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Disclosures

- Julie Cagney, PT, DPT
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– Have no financial or non-financial interests to disclose

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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.

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Locomotion and Developmental Considerations

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.

The Child's Development of Functional Movement, 65-71
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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

RESNA Position of the Application of Power Wheelchairs for Pediatric Users
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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

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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, Furumasa 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


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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**

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**Pediatric Devices to Facilitate Mobility:
Standers**



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



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**Pediatric Devices to Facilitate Mobility:
Other Equipment**

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



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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

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How To Justify

10. CURRENT SEATING / MOBILITY:

Current Mobility Base: None Dependent Dependent with Tilt Manual S-cooter Power

Type of Control: _____ Color: _____ Model: _____ Serial #: _____
 Size: _____ Age: _____

Current Condition of Mobility Base: _____
 Current Seating System: _____ Age of Seating System: _____

COMPONENT	MANUFACTURER/CONDITION
Seat Base	
Cushion	
Back	
Lateral trunk support	
Thigh support	
Knee support	
Foot Support	
Foot strap	
Head Support	
Pelvic Stabilization	
Armrest	
Chest/Shoulder Support	
U.S. Support	
Other	
When relevant: Overall seat height	Overall w/c length
Overall w/c width	

Describe posture in present seating system: _____

Describe reason why current base and/or seating system will not meet medical needs: _____

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How To Justify

11. ADL STATUS (in reference to wheelchair use):

	Indep	Assist	Unable	Indep with Equip	Not assessed	Comments
Dressing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Eating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe oral motor skills
Grooming/Hygiene	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Meal Prep	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
IADLs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bowel Mgmt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:
Bladder Mgmt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:

12. MOBILITY/BALANCE:

Balance		Transfers		Ambulation	
Sitting Balance	Standing Balance	<input type="checkbox"/> Independent	<input type="checkbox"/> Independent	<input type="checkbox"/> Independent	<input type="checkbox"/> Independent
<input type="checkbox"/> WFL	<input type="checkbox"/> WFL	<input type="checkbox"/> Min Assist	<input type="checkbox"/> Min Assist	<input type="checkbox"/> Ambulates with Asst	<input type="checkbox"/> Ambulates with Asst
<input type="checkbox"/> Uses UE for balance in sitting	<input type="checkbox"/> Min assist	<input type="checkbox"/> Mod Asst	<input type="checkbox"/> Mod Asst	<input type="checkbox"/> Ambulates with Device	<input type="checkbox"/> Ambulates with Device
<input type="checkbox"/> Min Assist	<input type="checkbox"/> Mod assist	<input type="checkbox"/> Max assist	<input type="checkbox"/> Max assist	<input type="checkbox"/> Indep-Short Distance Only	<input type="checkbox"/> Indep-Short Distance Only
<input type="checkbox"/> Mod Assist	<input type="checkbox"/> Max assist	<input type="checkbox"/> Dependence	<input type="checkbox"/> Dependence	<input type="checkbox"/> Unable to Ambulate	<input type="checkbox"/> Unable to Ambulate
<input type="checkbox"/> Max Assist	<input type="checkbox"/> Unable	<input type="checkbox"/> Sliding Board	<input type="checkbox"/> Sliding Board		
<input type="checkbox"/> Unable		<input type="checkbox"/> Lift /Sling Required	<input type="checkbox"/> Lift /Sling Required		

Comments: _____

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How To Justify

OBJECTIVE MEASURES

Functional Mobility Assessment (FMA). Please refer to attached FMA form.

Six Minute Walk Path Test.

WISPI:

Self-Care subscale score:	_____	of 30
Respiration subscale score:	_____	of 40
Mobility subscale score:	_____	of 40
Total SPCM:	_____	of 100

• Interpretation:

WISPI II: / 20 Interpretation:

Barthel ADL Test: %

SF-36

Physical Functioning

Role Functioning Physical

Role Functioning Emotional

Energy/Fatigue

Emotional Well Being

Social Functioning

Pain

General Health

Other:

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Additional Objective Measures

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

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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

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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>

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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.

RESNA Position on the Application of Power Wheelchairs for Pediatric Users

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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
- Disuse muscular atrophy
- 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

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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

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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

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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)
- H/o femur fracture
- Diaphragmatic pacer or ventilator dependent
- Dysphagia
- G 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 subluxation
- Neuromuscular scoliosis



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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




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Case Study- Owen


Mobility Trials and Recommendations

- Tried 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



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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
- Disuse muscular atrophy
- Neurogenic bowel and bladder
- Hx 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

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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



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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

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Case Study- Ella

Mobility Trials & Recommendations

- Power wheelchair with various joystick adaptations
- Mobile Stander
- Locomotor Training
- Dependent crawling
- Reaching in prone



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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



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References

- Available via handout

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Questions?



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