

IDENTIFYING RESEARCH NEEDS FOR WHEELCHAIR TRANSFERS IN THE BUILT ENVIRONMENT

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BACKGROUND

For wheeled mobility device (WMD) users performing independent transfers, the task of moving oneself from one surface to another, is essential to performing activities of daily living yet many people report difficulties with transfers to surfaces in the built environment such as commodes, amusement park rides, playground and medical diagnostic equipment (Toro, Koontz, Cooper, 2012). Very little is known about how the built environment impacts the performance of an individual's transfer. To gain a better understanding of this the U.S. Access Board and the National Institute on Disability and Rehabilitation Research (NIDRR) has sponsored a multi-year research project on independent transfers.

In the first phase of this study Toro et al. performed an expert review on current transfer knowledge that concluded "there is no evidence concerning height differences, horizontal distance, and space needed next to the target surface so it can be accessible by a majority of WMD users" (Toro, Koontz, Cooper, 2012, p. 1). Toro et al. then performed an experimental study where 120 WMD users performed independent transfers to and from a custom-built transfer station to evaluate how the "height differential, gap, placement of a non-removable armrest, and the effect of grab bars" impacted the subject's ability to transfer (Toro, Koontz, Cooper, 2012, p. 1). It was found that the Americans with Disabilities Act Accessibility Guidelines (ADAAG) guideline for grab bar height did not match up to the preferred grab bar height of their sample of independently transferring wheelchair users. This study also showed that transferring higher and lower than an individual's WMD seat height and the addition of a gap or obstacle made the task of transferring more difficult or impossible for some subjects (Toro, Koontz, Cooper, 2012).

In preparation for the second phase of this study we aimed to form an international workgroup of experts with various backgrounds in independent wheelchair transfers to facilitate an exchange of ideas and information related to independent transfers and to develop future research directions. The ultimate outcome of the Independent Wheelchair Transfer (IWT) workgroup is a research agenda that addresses current unmet needs concerning independent transfers in the built environment. The results from the IWT workgroup will be used in part to guide the next phase of

research on independent transfers. The purpose of this paper is to describe the methods involved with forming the IWT workgroup and the outcomes of the first live web-based meeting which occurred on September 26th, 2012.

METHODOLOGY

Participant Selection

This study received exempt approval by the University of Pittsburgh's Institutional Review Board. Potential participants were identified by the University of Pittsburgh study investigators' and the Access Board and NIDRR project managers personal networks of collaborators and acquaintances in the field, authors of scientific papers related to transfers among wheelchair users, and by internet searches for individuals whose work closely related to this study's purpose. Potential participants were first approached in July, 2012 by receiving an email that described the purpose of the workgroup and what would be expected of them if they chose to participate. Individuals that agreed to participate were sent another email containing a link to a website created specifically for the IWT Workgroup participants where the background reading material, a survey, and an agenda for the first live web-based meeting on September 26th, 2012 could be found.

Pre-workshop Participant Tasks

Participants were asked to complete a survey prior to the workshop and were asked to read the research project report from Phase 1 of this research study and the existing standards pertaining to transfers. The purpose of the survey was to gather information about each participant's professional background and preference for which sub-topic group they would like to be in during the event (see sub-section on Sub-topic Meetings below for details).

Meeting Structure

A web-based live meeting was chosen as a discussion forum for the IWT Workgroup to minimize costs, eliminate travel time and expenses, and be able to bring experts from across the globe together in one 'virtual' location. The online web-based videoconferencing program Adobe Connect was used along with audio through traditional phone lines to conduct the IWT workgroup meeting. Although Adobe Connect allows for both video and audio, using the phone lines for the audio increased the reliability of the setup as internet connections can be disrupted due to

interference or noise. Three Adobe Connect rooms and three separate conference phone lines were used (one for each breakout meeting with one also used as a main room). Each room was setup with many “pods” where a list of participants, a chat box, PowerPoint slides, closed captioning, notes, and a webcam could be seen by everyone. Adobe Connect also allowed facilitators to share their screens as they took notes on Word documents. Participants had the option to virtually raise their hand, write in the chat box, or speak through their phone to communicate. A technical manager watched over the meetings and provided support to those who needed it. Participants were given the opportunity to test the system a week before the event.

The event was planned for one full working day and was comprised of a combination of two all-participant meetings (early morning and late afternoon) and three small group breakout meetings (late morning to early afternoon). The morning meeting was used as an introduction for the participants and dissemination and discussion of the first phase research results. The small groups were designed as focus groups which elicited detailed discussions on specific topics concerning transfers. During the afternoon session’s all-participant meeting, the small group facilitators provided a summary of their group’s discussion points. Video and audio of the day’s event were recorded using the recording feature in Adobe Connect and a telephone handset audio tap (THAT-2) that recorded audio in and out of the telephones and saved it in real time over the video recording. A closed captioning service (Colorado Caption) was hired to provide real-time captioning through a ‘pod’ within the Adobe Connect environment. This service was also used to transcribe all the contents of the workshop.

Sub-topic Meetings

As the area of independent transfers is somewhat broad we created three sub-topic areas to focus discussion during the small group meetings.

1. Identifying areas where current accessibility standards for elements designed for independent transfers need updating.
2. Identifying what additional research is needed concerning independent transfers, particularly as it relates to the impact of setup on the transfer process.
3. Identifying other issues (e.g., multi-step transfers, transfer-aids, surface stability, surface slope/cross-slope, seat-to-surface gap, etc.) related to independent transfer in the built environment that need further examination.

Participants were assigned to sub-topic groups prior to the live meeting based in part on their survey response preference and that each group had an evenly distributed population of the occupations and wheelchair users represented. Three University of Pittsburgh investigators (Koontz, Crytzer and Cooper) with experience in facilitating

focus groups each facilitated one of the sub-topic group meetings and a note-taker was present to assist them. Pre-determined questions for each sub-topic group were sent to participants in advance so that everyone would be prepared for the discussions.

Data Analysis

Qualitative analysis was performed on the full verbatim transcriptions of the sub-topic discussions. Three independent reviewers reviewed the meeting transcriptions to identify an initial set of codes (e.g. themes). The reviewers then met to come to a consensus on the initial themes. Next, the transcriptions were independently reviewed again so that each participant’s response was assigned one or more codes and any new codes were identified. Once this was done the reviewers met again to compare and contrast their findings and come to a consensus on the final set of codes. The final set of codes for each sub-topic group were compared to each other to further identify any overlapping themes, patterns, or relationships.

RESULTS

Participants

Invitations to participate in the workgroup were sent to 67 experts who are involved in the area of independent transfers (e.g. university professors, clinicians, human factors & ergonomic specialists, architects, assistive device manufacturers, researchers, engineers). Of the 67 invitees 38 accepted to participate, 25 declined, and 4 did not respond. Of the 38 who accepted 7 did not attend the web event making the total amount of workgroup participants 31 along with 3 investigator facilitators. The following are the occupational backgrounds of the participants: five researchers (two also a physical therapist), four engineers/designers, four academic professors, three physical therapists (PT), two architects, two graduate students (one studying rehabilitation science and one studying human factors & ergonomics inclusive design), two occupational therapists (OT), two nurses (one RN and one NP), one industrial designer, a building code consultant, an accessibility manager for a for-profit company, an accessibility specialist/designer for the federal government, a product manager for a for-profit wheelchair manufacturer, a county government employee who works on playground accessibility, and a U.S. Access Board member. The majority of the participants had at least 15 years or more experience in their current profession (67.7%), 12.9% had 2 to 5 years, 9.7% had 5 to 10 years, and 9.7% had 10 to 15 years experience.

Themes

The following list shows all the underlying themes and where they overlapped between the sub-topic areas.

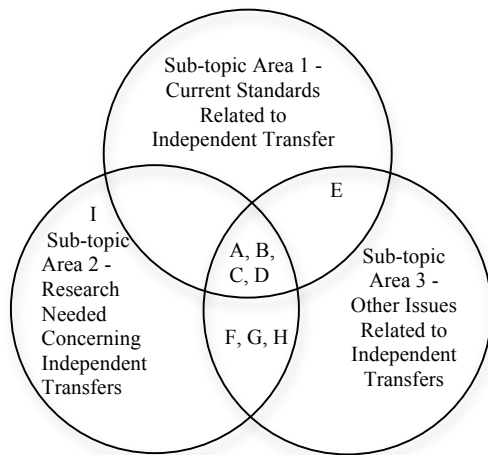


Figure 1 – Overlapping Themes

- A. User Issues, Factors, and Concerns
- B. Transfer Process/Techniques/Preferences
- C. Built Environment
- D. Future Research Studies
- E. Wheelchair Configuration and Design
- F. Transfer Training Evaluation
- G. Interactions Amongst Categories: Environment, Person, and Techniques/Process
- H. Education and Outreach
- I. Terminology and Definition of Transfer Movement/Technique

Of the underlying themes the ones that were felt to be most pertinent to the goals of the U.S. Access Board for the next phase of research on independent transfers were A, B, C, and G. The following are some main points brought up in these themes:

- A. User Issues, Factors, and Concerns
 - What is the cohort of people who perform independent transfers (demographics, physical characteristics, WMD sizes etc.)
 - The need to consider functional reach in environmental design
 - What are barriers for people with disabilities to achieving dynamic stability during transfers
 - What are the limiting factors for transfers according to those who do them
 - The need to learn more about demands of users and their capabilities for different types of equipment (scooter, manual WC, power WC)
 - Some disabilities do not enable people to be as flexible as others
 - How many people prefer to transfer than stay in their chair rather than transfer if the built environment offered that option (ex. restaurants, benches)?
- B. Transfer Process/Techniques/Preferences

- The need to find where people prefer to place their hands during transfers
- The preferred orientation of WMD in relation to the transfer surface or type of transfer
- Left or right side transferring preferences
- Repositioning on the target surface
- Repositioning of chair while transferring back to WMD
- Need to look at the functionality once someone has transferred

C. Built Environment

- Seat Height (Transfer Destination Height)
 - How many people would benefit by raising standard transfer surface seat heights?
 - Have adjustable or multiple transfer surface seat height options
 - Foot contact with floor (important when transferring to a toilet)
- Surface Size
 - Is there enough space to place hands and bottom to perform transfer and reposition?
 - Locations on the transfer surface for facilitating hand placement or grip
 - Stability of places on the surfaces where hands are placed
- Space
 - Clear floor space needed to do the actual transfer (size, shape and placement)
 - Maneuvering space needed to position device before transferring
 - Physical obstructions around or impeding into the space next to the transfer surface
- Accommodation and Equipment
 - Grab bar physical characteristics (height, surface texture, shape, size, position, angle and length)
 - Adjustable features for different people
 - Transfer equipment weight capacity and durability
 - What configurations work best for different built environments
- Grab Bars/Handholds
 - People grabbing onto elements that are not designed for grabbing
 - Space between grab bars/handholds and any obstruction
 - Hand placement on grab bars
 - When and where people place their hands on grab bars
 - What do people do, what helps, where should they be placed?
 - Dependent on anthropometry
- Other
 - Non-Compliant installations
 - How environmental barriers influence the overall demand of performing a transfer
- G. Interactions amongst Categories: Environment, Person, and Techniques/Process

- Should we adapt techniques to the environment or environment to techniques?
- How much risk is appropriate (tradeoff between designing an easier environment but putting the person at an increased risk)
- Need to figure out the things that work better for people with certain physical characteristics (e.g. weak upper body strength) and within certain environments (e.g. nursing homes) and then tailor the environment to them.
- Person strength vs. location of grab bars (mechanical advantages/disadvantages)
- Is there a skill deficit or it is economic cost to configuring the environment that we should focus on?

The participants of the workgroup also identified and addressed current issues concerning independent transfers that are beyond the scope of funding by the US Access Board. These topics included:

D. Future Research Studies

- Need to analyze outside of lab using portable instrumentation in their environment
- Use of video ethnography to identify specific adaptive behaviors

E. Wheelchair Configuration and Design

- WMD modifications to facilitate transfers

F. Transfer Training Evaluation

- Development of materials and guidelines for clinicians (transfer training, identifying environmental constraints)
- Need to train to do different types of transfers for different environments
- More wheelchair skill training before leaving rehab

H. Education and Outreach

- Outreaching to mainstream engineers, designers, architects early on (curriculum or professional society) to educate about this segment of the population and designing for their needs
- More dialog between manufacturers, clinicians, and researchers

I. Terminology and Definition of Transfer Movement/Technique

- Field needs a standardized approach to describe transfer movement

DISCUSSION

The IWT web-based meeting presented a unique opportunity to gather and share information among experts in the field. Overall the meeting was successful and many participants commented about how well organized it was and how much they enjoyed being a part of the effort. A couple minor issues that arose were occasional disconnections and the added expense of calling in for

international participants. As an alternative, participants could follow along with closed captioning and use the chat box to communicate. It was surprising that despite choosing different small group topics to discuss, many overlapping themes were discovered. Only one unique theme was uncovered: Terminology and Definition of Transfer Movement/Technique in sub-topic meeting 2 (research). This is because the discussion went to developing materials and guidelines to be used by clinicians for transfer training and before that could happens the field needs standardized terms that everyone agrees on.

The information gathered will be used to develop the next phase of research for the US Access Board which will entail in part addressing issues raised related to transfers to platform surfaces without backrests and handheld use and locations. Points brought up during this workgroup concerning perceived barriers to transfers, types of transfers people routinely do or would never do and for what reasons, and identifying the demographics of those who independently transfer will be incorporated into a questionnaire to administer to subjects who participate in future studies. The points made beyond the scope of the Access Board study are very valuable for learning more about independent transfer and should be considered by other groups for future research studies.

The results of the workgroup codes and themes will be sent to the participants for comments. Based on the participant feedback the results will be revised and sent back to the participants to approve and to rank in order of priority. Statistical analysis will be performed on the rankings to determine the priority themes which will then form the research agenda for independent transfers in the built environment.

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