If you are viewing this course as a recorded course after the live webinar, you can use the scroll bar at the bottom of the player window to pause and navigate the course.

This handout is for reference only. It may not include content identical to the powerpoint. Any links included in the handout are current at the time of the live webinar, but are subject to change and may not be current at a later date.
THE ROLE OF OCCUPATIONAL THERAPY IN THE PEDIATRIC INTENSIVE CARE UNIT

Laura Stimler, OTD, OTR/L, BCP, C/NDT
Occupationaltherapy.com

Objectives

- Identify common types of diagnoses, treatment, and rehabilitation implications specific to OT in the pediatric intensive care unit.
- Recognize evidence-based evaluation and treatment techniques to improve participation in occupations and quality of life for pediatric clients in the PICU setting.
- Recognize the need for further research on the effectiveness of OT services in the PICU setting.
Background and Common Conditions

Development of the Pediatric Intensive Care Unit (PICU)

- Europe 1930-1950s
- Dr. John J. Downes
  - The Children’s Hospital of Philadelphia 1967
  - Children’s Hospital of Pittsburgh 1969
  - Yale-New Haven Hospital 1969
  - Massachusetts General Hospital 1971
  - Children’s National Medical Center 1976
  - Johns Hopkins Hospital 1976
  - The Children’s Hospital 1980

(Mai, Schreiner, Firth & Yaster, 2013)
### Location

- Hospitals
  - General
  - Trauma centers
  - Children’s hospitals
  - PICU, PCCU, SICU

- More than 400 PICUs currently in the United States
- Approx 4,044 beds

(Society of Critical Care Medicine, 2017)

---

### Admission Criteria

<table>
<thead>
<tr>
<th>Respiratory</th>
<th>Cardiovascular</th>
<th>Neurologic</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Endotracheal intubation</td>
<td>• Shock</td>
<td>• Seizures, unresponsive to therapy; requiring continuous infusion of anticonvulsants</td>
</tr>
<tr>
<td>• Mechanical ventilation</td>
<td>• Postcardiopulmonary resuscitation</td>
<td>• Following neurological procedures</td>
</tr>
<tr>
<td>• Progressive pulmonary disease</td>
<td>• Unstable congestive heart failure</td>
<td>• Head trauma</td>
</tr>
<tr>
<td>• Newly placed trach</td>
<td>• Congestive heart disease with unstable cardiorespiratory status</td>
<td>• Increased intracranial pressure</td>
</tr>
<tr>
<td>• High oxygen requirement</td>
<td></td>
<td>• Spinal cord compression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• External ventricular drainage device</td>
</tr>
</tbody>
</table>

(AAP, Committee on Hospital Care and Section on Critical Care, Society of Critical Care Medicine, Pediatric Section Admission Criteria Task Force)
## Admission Criteria

<table>
<thead>
<tr>
<th><strong>Hematology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oncology</strong></td>
</tr>
</tbody>
</table>
| • Exchange transfusions
| • Plasmapheresis or leukopheresis unstable condition
| • Severe coagulopathy
| • Severe anemia
| • Chemo with risk for tumor lysis syndrome
| • Masses compressing on vital vessels, organ, or airway

<table>
<thead>
<tr>
<th><strong>Endocrine/Metabolic</strong></th>
</tr>
</thead>
</table>
| • Severe diabetic ketoacidosis
| • Severe electrolyte abnormalities
| • Inborn errors of metabolism requiring respiratory support, acute dialysis, etc.

<table>
<thead>
<tr>
<th><strong>Gastrointestinal</strong></th>
</tr>
</thead>
</table>
| • Acute gastrointestinal bleeding
| • After emergent endoscopy for removal of foreign body
| • Hepatic failure leading to coma, hemodynamic, or respiratory instability

(AAP, Committee on Hospital Care and Section on Critical Care, Society of Critical Care Medicine, Pediatric Section Admission Criteria Task Force)

<table>
<thead>
<tr>
<th><strong>Surgical</strong></th>
</tr>
</thead>
</table>
| • Cardiovascular
| • Thoracic
| • Neurosurgical
| • Otolaryngologic
| • Craniofacial
| • Orthopedic and spine
| • Organ transplantation
| • Multiple trauma*
| • Major blood loss

<table>
<thead>
<tr>
<th><strong>Renal</strong></th>
</tr>
</thead>
</table>
| • Renal failure
| • Acute hemodialysis, peritoneal dialysis
| • Rhabdomyolysis with renal insufficiency

<table>
<thead>
<tr>
<th><strong>Multisystem/other</strong></th>
</tr>
</thead>
</table>
| • Toxic ingestions and drug overdose
| • Multiple organ dysfunction syndrome
| • Electrical injuries
| • Burns covering >10% of the body surface

(AAP, Committee on Hospital Care and Section on Critical Care, Society of Critical Care Medicine, Pediatric Section Admission Criteria Task Force)
Common Conditions and Diagnoses

- Respiratory illnesses (most common)
- Complex chronic conditions
- Trauma
- TBI and SCI
- Burns
- Post-surgical care
- Infection
- Fluid and electrolyte derangements
- Congenital heart abnormalities and chromosomal abnormalities
- Oncology emergencies

(Society of Critical Care Medicine, 2017)

Prolonged Bedrest

- Risk for contractures
- Generalized weakness
- Decreased endurance
- Cardiopulmonary compromise
  (Dudgeon, Crooks, & Chappelle, 2015)

- ICU acquired weakness (ICU-AW)
  - 60% of critically ill adults
  (Abdulsatar, Walker, Timmons & Choong, 2013)
Equipment, Lines, Tubes, and Precautions

Precautions

- Seizures
- Autonomic dysreflexia
- Orthostatic hypotension
- Deep vein thrombosis (DVT)
- Cardiopulmonary status
- Infectious disease
  - Acute burns
  - Stem cell transplants

(Dudgeon, Crooks, & Chappelle, 2015)
Test and Labs

- CBC (Complete Blood Count)
- Ultrasound
- CT Scan
- Xray
- MRI
- PET scan
- Echocardiogram
- EEG, EMG

(Smith-Gabai, 2011)

Respiratory Equipment

- O₂ nasal cannula, face mask, nonrebreather mask & FiO₂
- Ventilator
  - Endotracheal
  - Nasotracheal
  - Tracheostomy
- BIPAP, CPAP, ECMO
- Suction

(Smith-Gabai, 2011)
Medication Administration

- PIV (peripheral intravenous catheter)
- Ports (Mediport, central line, etc)
- PICC (peripherally inserted central catheter)
- Pain (“rescue”) button (PCA)
- Epidural

Nutrition Equipment

- G-tube
- TPN (total parenteral nutrition)
  - Modified diet restrictions
Rehab Equipment

- Transfer equipment (sliding board, hoover lifts, etc)
- Assistive devices (walkers, wheelchairs, crutches, etc)
- Hospital beds (rotation, chair position, Trendelenburg)

Drains, Tubes, and Lines

- Foley catheter and colostomy bag
- A-line
- Wound vac
- Surgical drains
- Chest tubes
Clinical Monitoring

- Vital signs & telemetry
  - Heart rate
  - Blood pressure
  - Respiratory rate
  - Oxygen saturation
  - Mean arterial pressure
  - Intracranial pressure
    (Smith-Gabai, 2011)

- Lab values
  - CBC, etc

- Pain
  - Visual analog scale

(Pain Measurement Scale)

(Mayfield Clinic)
Normal pediatric vital signs

<table>
<thead>
<tr>
<th>Age</th>
<th>Awake HR</th>
<th>Sleeping HR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn to 3 months</td>
<td>85 to 205 bpm</td>
<td>80 to 160 bpm</td>
</tr>
<tr>
<td>3 months to 2 years</td>
<td>100 to 190 bpm</td>
<td>75 to 160 bpm</td>
</tr>
<tr>
<td>2 to 10 years</td>
<td>60 to 140 bpm</td>
<td>60 to 90 bpm</td>
</tr>
<tr>
<td>&gt; 10 years</td>
<td>60 to 100 bpm</td>
<td>50 to 90 bpm</td>
</tr>
</tbody>
</table>

Pharmacologic Considerations

- Anticoagulation (movement guidelines)
  - Warfarin (Coumadin)
  - Enoxaparin (Lovenox)

- Sedation

- Analgesics
  - Opioids, NSAIDS

- Oxygen
  (Smith-Gabai, 2011)
Infection Control

- Transmission of germs
  - Protect yourself and the patient

- Acute burns
- Infectious diseases
- Bone marrow transplant

Standard precautions:
- Hand hygiene, personal protective equipment, respiratory hygiene

**Choose appropriate toys!

Occupational Performance
OTPF: Client Factors

Body Structures

- Nervous system*
- Eyes, ears, and related structures
- Cardiovascular*, immunological, and respiratory* structures
- Digestive, metabolic, and endocrine structures
- Genitourinary and reproductive structures
- Skins structures

Body Functions

- Mental*
- Sensory*
- Neuromusculoskeletal*
- Muscle* and movement functions
- Cardiovascular*, hematological, immunological, & respiratory*
- Voice and speech, digestive, metabolic, endocrine, genitourinary, reproductive
- Skin

(AOTA, 2014)

Functional Implications

(AOTA, 2014)
ADLs*
- Bathing
- Toileting
- Dressing
- Swallowing/eating
- Feeding
- Functional mobility
- Personal hygiene and grooming

Rest and Sleep*
- Rest
- Sleep preparation
- Sleep participation

(AOTA, 2014)

Play & leisure
- Play & leisure exploration
- Play & leisure participation

Social participation
- Community
- Family
- Peer/friend

(AOTA, 2014)
Rest and Sleep

- Sleep deprivation may impact behavior, cognition, modulating emotions, decision making, and physical health.
- Descriptive qualitative study identified 4 main influences on sleep perceived by nursing staff:
  - Child factors
  - Environmental factors
  - Nurse-parent interaction factors
  - Nursing care factors

(Stremler, Adams, Dryden-Palmer, 2015)

Delirium

- Neuropsychiatric condition that presents acutely in all age groups
- Result of medical conditions and iatrogenic factors:
  - Oxygen deprivation
  - Disruption of intracellular systems
  - Physiological distress
- Greater risk associated with more severe illness
- Symptoms: deficits in awareness, cognition, arousal, disturbances in sleep/wake routines, attention and state disregulation, changes in orientation

(Porter, Holly & Echevarria, 2016)
Psychosocial Implications

- PTSD
  - Medical procedures, observation of other patients, burn dressing changes, etc.
- Dissociative symptoms
- High risk:
  - Pre-admission and parental psychopathology
  - Disease severity and life threat
  - Exposure to invasive procedures and treatment intensity
  - Fewer family visits
  - Cognitive factors and memory

(see Dow, Kenardy, Long & Le Brocque, 2012)

---

Long Term QOL following PICU admission

- Prospective follow-up study
- Pre-admission QOL vs QOL
- Preadmission comorbid status
  - 6 months: PICU admission had significant impact on children with and without CHC
  - 24 months: co-morbidity significantly determined QOL

(Polic et al., 2013)
Barriers to OT services in the PICU

■ Lack of evidence supporting rehabilitation in pediatric critically ill populations
■ Patient safety concerns
■ Feasibility of applying these interventions
■ Clinicians limited comfort with managing children on mechanical ventilation and with invasive devices

(Choong et al., 2015)

Occupational Therapy Process
OT assessment

Occupational Performance
■ Cognition
■ Sensory
■ ADL
■ Play
■ Fine motor skills
■ Visual perceptual skills
■ MMT
■ ROM

Standardized Tools
■ Pediatric Confusion Assessment Method (pCAM-ICU)
■ Cornell Assessment of Pediatric Delirium (CAPD) (Traube et al., 2014)*
■ FIM
■ PEDI
■ Montreal Cognitive Assessment (MoCA) (www.mocatest.org)
■ PedsQL
OT Intervention

- Prevent secondary problems
- Facilitate graded activities and encourage participation to perform OOB activity, ADLs, and enhance functional capacities

(Dudgeon, Crooks, Chappelle, 2015)
Preparatory Methods

- Respiration (soft tissue mobilization to ease breathing)
- Purse lip breathing (anxiety and increase efficiency of respiration)
- OOB positioning support (wheelchair, adapted seating)
- Splinting
- Maintain skin integrity/wound care
- Develop schedule to improve orientation and cognitive performance
- Assistive technology and environmental modifications
- ROM, ther ex, sensory-based activities

Coping Strategies for Procedural Distress

- Enhancing children’s beliefs about the efficacy of their coping strategies
- Encouraging realistic appraisals of prior responses
- Providing information about an invasive medical procedure
- Distraction (cartoon video)
  - Improved recall of event, decreased self perceived distress and pain

(Dow, Kenardy, Long & Le Brocque, 2012)
Activity and Occupation Based Interventions

- ADL training
  - compensatory vs remedial
- OOB activity
- Rest and sleep**
- Play

In-Bed Mobilization

- Prospective cohort trial including 31 critically ill children
- In-bed cycling for passive mobilization
- Interactive video games (VG)

(Choong et al., 2015)
Early Mobility

- Initiation of rehab services immediately following mechanical ventilation resulted in
  - Higher functional independence at discharge
  - More ventilator-free days during admission
  - Reduced ICU delirium

(Pohlman et al., 2010)

Early Mobility Video:
http://www.icudelirium.org/earlymobility.html

Pediatric Early Mobility video:

(Pohlman et al., 2010, p. 2090)
Early Mobilization

- Early mobility (EM): any mobilization off bed surface while intubated
  - To chair, pre-gait activities, positioning and activity out of the bed
  - Strong evidence in adult population
  - Limited evidence in pediatrics
- 4 qualitative case studies
  - Environment
  - Awareness
  - Communication
  - Participation

(Parisien et al., 2016)

“Wii-Hab”

- Intensive Care Unit – acquired weakness (ICU-AW)
- Nintendo Wii™ Boxing (interactive virtual reality)
  - Antigravity movement of BUE
  - Minimal fine motor coordination
- Hand grip strength, physiological baseline, Pediatric Overall Performance Category (POPC)

(Abdulsatar, Walker, Timmons & Choong, 2013)
Education and Training

- Provide education and training to
  - Caregivers, nursing staff, and patients on
    - Transfer techniques
    - Cognitive activities/techniques
    - ADL training, energy conservation, safety
    - DME management
    - ROM, position, therapy to prevent contracture or skin breakdown
    - Behavioral techniques
    - Activity precautions (cardio, ortho, WB, ROM restrictions)

Non-pharmacologic pain management

- Multidisciplinary pain management team created for patients s/p liver transplant
  - Provided parent and patient education on pain
  - Assigned mentor for each patient and parent
  - Routine consult from OT and PT POD 0
  - Child Life and Child Psychiatry
  - Hypnosis, positioning swaddling, acupuncture, guided imagery options

- When compared to standard pharmacological pain regimen (pain medication) group:
  - Significantly decreased pain reported
  - Improved parental perception of appropriate pain management

(Sharek et al., 2006)
Case study

- 8 year old multitrauma s/p car accident
- s/p resuscitation, thoracolumbar vertebral and left femural fractures
- Currently on continuous ICP monitoring and CPAP (previously intubated for 3 days)
- Hypotension
- External fixators for temporary stabilization of LLE
- Good family support

Summary

- The PICU is a highly complex, challenging environment for occupational therapists.
- Evidence-based evaluation and treatment techniques should be utilized in the PICU to improve participation in occupations and quality of life for pediatric patients.
- Evidence supports the use of biomechanical, psychosocial, and cognitive approaches to be used with patients admitted to the PICU.
- Further research on the effectiveness of OT services in the PICU setting is required.
Pediatric/Critical Care Resources

- Society of Critical Care Medicine:  
  - http://www.sccm.org/Member-Center/Journals/Pages/Pediatric-Critical-Care-Medicine.aspx
- ICU Delirium and Cognitive Impairment Study Group:  
  - http://www.icudelirium.org/pediatric.html

Occupational Therapy Resources

Acute Care Fact Sheet:  

Polytrauma Fact Sheet:  

Sleep Fact Sheet:  
- http://www.aota.org/~/media/Corporate/Files/AboutOT/Professionals/WhatIsOT/HW/Facts/sleep.pdf

Cognitive Impairment Fact Sheet:  
What are your questions?

Thank you!
Laura Stimler, OTD, OTR/L, BCP, C/NDT
lstimler@spalding.edu