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Intensive partial body weight supported treadmill training ¹

Clinical Question

P (population/problem):	In individuals with neurological disorders such as cerebral palsy (CP), spinal cord injury (SCI), and acquired brain injury (ABI)
I (intervention):	is intensive partial body weight supported treadmill training (PBWSTT) robotic or manual
C (comparison)	compared to other activities
O (outcome):	more effective in improving function, specifically gait and/or gross motor skills?

Target Population:

Inclusion

- Children, adolescents, and young adults up to 21 years of age
- Individuals who
 - meet the equipment specifications
Note: For Lokomat® training distance between the knee joint line and the greater trochanter must be between 21 cm and 47 cm (*Hocoma 2009 [5]*).
 - demonstrate emerging gait and/or gross motor skills
 - follow commands and
 - indicate readiness to improve their health through participation in this intensive program.
- Individuals with:
 - CP: Gross Motor Function Classification System GMFCS level II – IV (Appendix 1) (*Hocoma 2006a [5]*, *Mobility Research Website [5]*)
 - SCI: Intact quadriceps and Achilles tendon reflex; American Spinal Injury Association (ASIA) C & D (chronic, greater than 1 year post injury); ASIA B, C, or D (acute, less than 1 year post injury) ² (*Damiano 2009 [1a]*, *Mehrholz 2008 [1a]*, *Hocoma 2006b [5]*, *Mobility Research Website [5]*)
 - ABI (*Hocoma 2006a [5]*, *Mobility Research Website [5]*)
 - Other non progressive neurologic disorders (*Hocoma 2006a [5]*, *Local Consensus [5]*, *Mobility Research Website [5]*)

Exclusion

- Individuals with spinal instability, large disc bulge/rupture (*Hocoma 2009 [5]*, *Mobility Research Website [5]*)
- Individuals with severe orthostatic hypotension that limits time in weight bearing (*Hocoma 2006b [5]*)
- For those with SCI, high resting diastolic blood pressure (BP) that interferes with patients ability to exercise safely
Note: > 90mmHg is considered an exclusion by Hocoma for the Lokomat (*Hocoma 2006b [5]*)

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² American Spinal Injury Association. International Standard for Neurological and Functional Classification of Spinal Cord Injury. Chicago: ASIA. 1992.

- Machine-assisted respiration (ventilator dependent) (*Hocoma 2009 [5]*)
- Individuals not able to tolerate upright position for at least 30 minutes (*Hocoma 2006a [5]*, *Local Consensus [5]*)
- Individuals with severe osteoporosis and/or lower extremity/pelvic/rib fracture (*Hocoma 2009 [5]*, *Mobility Research Website [5]*)
- Individuals with uncontrolled seizures that pose a safety risk and limit ability to participate in program(*Hocoma 2006b [5]*)
- Individuals for whom bed rest or immobilization has been prescribed because of osteomyelitis or other inflammatory and/or infectious diseases (*Hocoma 2009 [5]*)
- When loading of the hip, pelvic, abdominal, and/or chest region is prohibited (*Mobility Research Website [5]*)

Recommendations

1. It is recommended that PBWSTT be considered as a physical therapy treatment intervention in a clinical setting for individuals who show potential to improve gait and/or gross motor skills with the diagnoses of:
 - CP (*Mattern-Baxter 2009 [1b]*, *Fiss 2006 [1b]*, *Meyer-Heim 2009 [3a]*, *Damiano 2009 [5]*, *Hocoma 2006a [5]*, *Local Consensus [5]*)
 - SCI (*Damiano 2009 [1a]*, *Mehrholz 2008 [1a]*, *Hocoma 2006a [5]*, *Hocoma 2006b [5]*, *Local Consensus [5]*)
 - ABI (*Hocoma 2006a [5]*, *Local Consensus [5]*) or
 - other non-progressive neurologic disorders (*Damiano 2009 [1a]*, *Fiss 2006 [1b]*, *Tuckey 2004 [5]*, *Local Consensus [5]*)

Note: Treatment can be initiated after a trial has been undertaken to assess fit and tolerance to the equipment (*Local Consensus [5]*).

2. It is recommended that the percentage of body weight support given to the patient is individualized to the patient's needs and determined by clinical judgment of the therapist. The goal is to minimize the amount of body weight support given to the patient while maintaining an erect posture and optimal gait pattern (*Damiano 2009 [1a]*, *Mattern-Baxter 2009 [1b]*, *Marshall 2007 [1b]*, *Local Consensus [5]*).
3. It is recommended that treadmill speed targets functional gait speed but may need to be adjusted to optimize the stepping pattern (*Damiano 2009 [1a]*, *Mattern-Baxter 2009 [1b]*).
4. It is recommended that the intensity of PBWSTT be delivered as follows:

- **Frequency:** 2 or more times per week (*Damiano 2009 [1a]*, *Mattern-Baxter 2009 [1b]*, *Meyer-Heim 2009 [3a]*, *Trahan 2002 [4b]*, *Hocoma 2006a [5]*, *Hocoma 2006b [5]*, *Local Consensus [5]*).
- **Session length:** goal of 30 minutes of direct walking time on the treadmill (*Damiano 2009 [1a]*, *Mattern-Baxter 2009 [1b]*, *Meyer-Heim 2009 [3a]*, *Hocoma 2006a [5]*, *Hocoma 2006b [5]*, *Local Consensus [5]*).

Note: Total session length will be longer to include set up, getting on and off equipment, and carry over to over ground training (*Hocoma 2006a [5]*, *Hocoma 2006b [5]*, *Local Consensus [5]*).

- **Length of episode of care:** 15 to 20 sessions (*Mattern-Baxter 2009 [1b]*, *Meyer-Heim 2009 [3a]*, *Hocoma 2006a [5]*, *Hocoma 2006b [5]*, *Local Consensus [5]*).

Note 1: If the patient is not demonstrating progress towards goals the episode of care may be discontinued. (*Damiano 2009 [1a]*, *Local Consensus [5]*).

Note 2: Plateaus need to be assessed on an individual basis since progress does not always occur in a linear fashion and may occur in increments (*Damiano 2009 [1a]*).

- **Additional episodes:** For acute conditions the length of episode of care may be extended when the patient is continuing to make progress during a time of rapid recovery as determined by appropriate tests and measures (*Local Consensus [5]*). For chronic conditions an episode of intensive PBWSTT may be repeated every 6-12 months if follow-up assessments indicate that the individual gained and maintained new gait and/or gross motor skills (*Local Consensus [5]*).

Note: After an episode of care is completed a break from traditional therapy services may be indicated to “allow practice and generalization” (Schertz 2009 [5]) of skills (Trahan 2002 [4b], Schertz 2009 [5], Local Consensus [5]).

5. It is recommended that a home program be developed and provided to the family with emphasis on skill carryover with suggested activities that target enhanced community participation in daily activity. (Local Consensus [5]).
6. It is recommended that the decision to use robotic versus manual PBWSTT be determined by clinical judgment of the therapist in agreement with child and family preferences, taking into consideration the following:
 - over ground ambulation
 - trunk control
 - motor control
 - spasticity

(Local Consensus [5])

Robotic

Note 1: Robotic PBWSTT may be utilized with individuals who require external assistance to manage many aspects of their gait cycle (Local Consensus [5]).

Note 2: Benefits of robotic PBWSTT are that it provides greater and more precise repetitions of a typical gait cycle and utilizes fewer staff resources (Fiss 2006 [1b], Meyer-Heim 2009 [3a], Local Consensus [5]).

Note 3: Individuals with increased muscle tone that interferes with functioning of the machine may not be eligible for Robotic PBWSTT. (Local Consensus [5])

Manual

Note 1: Manual PBWSTT may be utilized with higher functioning individuals who demonstrate some independence with active stepping for community and household ambulation (Local Consensus [5]).

Note 2: A benefit of manual PBWSTT is that it affords the individual opportunities to self manage aspects of their gait cycle (Fiss 2006 [1b], Local Consensus [5]).

7. It is recommended that regular skin checks are performed before and after the intervention by the caregiver or therapist to monitor skin integrity (Local Consensus [5]).
8. It is recommended that clinicians receive specialized training in PBWSTT prior to providing this intervention. (Mutlu 2009 [1b], Local Consensus [5]).
9. It is recommended that gait speed, walking endurance, gross motor skills, strength (myometry) and occupational performance be evaluated a) before starting the intensive PBWSTT program, b) immediately after completing and c) 6 weeks after completing the intensive PBWSTT program to determine the effects of the intervention. (Schertz 2009 [5], Local Consensus [5]).

Note 1: Recommended Outcome Measures to evaluate treatment efficacy

1. Walking velocity: 10 meter walk/run test (Thompson 2008 [2b])
2. Walking endurance: 6 minute walk test (Thompson 2008 [2b], 2002 [5])
3. Gross motor function measure: GMFM 66 (Russell 2000 [2b])
4. Canadian Occupational Performance Measure (COPM) (Law 1990 [5])

Note 2: Optional Outcome Measures to evaluate treatment efficacy

1. Childhood Assessment of Participation and Enjoyment (CAPE) (King 2007 [2a])
2. Cerebral Palsy Quality of Life (CPQOL) (Waters 2007 [2a])
3. Functional Independence Measure for Children (WeeFIM) (Uniform Data System for Medical Rehabilitation 2006 [5])
4. Pediatric Evaluation of Disability Inventory (PEDI) (Haley 1992 [5]).

Discussion/summary of evidence

There are recent systematic reviews (Damiano 2009 [1a], Mattern-Baxter 2009 [1b], Mutlu 2009 [1b], Marshall 2007 [1b]) and a meta-analysis (Mehrholtz 2008 [1a]) in the literature which examine the effects of PBWSTT in individuals with CP, SCI, and ABI. In the literature, protocols for PBWSTT vary. Session frequencies range from 2-5 times per week (Damiano 2009 [1a], Mattern-Baxter 2009 [1b]); session duration varies, with most reporting 20-30 minutes of treadmill walking at each session (Damiano 2009 [1a]); and length of episode varies from 2 weeks to 5 months (Damiano 2009 [1a], Mattern-Baxter 2009 [1b]). There is insufficient evidence to support any one frequency, duration of each session, length of episode, or discontinuation of PBWSTT. Schertz, Trahan and local consensus (Trahan 2002 [4b], Schertz 2009 [5], Local Consensus [5]) agree that an episode of intensive therapy may be repeated following a break to “allow practice and generalization, along with follow-up measurements” (Schertz 2009 [5]). There are no published pediatric studies that compare robotic PBWSTT to other interventions. There is a recent RCT comparing over ground ambulation training to manual PBWSTT in children with CP that did not demonstrate statistically significant between group differences (Willoughby 2010 [2a]). However, in the adult literature one case control study compares robotic PBWSTT to manual PBWSTT in a group of adults post stroke and concludes robotic training has an advantage over manual training in persons with chronic hemiplegia (Westlake 2009 [2b]).

In children with CP, systematic reviews (Damiano 2009 [1a], Mattern-Baxter 2009 [1b], Mutlu 2009 [1b]), a recent cohort study (Meyer-Heim 2009 [3a]) and a recent RCT (Willoughby 2010 [2a]) suggest that evidence to support PBWSTT is limited. Studies include heterogeneous age groups with varying GMFCS levels and most are of low quality. Damiano and Mattern-Baxter indicate that this intervention may be beneficial (Damiano 2009 [1a], Mattern-Baxter 2009 [1b]), however, PBWSTT effects could not be isolated in a number of reviewed studies secondary to co-intervention/continuation of other therapies during PBWSTT (Damiano 2009 [1a], Mutlu 2009 [1b]). Despite shortcomings, trends demonstrate PBWSTT may improve walking velocity, walking endurance, gross motor function, and functional mobility status (Damiano 2009 [1a], Mattern-Baxter 2009 [1b], Mutlu 2009 [1b], Meyer-Heim 2009 [3a]). Willoughby suggests combining PBWSTT with over ground training to assist with carryover (Willoughby 2010 [2a]). Some evidence suggests that in children with CP, more intensive active programs lead to better outcomes (Mattern-Baxter 2009 [1b], Damiano 2006 [5]). “In the past decade increased intensity in the amount of practice or the physiological demands of exercise and increased task or functionally based training constitute major trends in physical therapy treatment of CP and are associated with the highest level of evidence” (Damiano 2009 [1a]).

In individuals with SCI, one pediatric systematic review (Damiano 2009 [1a]) and one adult meta-analysis (Mehrholtz 2008 [1a]) were used to summarize evidence regarding PBWSTT. Pediatric studies report positive improvements in ambulation independence following PBWSTT (Damiano 2009 [1a]) but these reports are derived from a low grade body of evidence. In the adult SCI literature (18 to 68 years of age, level C3-L4, and baseline ASIA A to D) Mehrholtz reports benefits to PBWSTT (Mehrholtz 2008 [1a]) but there is insufficient evidence to conclude that any one approach to locomotor training (PBWSTT versus other training approaches) is more effective for improving the walking function of people with SCI. Conclusions based on the SCI literature are difficult to make due to the small number of trials, small sample sizes and diverse participant characteristics. Despite limited evidence, theoretically, individuals with SCI who show motor function below the level of lesion and show potential for some over ground weight bearing and ambulation may be appropriate for at least a trial of PBWSTT (Local Consensus [5]).

In children with ABI there is no literature examining the effectiveness of PBWSTT. In the adult literature one systematic review of rehabilitation interventions for ABI includes PBWSTT as one treatment strategy in two RCTs (Marshall 2007 [1b]). Results suggest that there is strong evidence that PBWSTT does not provide any added benefit over conventional gait training for adults with acute or chronic brain injury (Marshall 2007 [1b]). One cannot infer that children with brain injuries would respond similarly to adults (Local Consensus [5]). Furthermore, as a result of developmental maturation and neuroplastic potential (Phillips 2007 [3b]), children with ABI may have greater potential for motor relearning through participation in PBWSTT (Local Consensus [5]).

Health Benefits, Side Effects and Risks

Functional Outcomes:

When designed by a licensed Physical Therapist in conjunction with caregiver input, the hypothesized outcomes of Partial Body weight supported treadmill training may include improved:

- gait speed (*Damiano 2009 [1a], Mattern-Baxter 2009 [1b], Damiano 2009 [5]*)
- gait endurance (*Damiano 2009 [1a], Mattern-Baxter 2009 [1b]*)
- walking function (*Mattern-Baxter 2009 [1b]*)
- weight acceptance during transfers (*Mattern-Baxter 2009 [1b]*) and
- motor skills (*Damiano 2009 [1a], Damiano 2009 [5]*)

Benefits:

- PBWSTT provides a safe environment to practice walking (*Tuckey 2004 [5]*)
- PBWSTT decreases demands on therapist, makes repetitive training more feasible, increases safety of standing and ambulation training and decreases the work necessary by one or more therapists (*Damiano 2009 [1a], Tuckey 2004 [5]*)

Considerations/Side Effects/Risks:

- Decreased sensation could result in excessive shearing on skin causing breakdown without patient knowledge
- Strenuous program with high level of commitment required (*Local Consensus [5]*)
- Manual PBWSTT has been purported to pose risk of injury to the therapist (*Westlake 2009 [2b]*)

Precautions:

- Inappropriate or unsafe fit of the harness/equipment due to the participant's body size (*Hocoma 2009 [5]*)
- Open skin lesion in area of contact with equipment (cuff, harness support, robotic orthosis) (*Hocoma 2009 [5], Mobility Research Website [5]*)
- Conditions that result in compromised skin integrity (*Local Consensus [5]*)
- Skeletal dysplasia and individuals with a major difference (> 2 cm) in leg length may not be accommodated by robotic legs (this only applies to the Lokomat®) (*Hocoma 2009 [5]*)
- Bracing of spinal column or lower extremity (LE) that would preclude fit into the Driven Gait Orthosis or harness (*Hocoma 2006b [5]*)
- Severely fixed contractures (*Hocoma 2009 [5]*)
- Cardiac abnormalities resulting in activity restrictions(*Hocoma 2009 [5]*)
- Severe vascular disorders of the lower limbs resulting in changes in sensation or compromised circulation (*Hocoma 2009 [5]*)
- Uncooperative or self-aggressive behavior (*Hocoma 2009 [5]*)
- Patients with long term access ports (colostomy, gastro-intestinal tube, peripherally inserted central catheter, etc.) where the PBWSTT equipment may disrupt position or increase pressure at site (*Hocoma 2009 [5], Mobility Research Website [5]*).

Adverse Events:

- Mutlu and Mattern-Baxter comment that no adverse events have been reported and the treatment does not appear to be harmful (*Mattern-Baxter 2009 [1b], Mutlu 2009 [1b]*).
- Friction associated skin breakdown can be observed (*Local Consensus [5]*).

Burden:

High cost of the equipment (*Damiano 2009 [1a]*) which may lead to decreased availability to carry out program (*Local Consensus [5]*). High staff resources need for manual PBWSTT.

The above list makes no claim to completeness. The decision as to whether or not the patient is able to undergo treatment is to be made by the medical practitioners involved in the patient's care. In particular, the practitioner has to weigh the possible risks of treatment, as well as the possible adverse reactions, against the potential therapeutic benefits in each individual case. In this context, the situation of the individual patient is just as important as the basic risk assessment for specific patient groups.

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Note: Full tables of evidence grading system available in separate document:

- Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality (abbreviated table below) <http://groups/ce/NewEBC/EBCFiles/Table-EvidenceLevels.pdf>
- Grading a Body of Evidence to Answer a Clinical Question <http://groups/ce/NewEBC/EBCFiles/GradingBodyOfEvidence.pdf>
- Judging the Strength of a Recommendation (abbreviated table below) <http://groups/ce/NewEBC/Judgingthestrengthofarecommendation.pdf>)

Table of Evidence Levels (see note above)

<i>Quality level</i>	<i>Definition</i>
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5	Other: General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study

Table of Recommendation Strength (see note above)

<i>Strength</i>	<i>Definition</i>
“Strongly recommended”	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
“Recommended”	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is lack of consensus to direct development of a recommendation.
<p><i>Dimensions:</i> In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.</p> <ol style="list-style-type: none"> 1. Grade of the Body of Evidence (see note above) 2. Safety / Harm 3. Health benefit to patient (<i>direct benefit</i>) 4. Burden to patient of adherence to recommendation (<i>cost, hassle, discomfort, pain, motivation, ability to adhere, time</i>) 5. Cost-effectiveness to healthcare system (<i>balance of cost / savings of resources, staff time, and supplies based on published studies or onsite analysis</i>) 6. Directness (<i>the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]</i>) 7. Impact on morbidity/mortality or quality of life 	

Supporting information

Introductory/background information

PBWSTT “increases the feasibility of gait training” and has “been enthusiastically endorsed by the physical therapy field” (Damiano 2009 [1a]). The success of PBWSTT is rooted in concepts and empirical work on central pattern generation for locomotion. Seminal studies by Grillner and colleagues on mammals have demonstrated neural patterns of locomotor activity, independent of supraspinal and afferent input. In this work, animals with transected spinal cords were able to demonstrate stepping movements on a treadmill without input from the cortex, illustrating a way to elicit locomotion in cases where the central nervous system has been compromised. This work, in combination with the adaptability afforded by the neuroplasticity of the developing brain, lends support to the plausibility of gross motor function recovery and return following neurological insult (Grillner 1995 [1b]).

PBWSTT also borrows from motor learning theory and more recent theoretical positions advocating and demonstrating the effectiveness of task-specific intervention. Stepping requires repetitive, reciprocal, coordinated movement in the lower extremities. As an intervention, these components are precisely practiced: a re-training of an everyday task. Research indicates that when a task is meaningful, functional outcomes can be further enhanced. Subsequently, the impact of an intervention strategy like PBWSTT plays an important role in cortical re-organization and the acquisition or re-acquisition of functional ability.

Damiano reports that “increasing the amount and intensity of physical activity is critically important for general health and for participation of those with motor disabilities” (Damiano 2009 [1a]). In individuals with developmental disability, it has been documented that intensive programming may be a useful mode of service delivery for improvement in function and gait.

Definition(s):

PBWSTT: a task-specific intervention used to facilitate attainment of stepping and the kinematic, kinetic, and temporal characteristics of locomotion, resulting in activation of the spinal and supraspinal pattern generators and enhanced motor learning and neuroplasticity. Intervention requires a treadmill, a suspension system to provide body weight support, and management of the participant’s lower extremities by either a therapist (manual) or a driven gait orthosis (robotic).

Manual PBWSTT: one or more therapists manually facilitate limb, pelvic, and trunk control in an effort to normalize upright, reciprocal stepping and dynamic postural control while a participant walks on a treadmill. This approach

requires precise consistent kinematic reproduction of stepping patterns by the therapist; Devices would include the Litegait®

Robotic PBWSTT: a robotically driving exoskeleton/robotic legs are attached to the participant to facilitate a bilaterally symmetrical gait pattern while a participant actively attempts to advance each limb during treadmill walking. The robotic device uses preprogrammed normal gait kinematics including cycle timing (stance and swing phase), limb and joint coordination, limb loading and afferent signaling. Biomechanics of gait can be adjusted using a computer interface. Devices would include the Lokomat®.

Assumptions:

1. The brain is plastic. Neural plasticity can be thought of as a continuum that goes from “short-term changes in the efficiency or strength of the synaptic connections to long-term structural changes in the organization and number of connections among neurons” (*Shumway-Cook 2001 [5]*). Based on studies in adults with stroke that have demonstrated changes in brain physiology after a variety of rehabilitation methods, and from a theoretical standpoint “there should be more plasticity in the fetal and infant brain than in the adult. Therefore there are opportunities to intervene across the lifespan in CP” (*Wittenberg 2009 [5]*).
2. Motor learning theory suggests that skill dependent training with increasing levels of difficulty may promote learning of new skills and neuroplasticity (*Nudo 2006 [5]*).

Future Research Agenda

Future work is needed in many areas to strengthen the evidence for PBWSTT. Studies ought to include more rigorous designs with greater numbers of participants, identification of specific training parameters such as body weight support, walking speed, walking time, and frequency of sessions. Studies examining the effects of PBWSTT in different pediatric populations are needed. Finally, comparing robotic BWSTT to non robotic and other methods of ambulation training are needed to determine the most effective intervention.

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All Team Members and Clinical Effectiveness support staff listed above have signed a conflict of interest declaration.

Search strategy

1. Databases

OVID MEDLINE

OVID CINAHL

PEDRO,

All OVID EBM Reviews - Cochrane DSR, ACP Journal Club, DARE, and CCTR

www.otseeker.com

www.pedro.fhs.usyd.edu.au

www.otcats.com

Looked at Can Child - <http://www.canchild.ca/>

Search dates: January 2000 to March 2010

Search Terms: Partial body weight supported treadmill training, Partial body weight treadmill training, Partial body support treadmill training, Harness, Litegait®, Walkable, Lokomat®, Robotic driven gait orthosis, Treadmill training, Suspended, Task specific training, Mobility, Gross motor, Quality of life, Cardio-respiratory, Strength, Independence, Activities of daily living, Self care, Gait, Postural control

2. **Limits and Filters:** English, humans

3. **Additional articles:** from reference lists

Applicability issues

Equipment varies in cost and requires specialized training of staff. Need to have engineering support for machine maintenance. Can only be used with one patient at a time therefore there is the potential for limited access.

Conflicts of interest

Conflict of interest declarations were completed by members of the BEST development team and none were found.

Copies of this Best Evidence Statement (BEST) are available online and may be distributed by any organization for the global purpose of improving child health outcomes. Website address: <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm>

Examples of approved uses of the BEST include the following:

- copies may be provided to anyone involved in the organization's process for developing and implementing evidence based care;
- hyperlinks to the CCHMC website may be placed on the organization's website;
- the BEST may be adopted or adapted for use within the organization, provided that CCHMC receives appropriate attribution on all written or electronic documents; and
- copies may be provided to patients and the clinicians who manage their care.

Notification of CCHMC at HPCEInfo@cchmc.org for any BEST adopted, adapted, implemented or hyperlinked by the organization is appreciated.

*Additionally, for more information about CCHMC Best Evidence Statements and the development process, contact the **Division of Occupational Therapy and Physical Therapy at: 513-636-4651 or OTPT@cchmc.org***

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Reviewed against quality criteria by two independent reviewers.