are you able to store the system when not using it?					
44	In what ways has the track and lift system taken away from the living space for the other people who live here?					
45	What things were hard to learn about using the lift? What things were easy?					
46	What kind of training do you have in safe transfer techniques?					
47	When have you ever not used the lift and transferred someone manually? Why?					
48	What are the positive things about the track system in your daily routine?					
49	What are the negative things about the track system in your daily routine?					
Additional Questions for Client and Community Health Worker or Primary Caregiver (if applicable)						
50	Are there any other experiences with your lift, either when it was being installed or since then, that you would like to tell me about?					

Installation Expert Questionnaire

The following interview questionnaire is designed to complement the research question asked of caregivers and clients:

What are the problems encountered in installing ceiling track systems?

Installer Experience	
Questions about the kinds of general issues and problem you have experienced when installing ceiling lifts	
1	What are the typical tasks that you have to do to prepare a home for the lift installation? (based on question 31 in Client and Caregiver questionnaire) How long do these tasks usually take to perform?
2	What are the typical kinds of renovations required to install a ceiling lift?
3	What building code requirements are there for installing a ceiling lift?
4	What kind of explanation do you provide clients and caregivers on how the lift system works when it is installed? (based on question 35 in Client and Caregiver questionnaire)

Actual Installation Observations
This portion of the interview involves non-quantitative, unstructured observations while attending a ceiling-lift installation
Note the general activities and kinds of renovations performed while the ceiling lift is being installed (attach additional pages as required).

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