Too Early for Mobility? The Benefits of Early Mobility on Pediatric Development

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Disclosures

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  – Have no financial or non-financial interests to disclose

Objectives

• Recognize the importance of mobility in children under 3 years of age
• Apply current literature to explain and classify the areas of pediatric development that would benefit from early mobility such as cognition, social interaction, visual perceptual skills, and orthopedic structures.
• Identify various funding sources to acquire pediatric mobility equipment.
• Assess and select appropriate pediatric devices that will provide early mobility and enhance development for 3 different pediatric case studies.
LOCOMOTION- noun, Movement or the ability to move from one place to another- Oxford Dictionary

- Self directed locomotion is a critical element in the development of:
  - Depth perception related to degree of locomotor experience
  - Memory
  - Object permanence
  - Object relation without reference to oneself

- Experience, not maturation alone, drives perceptual cognitive development. Self induced movements are critical in the development of a multitude of systems.

- Motor development is a rate limiting factor in many perceptual cognitive skills, as movement assists in acquiring perception.

- If infants are unable to engage in motor activities necessary for acquisition of perceptual or cognitive skills, the motor problem may block mental development.

RESNA Position on the Application of Power Chairs for Pediatric Users:
- Age appropriate supervision is always necessary! (Attendant control)
- A child’s ability to drive a motorized wheelchair is related to cognitive readiness, not chronological age.
- Functional independent mobility has been shown to:
  - Reduce learned helplessness
  - Increase confidence and interactions with peers

RESNA Position of the Application of Power Wheelchairs for Pediatric Users

- Orthopedic Limitations and Cerebral Palsy, 18-72 months, power mobility training
  - Development Observations Checklist-part III, PSSC, MATCH, Survey of Technology Use: scores indicated decreased parental stress, improved satisfaction with sleep/wake schedules, increased satisfaction with child’s independence, no increase in negative emotions regarding wheelchairs.

- Multiple diagnoses, 14-30 months, power mobility training
  - BDI, PEDI, Early Coping Inventory: scores increased significantly more than control group

- Children with myelodysplasia, 7-12 months, power mobility training
  - Bayley 3 scores for cognition and language: increased at a rate faster than chronological age
Determination of Readiness

**CLINICAL JUDGEMENT!**

- IQ is not an adequate determinant of ability for eligibility

- Unless the child is actually placed in the power wheelchair, it is difficult to determine appropriateness!

- Pediatric Power Wheelchair Screening Test (Tefft, Guerret, Furumasu 1999): determines cognitive developmental age
  - Cause and effect
  - Spatial relationship
  - Judgment
  - Motor planning
  - Reaction time

Pediatric Devices to Facilitate Mobility: Manual Wheelchairs

- **Key Concerns:**
  - Growth
  - Adjustability
  - Weight
  - Seat Height
  - Parent/Caregiver Access

Pediatric Devices to Facilitate Mobility: Power Wheelchairs

- **Key Concerns:**
  - Growth
  - Adjustability
  - Parent/Caregiver Access
  - Seat Height
  - Access to Floor
  - Type of Control
Benefits of Standing

- Children with impaired mobility are at increased risk of developing musculoskeletal abnormalities, such as scoliosis and pelvic misalignment.
- **Medical Benefits:**
  - Prevention of contractures
  - Improvement of range of motion
  - Reduction in spasticity
  - Prevention of osteoporosis
  - Prevention of pressure ulcers through changing position
  - Improved circulation
  - Improved bowel function
  - Improved respiratory function
  - Development and/or improvement of upper body and core strength
- **Psychological Benefits**

Pediatric Devices to Facilitate Mobility: Standers

- **Key Concerns:**
  - Growth
  - Ability to explore environment
  - Adjustability

Pediatric Devices to Facilitate Mobility: Other Equipment

- Star Car
- Ride on Toys
- Push Walkers
- Gait Trainers
- Scooters
- Adapted Tricycles
How to Justify

- Important to Remember:
  - It is appropriate for children at this age to require supervision with mobility
  - Importance of mobility for development
  - Current positioning in stroller or other device
  - Outcome measures as appropriate
  - Pictures & video using device

How To Justify

- [Table or diagram]

How To Justify

- [Table or diagram]
How To Justify

Additional Objective Measures

• GMFM
• Seated Postural Control Measure (SPCM)
  – 34-item evaluation to measure postural alignment & functional movement
• Pressure Mapping
• Powered Mobility Program

How to Justify: Other Equipment

• Justify:
  – Medical necessity
  – Developmental benefits
  – Changes in tone/spasticity, posture, range of motion, strength, etc. with use of device
• Outcome Measures:
  – GMFM
  – Peabody
  – Gait: Walk tests, TUG
  – Balance: BERG, functional reach
Funding Sources

- Local Service Clubs
- Fundraisers
- Darryl Gwynn Foundation
  - http://darrellgwynnfoundation.org
- Lollipop Kids
  - http://www.lollipopkidsfoundation.org
- Equipment Connections
  - http://www.equipforchildren.org
- Wheelchairs 4 Kids
  - http://www.wheelchairs4kids.org

Challenges

- Not everyone who is incapable of walking or propelling a manual wheelchair effectively is a candidate for powered mobility. Motivation, understanding of basic cause and effect, spatial relationships, problem-solving concepts, attention, and motor activation for drive controls are necessary.

Case Studies- Wyatt

11 month old male with a history of transverse myelitis at 8 months of age. Initial MRI showed spinal cord inflammation from C5-T8.

Assessment
- Tetraplegia
- Diuretic muscular atrophy
- Suspect neurogenic bowel and bladder
- Absent/decreased sensation bilateral LE
- Weak cough
- LE spasticity with position changes

At risk for
- Autonomic dysreflexia
- osteopenia and fragility fracture
- Hip subluxation
- Neuromuscular scoliosis
Case Studies - Wyatt

Initial Presentation
- Right upper extremity weakness
- Fine motor deficits
- Decreased/absent sensation below level of injury
- LE paralysis
- Dependent assist for maintenance of developmental positions and functional mobility
- Sat with bilateral UE support for bouts of 1 minute (no protective extension)

Changes after 4 weeks of inpatient ABRT
- Hip flexor/extension activation
- Began weight bearing through bilateral LEs
- Creeping short distances
- Improved trunk strength and sitting balance (could lift an arm)
- Less caregiver assistance for sitting, creeping, and bed mobility
- UE strength and fine motor skills were in the average range

Case Studies – Wyatt

Mobility Trials & Recommendations
- Encouraged creeping
- Educated family on crawling with assistance
- Manual wheelchair
- Mobile Stander
- Locomotor Training and over ground gait training
- Gait trainers
- Power wheelchair was not something the family was interested in trying at this time

Case Study 2- Owen

3 year old male in an MVA a year prior to admission KKI
Assessment:
C2 SCI with a C spine fusion
Closed head injury (initial GCS of 7)
Hip femur fracture
Diaphragmatic pacer or ventilator dependent
Dysphagia
G-tube
Neuromuscular bowel and bladder
VH short secondary to hydrocephalus
Neuropathic pain
History of seizures
At risk for
Autonomic dysreflexia
Osteoporosis and fragility fracture
Hip subluxation
Neuromuscular scoliosis
Case Study- Owen

Initial Presentation
- Dependent in tilt in space w/c or adapted stroller
- Dependent for all ADLs, functional mobility tasks, sitting balance, and head control
- Could complete shoulder shrugs, but otherwise had 0/5 strength throughout UE and LEs
- Absent sensation

Changes after 4 weeks of Inpatient ABRT
- Could sit in posterior propped position with occasional assistance for head control
- He had improved head control for longer periods of time in supported sitting
- Improved ability to sip and puff compared to admission, however fatigued quickly and was inconsistent

Mobility Trials and Recommendations
- Trialed various drive controls with a power w/c including: sip and puff, head array, and chin control
- Worked on his ability to sip and puff as well as head control (outside of the w/c training)
- Locomotor training
- Standing

Case Studies-Ella

2 ½ year old female with a history of transverse myelitis at 9 months of age. Initial MRI showed inflammation from brainstem to T4.

Assessment
- Tetraplegia
- Disease muscular atrophy
- Neuromuscular bowel and bladder
- HI of respiratory failure, trach in place
- Dysphagia, g-tube in place
- Sensation impairment
- Spasticity

At risk for:
- Autonomic dysreflexia
- Osteoporosis and fragility fracture
- Hip dislocation
- Neuromuscular scoliosis
Case Studies-Ella

Initial Presentation
- LE paralysis
- Right UE stronger than left; right UE against gravity movement at shoulder, elbow and wrist; left UE gravity eliminated movements at shoulder and elbow; no digit movements
- Sat with UE support and mod assistance

Changes after 6 weeks of inpatient ABRT
- Sat with UE support and supervision
- UE against gravity movement bilaterally at the shoulder, elbow, and forearm, trace left hand movements, and gravity eliminated right hand and wrist movements

Case Study- Ella

• Patient returned 8 months later
  - Patient had been decannulated prior to admission
  - Admitted for 6 weeks for an update to Home Rehabilitation Program and for the feeding program
  - Family had done an excellent job having patient work on recommendations at home
  - New Goals: Assist with ADLs and functional mobility tasks (rolling), improving sitting balance, and having patient begin to eat more consistently
  - Upon discharge:
    - Gluteal activation
    - Rolling independently when motivated
    - Assisting with ADLs
    - Recommended a power wheelchair

Case Study- Ella

Mobility Trials & Recommendations
- Power wheelchair with various joystick adaptations
- Mobile Stander
- Locomotor Training
- Dependent crawling
- Reaching in prone
Conclusion

• Summary
• A thriving child requires a team approach to incorporate many systems of development
• Get your kids moving early
• You never know until you try
• Client drive choices, not insurance driven choices

References

• Available via handout

Questions?