

CRITICALLY APPRAISED TOPIC

FOCUSED CLINICAL QUESTION

In preschool children with limited or no ambulation is an interdisciplinary specialized adaptive seating and mobility assessment more effective at improving function and/or participation than an assessment from a physical or occupational therapist alone.

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CLINICAL SCENARIO

Young children with significant physical disabilities often require adapted seating and mobility. For this population independent sitting, standing or walking is not possible without equipment. Seating and mobility equipment recommendations are made most often by treating occupational or physical therapists based on their current patient knowledge with assistance from a durable medical equipment provider or assistive technology professional. Although pediatric physical therapists have the basic knowledge necessary to prescribe equipment few have specialized seating training or certification.

In Eastern North Carolina most young children with physical disabilities receive early intervention, school system or outpatient physical therapy without being seen by a specialized diagnosis clinic for medical or equipment needs. The closest interdisciplinary pediatric seating and evaluation team for children residing in Eastern North Carolina is located in the Raleigh/Durham area. This distance increases the burden of care for families of children with disabilities in Eastern North Carolina. Evidence to support improved functional outcomes from a coordinated interdisciplinary seating and mobility assessment for children with disabilities will justify to local health care providers the need for a specialized pediatric clinic to serve the eastern portion of our state.

SUMMARY OF SEARCH

[Best evidence appraised and key findings]

- There are no randomized controlled studies comparing patient outcomes from a specialized seating clinic versus a single physical therapist or occupational therapist.
- Clinicians in the UK agree on the desirability, feasibility and importance of a multi-disciplinary approach for seating and mobility assessments for children.
- Future studies should employ an RCT to compare pediatric seating outcomes between a specialized center and the community treating pediatric physical or occupational therapist.
- Eight studies were identified that met the inclusion/exclusion criteria and included 3 low quality qualitative studies, one high qualitative study, one case study, and 3 low quality cohort studies.
- Pediatric seating and mobility assessments in the UK consistently perform evaluation of current seating device and provide equipment prescription.
- Clinicians prescribing adapted seating for children in the UK agree on the essential components of a seating assessment and the importance of a knowledgeable and experienced therapist.
- An individualized wheelchair assessment and intervention from a trained therapist demonstrated statistically significant higher initial wheelchair use and home modifications for elderly adults being discharged from the hospital.
- A specialized seating assessment demonstrated statistically significant improvements in skin management independence for patients with SCIs in the UK.
- Authors describe the need for future research to distinguish which components of the seating assessment intervention significantly reduce secondary impairments and positively impact patient function and participation, establish a standardized assessment tool and valid outcome measures, and delineate expert consensus of necessary evaluation and education components for seating and mobility assessments from specialized centers in the US.

CLINICAL BOTTOM LINE

Experts in pediatric seating and mobility seating and mobility agree that a multi or interdisciplinary team assessment is best practice for children requiring adapted seating and mobility. Studies with adults provide weak evidence in support of enhanced patient outcomes from a seating and mobility assessment completed by clinicians with experience and specialized training in seating and mobility assessment and intervention. Future research is necessary to establish an internationally accepted standardized assessment and outcome tools in order to compare outcomes from an inter- or multi-disciplinary assessment versus a single treating therapist.

This critically appraised topic has been individually prepared as part of a course requirement and has been peer-reviewed by one other independent course instructor

SEARCH STRATEGY

Terms used to guide the search strategy			
<u>P</u>atient/Client Group	<u>I</u>ntervention (or Assessment)	<u>C</u>omparison	<u>O</u>utcome(s)
"Limited ambulation" non-amb* non-ambulatory impair* disab* "neuromotor disease"	Seating Wheelchair Assessment Evaluation Fitting recommendation prescription interdisc* Multi-disc* expert team specialist	Occupational therapy Physical Therapy Therap* Physiotherapy Clinician	Participation quality of life Function* outcome* mobility ischial pressure "postural control" Posture ADL pain Fatigue Endurance "best practice"

Final search strategy:

Databases and Sites Searched	Number of results	Limits applied, revised number of results (if applicable)
PubMed	4 for children	18 removing age limitation
CINHAL	0	12 removing #8 from final search strategy
Hooked on Evidence	0	Even a basic search of seating assessment or wheelchair assessment was not productive
RESNA search (Assistive Technology Journal)	34	Could only combine a few key words therefore many irrelevant studies

INCLUSION and EXCLUSION CRITERIA

Inclusion Criteria

Academic Journals

Children or adults considered non-ambulatory or with limited ambulation

Physical or Occupational Therapist involved in assessment or intervention.

Randomized Controlled Studies, Controlled Trials, Uncontrolled trials, Case Studies, Review Articles, Meta-Analysis, Qualitative Studies

Published in English

Data collection included analysis of assessment components or measurement of quality of life, participation, ADLs, function, postural control or ischial pressures, pain, fatigue, mobility, ADL or endurance.

Exclusion Criteria

Dates prior to 1990

Letters to the editor, magazine article based on opinion without references

RESULTS OF SEARCH

A total of 8 relevant studies were located and categorized as shown in the following table (based on Levels of Evidence, Centre for Evidence Based Medicine, 2011) Qualitative Study guidelines were used to assess qualitative research (21 questions). Downs and Black quality assessment was used for remaining studies.

Summary of articles retrieved that met inclusion and exclusion criteria

Author (Year)	Study quality score	Level of Evidence	Study design
(Kennedy, Berry, Coggrave, Rose, & Hamilton, 2003)	Low 12	2c	Observational Outcome Study, Retrospective Cohort Between Subject Design
(Huhn, Guarrera-Bowlby, & Deutsch, 2007)	Low 2	5	Single Case Description
(Ryan et al., 2009) Adaptive Seating Outcome	Low 9	4	One group Prospective pretest-posttest design
(Hoenig et al., 2005)	Low 12	4	Quasi-experimental prospective cohort study between subject repeated measure design
(Schein, Schmeler, Brienza, Saptono, & Parmanto, 2008)	3 Low: Development Study	5 (not completed)	Quasi-experimental, Prospective Cohort repeated measure design
(Wright, Casey, & Porter-Armstrong, 2010)	High 18	5	Non-experimental Qualitative Study: Two arms: Observational and Delphi
(Isaacson, 2011)	Low 5	5	Non-experimental, Qualitative Study Delphi (Consensus)
(Guerette, Tefft, & Furumasu, 2005)	Low 10	5	Non-experimental, Descriptive Qualitative Study: Survey

BEST EVIDENCE

The following 3 studies were identified as the 'best' evidence and selected for critical appraisal. Reasons for selecting these studies were:

<p>(Wright et al., 2010): These investigators describe seating assessment for children in the UK based on observations and survey of providers in seating clinics. Clinically results of the survey are useful for establishing practice guidelines for assessment. This is a well-designed high quality qualitative study.</p> <p>(Hoenig et al., 2005): Although the subjects in this study are adults, the results demonstrate improved outcomes from a specialist in seating/wheelchairs in the US as compared to treating physical therapist in acute care. Although this is not a high quality study investigators attempt to explore the effect of a specialized seating assessment completed by an experienced clinician in comparison to a staff physical therapist.</p> <p>(Kennedy et al., 2003): The subjects in this study are adults s/p SCI in the UK. The investigators compared independent skin management at different time points after assessment and education from a specialized seating clinic. One of the groups received only standard skin management education and seating recommendations from treating rehabilitation team. Although not specifically described the seating clinic employs a multi-disciplinary approach to assessment and treatment. This study provides initial justification of a specialized seating clinic for improved outcomes.</p>
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SUMMARY OF BEST EVIDENCE

(1) "Establishing best practice in seating assessment for children with physical disabilities using qualitative methodologies" by Wright et al. (2010)

Aim/Objective of the Study/Systematic Review:
The purpose of this study is to delineate the currently accepted and employed elements of a pediatric seating assessment by physical and occupational therapists working in specialized seating clinics the UK and Ireland. The findings may assist with creation of a clinical seating assessment tool.
Study Design
As the title states, this is a qualitative study based on a grounded theory approach. Data collection consisted of non-participant field observations, observations via recorded video and written questionnaires. Observational data was collected via a checklist consisting of 83 items previously determined aspects of a seating assessment based on expert opinions from the literature. A member of the research team collected on-site descriptive and checklist data while videotaping therapists seating evaluations with children. Two different members of the investigative team reviewed video records separately. A second investigator collected checklist and descriptive data. Expert consensus was based on 70% agreement in three rounds of the Delphi technique. The first round comprised of open-ended questions to elicit opinions regarding the necessary components of seating assessments. The most repeated participants in the second and third rounds based on importance, desirability and feasibility subsequently ranked themes and components. The authors provided participants with questionnaire results in rounds two and three.
Setting
Regional pediatric seating assessment clinics in Scotland, Ireland and Wales.
Participants
The authors initially identified 569 seating centers via internet and database information from six distinct geographic areas of the United Kingdom with the goal including one center from each location. Randomized selection was employed for areas with more than one eligible center. Centers conducting only adult seating assessments were excluded. Eligible clinics employed physical or occupational therapist and performed pediatric seating assessments (6months to 18 years of age) at least weekly. Eligible therapists were only required to have a license without regard to experience for the observational study but a minimum of 2 years experience was required for the questionnaire study. The sample was purposive using only regional centers routinely performing seating assessments. At the start of the study five sites were selected however two were lost due to resource limitations or exclusion criteria. Data was collected from 13 therapists from 3 separate regional seating clinics. The majority of the therapists were female occupational therapists with varying amount of professional experience. Most reported seating and mobility training but none were accredited in seating. Additionally, 8 out of 13 respondents had less than 6 years experience in specialized seating and mobility. 5 out of the 6 evaluated children had received adapted seating in the past. Additionally, 4 out of 6 children attended specialized schooling and 3 out of 6 where adult sized and over the age of 13.
Intervention Investigated
<i>Observational Study</i>
Data was collected from six seating assessments in three regional centers. Data was comprised of written descriptions and occurrences of pre-determined assessment components within the categories of interview, observation in current seating, mat assessment, skin inspection, mat sitting assessment, seated measurements, goals, seating simulation, identification of product specifics, prescription and education on delivery and training.
<i>Delphi Study</i>
Round 1 included only one open-ended question. "When you think of a 'best practice' children's seating assessment, what components, tools or techniques do you think should be included?"pg. 38 The research team grouped the responses into 3 broad themes of assessment process, assessment approach and broader issues with a total of 21 sub-themes. Details regarding how this was accomplished are not provided but the authors state a systematic approach was utilized. Rounds 2 and 3 surveyed participants to evaluate each sub-theme on importance, desirability and feasibility using a 5-point Likert scale.

<p>Outcome Measures (Primary and Secondary)</p>
<p>Observational: Frequency and percentage of observations from an 83-item checklist devised from best practice seating assessment literature.</p> <p>Delphi: Consensus and general rating of response (positive, negative or neutral) for 21 sub-themes identified in round 1 by participants.</p>
<p>Main Findings</p>
<p>Observational The only two seating assessment items performed in all six observed evaluations were assessment of current seating device and equipment prescription. Participants omitted obvious assessment of behavior, social development, emotional development, funding, reflexes, skin inspection for areas of redness or sores, measurements of flexed elbow height, transfers and simulation. Additionally, only 16.7% of therapists evaluated the need for lateral trunk support, discussed plans for subsequent delivery/training/education or preformed all of the necessary musculoskeletal measurements and observations included in a mat evaluation. Four of six therapists assessed tone, pelvic alignment, and trunk alignment and discussed goals with the family as they pertained to function and prescribed equipment. Observed evaluations were completed in 20-60 minutes.</p> <p>Delphi Overall a consensus was reached on the importance, desirability and feasibility for the all of the sub-themes identified in round one except: 1. importance of standard assessment and care pathways and 2. feasibility of review, standard vocabulary and assessment, care pathways, training and legislative knowledge.</p>
<p>Original Authors' Conclusions</p>
<p>According to the authors, therapists understand the foundational aspects necessary for an optimal pediatric seating assessment based on current expert opinion available in the literature. Although there is agreement among practicing clinicians multiple previously identified best practice components were not observed. The authors believe this is possibly due to constraints on practice or health care institutions, non-articulated thoughts of participants or previous experience with patients. Missing components may lead to improper equipment prescription, decreased functional use, discomfort, transportation issues, inadequate funding, skin breakdown or physical injury due postural mal-alignment. Omitted elements of the assessment may have been due to the intuitive clinical reasoning without explicit verbalized statements.</p> <p>The authors believe a multi-disciplinary assessment including a physical or occupational therapist is both realistic and ideal based on its use in two out of the three centers studied. Additionally, inadequate training or accreditation may result in deficient seating use and prescription. Although none currently exist, a standardized assessment and outcome measure of seating prescriptions is necessary to improve best practice.</p>
<p>Critical Appraisal</p>
<p>Validity</p>
<p>Guidelines for Critical Review of Qualitative Studies: 18/20</p> <p>Triangulation data, observations from two separate observers, use of a pilot study and three rounds of consensus building are the strengths of this qualitative study. The authors attempted to collect all of the relevant observations with repeated reviewing of videotape by both an initial and second researcher. However, the authors did not explicitly state whether the same investigator completed all of the initial observations and recording. "A member of the research team visited all three centers to carry out observations."(Wright et al., 2010) pg 36. This threatens reliability of a qualitative study. However, repeated review of video recordings strengthens and confirms initial data collection.</p> <p>The greatest threat to the validity (or credibility) of this study lies in the sampling technique, expertise of participants, small sample size, limited geographic area and response rate. Only three geographic locations out of six possible were sampled due to dropout or lack of appropriate clinics. Original sampling may have also excluded experts in seating assessments in non-regional centers routinely servicing children in the home or local clinics. Accurate sampling is difficult in pediatric seating because many therapists handle equipment prescription individually for regularly treated patients. The validity of a qualitative study employing the Delphi technique is based upon the involvement of experts in the area under investigation. (Keeney, Hasson, & McKenna, 2001) Although the original sample aimed to capture experts currently practicing in seating assessment none of the therapist completed accreditation in seating and the majority had only 0-5 years of experience in seating and mobility. Additionally the Delphi study only consisted of 9 therapists with subsequent responses and data collection from 7 in round one and 6 in round 2 and 7 in round 3. The Delphi conclusions</p>

could be augmented through inclusion of known experts in seating throughout the geographic location even without participation in the observational arm of the study.

Participants in the observation arm comprised of only four therapists half of which had 0-5 years of experience in seating and mobility. The strength of a purposive sample and Delphi study is determined by the information gathered from known experts. Analysis of the approach used to process the survey responses is not possible. The authors state that a systematic approach was used to analyze round one responses but a clear description of utilized procedures was not provide.

Interpretation of Results

The results of the study imply that although therapists agree on the crucial aspects of a seating assessment for children an intuitive, therapist individualized approach based on clinical experience and reasoning is highly valued. Standard assessments feasibility was narrowly reached (71%) on the third round. Consensus for the feasibility for equipment trials, review, legislation knowledge, training, care pathway and standardization of vocabulary was not reached and is feasibility.

The lack of consistent performance of mat assessment and anthropometric measurements during the observational study is a concern. Although most therapists clearly addressed pelvic alignment a thorough assessment of the trunk and hips was not consistently completed. This corresponds to the first round of the Delphi study. 100% consensus was not reached for supine assessment. Supine assessment was deemed important by 84%, desirable by all and feasible by only but only 50% of respondents. However, by the third round consensus feasibility was narrowly reached at 71%.

Desirability was also barely attained for standardized assessment and simulation. Respondents rated simulation as unfeasible. This correlates with low percentage of equipment trials or simulation during observed assessments. During observations no therapists assessed transfers, few discussed goals of mobility/durability transportation or the environment. Lastly, a multi-disciplinary approach is important, desirable and feasible within the studied geographical health environment.

Although a consensus was reached, all of the participating centers and therapists were located in the United Kingdom and the observed and documented opinions may not directly apply to other countries, specifically the United States. Unfortunately, reimbursement issues strongly influence financial access to evaluations and prescribed equipment.

(2) "A Clinical Trial of Rehabilitation Expert Clinician Versus Usual Care for Providing Manual Wheelchairs" by Hoeing et al., 2005

Aim/Objective of the Study/Systematic Review:

To measure the effect of an individualized wheelchair assessment and intervention delivered by a therapist trained in seating and mobility versus standard care delivered by a licensed therapist.

Study Design

This study is quasi-experimental prospective cohort study between subject repeated measure design. This was a quasi-experimental study due to lack of fully randomized allocation, convenience sampling and group assignment based on day of the week. Investigators attempted to control for variance among intervention and control groups by alternating group assignment within the study. Initially patients were referred to a specialist Mondays, Tuesdays and Wednesdays (8am -12:00pm). The second half of the study allocated patients to the intervention group Wednesday (8am-12:00pm), Thursday and Friday. The control group consisted of patients referred for a wheelchair on the remaining days. Therefore group assignment was not completely random but based on naturally occurring group of patients requiring wheelchairs based on physician recommendations. Therapists and subjects were not blinded to the study. Outcome measurements were collected 2 weeks, 3 months and 6 months after intervention.

Setting

Assessment and intervention took place during hospital admission at Durham Veterans Affairs Medical Center, Durham NC. Outcome measures were performed via phone self-reports.

Participants

Initially the study recruited 84 total subjects with data collected from 64 at first follow up, 67 at second and 57 by the last follow-up. This is a convenience sample of patients admitted to DVAMC and referred for a manual wheelchair prior to discharge. Patients were deemed eligible based on referral for a manual wheelchair from a

<p>VA physician or therapist, discharge to community, long distance ambulation deficits (unable to walk more than 3 blocks), no more than 1 month of wheelchair use over the last year, tolerated being out of bed for at least one hour, and cognitive ability of follow directions and give consent based on the Short Portable Status Questionnaire score of at least 6/10. 94% of the subjects were male and required wheelchairs for medical activities due to a weakness, poor balance, fear of falling, shortness of breath and/or pain. The overall mean age was 65 with large standard deviation of 13.7. 94% were men of whom more than 75% required assistance for mobility related to community and medical activities and personal assistance most likely related to ADLs and IADLs. This is based on self-reported measure of 4.5-5 mean ADL and IADL itemized difficulties. Over 65% needed assistance for home and recreational mobility. More than 70% were hospitalized within the last six months and required a wheelchair for multiple impairments possibly including weakness, poor balance, fear of falling, pain and/or shortness of breath. On average participants reported 2.2 chronic conditions and 80% considered their health to be fair or poor.</p> <p>The authors analyzed the two groups using p values. In this case a high p value would indicate similarities in groups. Significant variances between groups included previous hospitalizations, reported impairments requiring a wheelchair, activity need for wheelchair, recent hospitalizations, gender, race and socioeconomic demographics.</p>
<p>Intervention Investigated</p>
<p><i>Control</i></p>
<p>Wheelchair assessment, prescription and delivery provided by a licensed physical or occupational therapist or assistant without specific training in seating or mobility. Licensed therapists utilized their own clinical judgment regarding to determine appropriateness of a standard wheelchair and/or need for different equipment, consultation with a seating specialist or home assessment.</p>
<p><i>Experimental</i></p>
<p>Five component equipment provision and intervention process with specific components not included for control. A therapist with specialized education and experience with seating and mobility performed a 1 to 1 ½ hour wheelchair assessment, prescription and training prior to discharge. The outlined process comprised of five distinct items. 1. Trained occupational or physical therapist. 2. Assessment 3. Individually fit and additional appropriate referrals. 4. Wheelchair training. 5. 3 week and 6 week interview follow-up.</p>
<p>Outcome Measures</p>
<p>All data was collected using responses from patient surveys by the primary investigator. Measured dependent variables included responses to interviews or surveys but the authors did not clearly indicate if this was done in person, phone or written surveys. Extraneous variables are assumed to come from chart reviews but once again this was not explicitly stated.</p> <p>Primary Dependent Variable</p> <p>Wheelchair use was measured using ordinal scale of 1-5 based on increasing amounts of weekly or daily use of wheelchair.</p> <p>Secondary Dependent Variables</p> <p>Secondary variables included both nominal and ordinal data. Wheelchair comfort and confidence were measured with ordinal scales, shoulder pain with a nominal measure of "yes" or "no", and reports of home based on survey response.</p>
<p>Main Findings</p>
<p>The intervention group reported more wheelchair use and home modifications then the control group for all repeated measures with only wheelchair use decreasing in both groups over time. Mean wheelchair use on an ordinal scale of 1-5 was 3.14 for the intervention group compared to 2.25 of the control at 2 weeks. At 6 months wheelchair use decreased to 1.94 for the intervention group and 1.38 for the control group. Categorical secondary variables were not significantly different between groups or over time. Most common home modifications were installation of ramps, bars and use of adapted toilet or bath seat. Increased wheelchair use was related to shoulder pain and home modifications. However, absolute differences between groups for wheelchair use and home modifications are listed below.</p> <p>None of the usual care therapists referred patients to the trained seating specialist for recommendations or further assessment. Percentage of prescribed wheelchairs in the intervention group: standard wheelchair 45.3%, light weight wheelchair 28.3% and power wheelchair or scooter 20.8%. In comparison to the control group who were prescribed a standard wheelchair 71% of the time, light weight wheelchair 12.9% and a power</p>

wheelchair or scooter 3.2% of the time. 96.2% of the intervention group was provided cushions versus 64.6 in the usual care.

The intervention group received 35.1 more minutes of treatment than the usual care group.

Amount of Wheelchair Use (WC)	2 weeks Intervention	2 weeks Usual Care	Difference	3 Months Intervention	3 Months Usual Care	Difference
% Patients Reported Any Use of Wheelchair	94.4	73.8	20.6	77.8	53.4	24.4
% Patients Reported Up to 1 Day a week	86.1	60	26.1	52.8	46.7	6.1
% Patients Reported Up to 2 Days a week	63.9	43	20.9	22.2	13.4	8.8

Home Modifications	2 weeks Intervention	2 weeks Usual	Difference	1 Month Intervention	1 Month Usual Care	Difference
% Reported ANY Home Modifications	57.4	29.5	27.9	95.5	35	60.5
% Reported ramps, bars, raised toilet seat	48.8	17.5	31.3	66	21.8	44.2

Original Authors' Conclusions

The authors conclude that a specialized assessment and intervention increases daily patient wheelchair use and home modifications more than usual care. They also reported wheelchair use was significantly related to shoulder pain and home modifications. However, this was not illustrated on any of their data tables.

The cost of prescribed wheelchair is higher in the intervention group due to specialized cushions and non-standard wheelchair prescriptions. The subjects in this study differed from the national population due to increased percentage of males, Caucasians and significantly more ill patients.

Critical Appraisal

Validity

PE德罗 Scale 2/10

Downs and Black 12/27

This study has many threats to internal validity based on the study design, poorly described intervention, group allocation, high attrition rate, significant group differences, small sample size, choice of outcome measures, investigator bias, and possible Hawthorne effect. Additionally, external validity is questionable because the convenience sample was not representative of the typical elderly population and the primary investigators experience is atypical of a true specialist. Although the investigator received specific training in seating and mobility, s/he was not certified as an assistive technology professional (ATP) or a seating and mobility specialist (SMS). Most specialized seating clinics employ therapists who are also ATPs or SMS.

A total of 27 patients died during this study and attrition rates varied for each repeated measure from 20-32%. Therefore the results were from a much smaller sample size than originally recruited.

The study analyzed ordinal and nominal data means with a mixed-model regression to compare data within and between groups. This statistical tool is appropriate but the use of means for the ordinal measure of wheelchair use is questionable. The scores within the ordinal Likert scale used to quantify wheelchair use are not equidistant. For this level of measure, median and range of scores with analysis using non-parametric statistics of difference may be more appropriate.

The experimental design was not random and the primary investigator performed all of the intervention and data collection. This practice allows for significant bias and the possibility of the subjects inflating their responses based on the tone or cues inadvertently provided by the investigator. The methods do not adequately describe the specific components of the assessment or measurements taken. The primary outcome measure was wheelchair use as measured by an ordinal self-report has been used in other studies by the primary investigator but not validated in the literature. More recent studies support the use of accelerometers as a valid measure of physical activity, wheelchair use and posture. (Murphy et al., 2014; Sonenblum, Sprigle, Caspall, & Lopez, 2012; Vermaete, Wolter, Verhoef, & Gosselink, 2013)

Interpretation of Results

This is the only study comparing patient wheelchair outcomes between interventions provided by an experienced therapist with seating and mobility training with and licensed therapists without specific training. The investigators found a statistically significant increase in wheelchair use and home modifications in the intervention group. However, by 6 months the difference in mean wheelchair use was only .56. This difference is not clinically significant. This finding may be related to the sample of significantly ill patients. A .56 increase does not equate to a higher ranking on the Likert scale used to measure wheelchair use. Accelerometers may provide a less biased approach to more accurately quantify wheelchair use.

The use of absolute difference in percentage of wheelchair use at 2 weeks and 3 months may be more meaningful use of data. As a whole the intervention group reported any wheelchair use 20.6-24.4% more than the usual care group at 2 weeks or 3 months respectively. At one month, the intervention group reported any type of home modifications 60.5% more than the usual care group. Specialized intervention provided short term benefits over usual care. Clinically, individualized assessment and education appears to initially increase wheelchair use and home modifications for adult white males being discharged from the Veterans hospital system. Appropriate home modifications and training has the potential to improve patient function and participation.

However, these results have very limited generalizability due to a convenience sample of older, ill, white males being discharged from one Veterans hospital. This population may be much less motivated, willing or able to independently use a wheelchair, manual or power. In my experience children who are non-ambulatory are not "sick" and exhibit the opposite effect after proper wheelchair prescription. Children are motivated to move and theoretically function improves over time with learning.

Assessment and education for appropriate home modifications is necessary to improve functional wheelchair use. Therapists without specialized training may neglect this component during assessment and prescription resulting in less frequent home modifications. Many home modifications take considerable time and planning. For children being assessed for wheelchairs, home assessment can be completed by ATP during the assessment period to ensure that the home is ready for wheelchair delivery. Unlike adults, the most important home modifications to improve wheelchair use and independence are ramps, moving furniture and flooring. Children who are non-ambulatory due to developmental disabilities are not issued standard wheelchairs and custom wheelchairs can take up 6-12 months for third party payer approval and delivery.

Future studies can compare patient and caregiver outcomes from pediatric seating clinics versus treating physical therapist. Collected data could include accelerometry, HRQOL, parent proxy reports of child's participation, ability to complete ADLS, or Caregiver burden questionnaires.

(3) "The effect of a specialist seating assessment clinic on the skin management of individuals with spinal cord injury" by Kennedy et al., (2003)

Aim/Objective of the Study/Systematic Review:

To compare seating outcomes, specific to skin management, based on timing of a specialized seating assessment and intervention for patients s/p SCI.

Study Design

This is a longitudinal retrospective between subject cohort study of repeated measures. Outcomes were measured within one month after moving out of bed after a SCI and within the first week of admission to the discharge SCI unit. Due to the nature of this design, researchers and subjects were not blind to treatment or

outcome measures.
Setting
National Spinal Injuries Center for Rehabilitation, Stoke Mandeville Hospital in the UK.
Participants
Data was collected from a convenience sample of 50 wheelchair dependent subjects admitted to rehabilitation. Type of wheelchair was not specified. Group 1, 30 subjects, received a seating assessment prior to first data collection of needs assessment base on the Needs Assessment Checklist (NAC). Needs assessment checklist (NAC) is routinely performed during rehabilitation admission. Group 2, 11 subjects, received a seating assessment after first NAC but before the second NAC. Group 3, 9 subjects, did not receive a seating assessment. Group 3 was created from patients that did not participate in a seating assessment secondary to methicillin resistant staphylococcus aureus infection. Group descriptive demographics were not reported. However the mean age for the entire sample was 41.14 years with a range of 16-74 years. Most of the subjects were diagnosed with complete tetraplegia (42%), followed by incomplete injuries (32%) and complete paraplegia (26%).
Intervention Investigated
<i>All Groups</i>
All groups received in-patient rehabilitation at National Spinal Injuries Center. Treatment is not described but authors conclude, "the rehabilitation environment involves a continuous mix of both informal and structured education opportunities." pg 125
<i>Group 1 and Group 2</i>
Comprehensive specialized seating assessment and education performed at different length of time during rehabilitation admission. Seating assessment evaluated patient's posture, alignment, functional wheelchair use, transfers, cushion, skin integrity and patient perceptions of wheelchair and seating. More specifically, skin integrity was measured via inspection, pressure mapping (Oxford Pressure Monitor with visual display) and weight bearing and non-weight bearing tissue oxygen measurements (TCM3 monitor). The purpose of the pressure mapping and oxygen data was to visually educate and engage patients on the importance of optimal seating and pressure reliefs. A report was furnished to the multi-disciplinary team documenting intervention provided, data collected with recommendations for seating, pressure reliefs, and equipment. Authors do not detail what type of health care professional performed the assessment, duration of intervention or supplied recommendations. Group 1 Seating Assessment before NAC. Group 2 Seating Assessment between first and second NAC.
<i>Group 3</i>
Only received in-patient rehabilitation.
Outcome Measures (Primary and Secondary)
To be achieved skin management percentages as measured by the Needs Assessment Checklist (NAC). The NAC measures a patient's perception of independence for skin management using a 0-3 ordinal scale progressing from totally dependent to completely independent. Skin management questions pertain to pressure reliefs, skin checks and prevention of trauma. Skin management raw scores range from 0-52 and calculated "achieved" or "to be achieved" percentage range from 0-100% and are used to indicate perceived independence or need for assistance.(Kennedy & Hamilton, 1999) The skin management needs assessment was administered at the National Spinal Injuries Center by a physical therapist, occupational therapist, nurse, or psychologist.
Main Findings
All three groups statistically improved perception of independence with skin management, as measured by the to be achieved (tba) percentage on the skin management section of the Needs Assessment Checklist (NAC) over time. Group 1 improved more than group 3 at both data collection points. Group 1 decreased Skin management tba NAC by 27.9% (p<.0001). Group 2 decreased skin management tba NAC by 35% (p<.01).

Group 3 decrease skin management tba NAC by 34.2% ($p < .01$).

Group 1 less skin management tba at NAC 1 compared to group 3 by 19.8% ($p < .05$).

Group 1 less skin management tba at NAC 2 compared to group 3 by 13.5% ($p < .01$).

Group 2 less skin management tba at NAC 2 compared to group 3 by 9.4%, treatment effect @.6

Group 1 less skin management tba at NAC 1 compared to Group 2 by 10.2%, treatment effect @.5

Original Authors' Conclusions

The authors conclude that a specialized seating assessment and education is an effective proactive tool necessary to promote improved independence with skin management for patients after spinal cord injury and is best delivered early in rehabilitation.

Critical Appraisal

Validity

PEDro: 3/10 Downs and Black: 12/27

This study has many threats to validity due to small sample size, subject sampling, unreported group descriptive analysis, retrospective study design, poorly described and controlled intervention, and large standard deviation of group means. Retrospective designs lack control and result in outcomes with significant confounding factors. The largest issue is the unknown variability between groups that may have affected outcomes. Improved outcomes for Group 1 may have been influenced by a higher proportion of patients with incomplete SCIs or low level paraplegics. Conversely groups 2 or 3 may have included patients with more tetraplegia or significant trauma from initial mechanism of injury. Additionally, Group 3 was known to be infected with the Staph aureus which potentially decreased their rehabilitation time and resulting in poor outcomes due to isolation or illness. All subjects were involved in rehabilitation but treated by different members of the rehab team and this may have also contributed to the variance in outcomes.

Assessment and seating modifications were not adequately described or controlled. The authors provided detailed description of the tools used to measure skin pressure and skin viability but treatment duration and patient participation was not documented. Some patients could have received significantly more or less intervention.

Means for each group were calculated and compared using t-tests. The t-test is an appropriate measure of difference to compare two means however parametric statistics assumes equally distributed data. The authors only reported standard deviation. A graphic illustration of the data would be helpful to assess for central tendency. The collected data with all groups demonstrated significant variability of outcomes as measured by the standard deviation at NAC 1. With a large standard deviation and possibly non-normally distributed data the Wilcox Signed Rank Test is an alternative to compare outcome within the same group. The Wilcox Rank Sum for between group differences. As mentioned previously there was little control of extraneous variables and this may have contributed to skewed data, or decreased central tendency.

Interpretation of Results

The results of this study provide weak support for the use of a specialized seating assessment and intervention which includes a significant educational component. The aim of intervention is to reduce the risk of pressure sores for patients s/p SCI. Although the results are statistically significant, this study cannot conclude for certain that education decreases the incidence of skin breakdown. However, education and intervention does appear to be effective in improving patient independence. The NAC has been reported to have concurrent validity with SCIM and FIM (Berry & Kennedy, 2003). These are both common outcome measures used to predict function in this patient population. Power of this study is limited by lack of known variance in the subject sample and small sample size. Treatment effect was moderate between Group 1 and Group 2 at NAC 1 and Group 2 and at NAC 2. Although there was no statistical significance, the treatment effect was moderate indicating a possible Type II error.

Clinically, the results indicate that a seating assessment and intervention positively impacts the life of non-ambulatory patients requiring wheelchairs for mobility. Patient engagement in intervention and assessment is enhanced through visual demonstrations of how individual actions and positions affect his/her outcomes. Prescribed pressure relief schedules and skin checks compliance is potentially enhanced due to improved patient understanding of the seating and tissue interface. There is limited ability to generalize to other patient populations and different geographic locations. This study took place in the UK in one rehabilitation center. Here in the United States our health care system and patient rehab access and duration of care is significantly impacted by third party payers. Although these principles of education can be incorporated into rehabilitation programs and outpatient centers.

IMPLICATIONS FOR PRACTICE and FUTURE RESEARCH

Implications for Practice

Experts in pediatric seating and mobility agree that a multi or interdisciplinary team assessment is best practice for children requiring adapted seating and mobility. The members of a team typically include at least a physical or occupational therapist, assistive technology provider, family, and physician. Although this concept is readily accepted no controlled experimental studies were identified to support this claim. However, the results from the appraised studies provide initial support for improved seating and mobility outcomes for adults receiving assessments performed by experienced and specialized clinicians. Young children requiring adapted seating and mobility typically exhibit a wider array of impairments and environmental factors necessitating experienced and knowledgeable clinicians even more so than adults. In the pediatric setting, experienced clinicians typically confer with other health care providers involved in a child's care even if they are not on-site. Therefore, one could argue that most pediatric assessments incorporate interdisciplinary approach to a degree. However, Wright et al. propose the possibility therapist bias contributing to omitted assessment components based on familiarity with children prior to a seating assessment. Previous knowledge may negatively bias assessment procedures. (Wright et al., 2010) A thorough comprehensive assessment must be performed on all patients prior to equipment prescription. Bias can be avoided if a neutral therapist from a specialized seating clinic evaluates children using a standardized assessment with input from regular treating therapist.

The appraised literature found that necessary components are often omitted potentially reducing patient safety, appropriate postural support, comfort, use, or functional outcomes. Observations of seating assessments in the UK found therapists failed to address skin integrity, funding sources, psychosocial status, anthropometric measurements, transfers, lateral trunk support and equipment education or follow-up. Although young children are at a much lower risk of skin breakdown due to smaller size, weight children and ease position change families require education on skin management in preparation for adulthood. The principles of visual education incorporating pressure mapping and seating simulation enhances child and parent engagement and possible use of adapted equipment. Simulation chairs or trial equipment demonstration shows families that adapted equipment improves posture and mobility. Additionally poor postural support may lead to secondary scoliosis. During the assessment education on proper support with images of children with secondary scoliosis possibly due to poor positioning can be used to illustrate the effects of poor positioning.

A comprehensive seating assessment is time consuming and individualized. According to Isaacson, expert clinicians in the US cite time constraints, reduced reimbursement, lack of equipment for trials, and difficulty with home environment assessment. (Isaacson, 2011) Clinically ideal seating assessment can take place over at least two visits and include a follow-up after equipment is received. Initial evaluation focuses on information gathering, physical assessments, mat assessment, seated simulations, anthropometric measurements, and discussion of potential equipment with family and child. After the initial evaluation the assistive technology professional (ATP) performs the home environment and reports back to therapist. Home modifications and appropriate equipment trial are identified and discussed during the second visit. In my experience, mobility provision without adequate home modifications results in patient abandonment of recommended equipment due to space constraints or difficulty with navigation in the home. After all of the necessary information is gathered a second visit is scheduled with the ATP and additional necessary professionals. The second visit emphasizes equipment trial, recommended home modifications with provided resources and, wheelchair/seating education. Funding is also a greater issue here in the United States and this would also allow time to locate resources and contact third party payers. Delivery of equipment occurs at the clinic and provides time for review and family and child education. This practice accurately reflects the time spent and provides an avenue for greater reimbursement of therapy services. Therapists can charge for an evaluation, treatment and follow-up.

Local therapists require education on the necessary components for a comprehensive seating and mobility assessment and appropriate outcome measures. Vidant Medical Center does provide a seating clinic once a month for adults and children. A specific pediatric seating clinic has not been established. The results from this appraised topic provide the groundwork for a pediatric seating clinic proposal with a research component to study outcomes.

Implications for Future Research

Future research is necessary to compare outcomes from an inter- or multi-disciplinary assessment versus a single treating therapist. The themes and checklist from the Wright et al. study should be replicated with a larger sample size from the United States and used in conjunction with current results to design an international standardized tool. Although observational studies are time consuming, a longer period of data collection and larger sample of both therapists and children of varying ages in the US would allow researchers to describe overall pediatric assessments and analyze the data to similarities and variances between age groups. Another option is a retrospective research reviewing written charts from seating clinic evaluations against the same 83-item checklist. An accepted standardized tool ensures utilization of best practices. A standardized tool must then be combined with reliable and valid outcome measures of pediatric function, quality of life and participation. Accelerometry provides a reliable and valid outcome measure of wheelchair use and improved postural control. (Murphy et al., 2014; Sonenblum et al., 2012) HRQOL and participation can also be assessed with a parent proxy reports.

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