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, and 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.

Evidence!

• 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

Evidence!

• 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

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**Pediatric Devices to Facilitate Mobility: Manual Wheelchairs**

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

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**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
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
- Decreased muscular strength
- Suspect neurogenic bowel and bladder
- Absent/decreased sensation bilateral LE
- Weak cough
- LE spasticity with position changes

At risk for
- Autonomic dysreflexia
- Osteoporosis 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/extensor 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
- O2 tube
- Neurogenic bowel and bladder
- VP shunt secondary to hydrocephalus
- Neuropathic pain
- History of seizures
- At risk for Autonomic dysreflexia
- Osteoporosis and fragility fracture
- Hip dislocation
- Neuromuscular weakness

www.kennedykrieger.org
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

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

Assessment
- Tetraplegia
- Diuse muscular atrophy
- Neurogenic bowel and bladder
- Ho of respiratory failure, trach in place
- Dysphagia, g-tube in place
- Sensation impairment
- Spasticity

At risk for:
- Autonomic dysreflexia
- Osteoporosis and fragility fracture
- Hip subluxation
- 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?