Pediatric TBI: Strategies for Evaluation and Treatment

Lauren Laur, CCC-SLP

General Pediatric Statistics

- In 2015 ASHA conducted a Health Care Survey and compiled information about intervention in different health care settings.
- Here is the average percentage of time spent on each area of intervention in several settings:

Rehab Hospital

- Articulation-Phonology- 21%
- AAC- 5%
- Autism Spectrum Disorders- 16%
- Cognitive Communication- 13%
- Fluency- 6%
- Language- 20%
- Swallowing/Feeding- 17%
- Voice/Resonance- 2%

Outpatient Clinic

Articulation- Phonology- 24%

AAC- 6%

Autism Spectrum Disorders- 20%

Cognitive Communication- 7%

Fluency- 3%

Language- 30%

Swallowing/Feeding- 7%

Voice/Resonance- 3%

General Pediatric Statistics

- In 2015 ASHA conducted a Health Care Survey and compiled information about intervention in different health care settings.
- Here is the average percentage of time spent on each area of intervention in several settings:

General Medical Hospital

- Articulation-Phonology- 22%
- AAC- 2%
- Autism Spectrum Disorders- 11%
- Cognitive Communication- 12%
- Fluency- 2%
- Language- 25%
- Swallowing/Feeding- 23%
- Voice/Resonance- 3%

Pediatric Hospital

Articulation- Phonology- 17%

AAC- 6%

Autism Spectrum Disorders- 10%

Cognitive Communication- 9%

Fluency- 6%

Language- 15%

Swallowing/Feeding- 31%

Voice/Resonance- 4%

Pediatric TBI

- TBI is the leading cause of death and disability for children and adolescents in the U.S.
- The two age groups at the greatest risk for TBI are 0-4 years old and 15-19 years old
- The most common causes of TBI in children are falls, motor vehicle accidents, sports injury, and physical abuse
  - Falls are the leading cause for children 0-14 and MVAs are the leading cause for children 15-19
- The types of cognitive and communication skills that TBI may impact are similar for adults and children, but the long-term effects and prognosis may be very different
  - TBI can impact speech, language, literacy, attention, memory, problem solving, executive functioning, social skills, emotional regulation, swallowing, feeding
  - The impact varies greatly from mild-severe

Differences between Adult and Pediatric TBI

- The pediatric brain is not yet fully developed and a pediatric patient may still have many skills to learn at the time of his/her injury
- Previous research suggested that a young child would recover more easily from a TBI because an immature brain would be more resilient, but newer research indicates that this is not true
- The full impact of a TBI may not be evident right away- educational, behavioral, and social problems can emerge as expectations become more complex
- The most intensive rehabilitation is often provided in the first few months after an injury, which may be before we really understand a child's cognitive needs
  - A child may appear to have retained all of the skills he/she has previously learned, but may have difficulty acquiring new skills
  - Families need to be educated about the potential delayed effects of TBI so that they can advocate for their child if new concerns arise
  - The school should also be involved to monitor the child's performance

Pediatric TBI, Impact on Self Esteem

- Elementary-aged students and adolescents may have a difficult time coping emotionally with changes to their appearance and ability level
  - Children of this age are still developing their self-image and identity, and a sudden change may be very difficult for the child to accept
  - Children may develop a very negative perception of themselves
  - They may worry about how their peers will react when they return to school
- It's important to encourage the interests/hobbies that the patient had pre-injury and try to find a way for them to participate in similar activities again
- Support groups with other people of the same age can be very beneficial
- Children can become discouraged when progress is slow
  - They may require more concrete reminders of progress, such as simple graphs, sticker charts, or lists of accomplishments
- Children are just starting to develop their independence and it's important to remember that it's just as frustrating for them to lose independence as for an adult

Evaluation of Pediatric Patients

- It's best to use a combination of standardized testing, informal checklists/observation and caregiver interview
  - It may be helpful to use just 1-2 subtests from a comprehensive test or to use tests that are not age-normed for a particular patient
- Some children with TBI may be unable to participate in standardized testing
  - Use informal checklists/observations and caregiver interview
  - Compare results to both age-expectations and prior level of functioning
- Children with TBI may need assessment in the areas of speech, language, cognition, social, literacy, and/or swallowing/feeding
- It's especially important to use caregivers as a resource to gather information about prior level of functioning and determine social/behavioral differences

Speech/Language/Literacy Evaluations

- Pediatric Test of Brain Injury (6-16 years)
- Test of Language Competence, Expanded Edition (5-18 years)
- Test of Word Finding- 3rd edition (4;6-12;11)
- Clinical Evaluation of Language Fundamentals- 5th edition (5-21;11)
- Clinical Evaluation of Language Fundamentals, Preschool-2 (3-6;11)
- Oral Written and Language Skills-2nd edition (3-21;11)
- Emerging Language and Literacy Assessment (4;6-9;11)
- Gray Oral Reading Test-5th edition (6;0-23;11)
- Standardized articulation tests may be helpful, but will also need to be combined with observations to assess apraxia or dysarthria

Cognitive Assessment

- Children may benefit from cognitive testing. Here is a list of common cognitive assessments:
  - Bayley Scales of Infant-Toddler Development-3rd edition (1-42 months)
  - Developmental Assessment of Young Children-2nd edition (birth-5 years)
  - Woodcock Johnson- Early Cognitive and Academic Development (2;6-7;11)
  - Elementary Test of Problem Solving-3rd edition (6-12 years)
  - Woodcock Johnson- 4th edition (5-18 years)
  - Comprehensive Test of Non-Verbal Intelligence-2nd edition (6-90 years)
  - Adolescent Test of Problem Solving-2nd edition (12-18 years)
  - Brief Test of Head Injury (10-59+ years)
  - Scales of Cognitive Ability for Traumatic Brain Injury (adolescent and adult)
  - Ross Information Processing Assessment (15-90 years)

Special Considerations

- You may need to spend extra time building rapport
  - Children may be feeling overwhelmed by everything that has happened recently- stress combined with behavioral changes related to TBI can cause significant behavior challenges
  - Children may be hesitant to interact with medical professionals
  - It may be helpful to incorporate some of the child's own toys that he/she is familiar with
- Children with TBI may get tired more easily and require breaks from testing
- The child may be experiencing pain, which could impact performance on test
- Carefully consider any motor deficits when selecting materials and assessments
  - Children may become frustrated or demonstrate challenging behaviors if asked to do something that is now physically difficult- especially if this task would have been easy before TBI
  - Talk to caregivers or OT/PT to determine the best positioning during testing
- Limit distractions during testing as much as possible
  - It may help to talk to the child's caregivers at beginning or end of assessment, but complete testing 1:1
- Scores on standardized tests may give very different results than an observation of functional communication skills

Resources for Age-Expectations

- You can download a full guide to milestones in a variety of areas including feeding, speech, pronouns, morphemes, MLU, pragmatics, vocabulary, concepts, questions, literacy, and listening from: http://www.linguisystems.com/pdf/Milestonesguide.pdf
- ASHA has milestone charts for children birth-5 years old: http://www.asha.org/public/speech/development/chart/
- ASHA also has milestone charts for Kindergarten-5th grade: http://www.asha.org/public/speech/development/communicationdevelopment/
- You can typically locate a list of the expectations and learning standards for each grade level (broken down by subject area) on your state's department of education or board of education website

Feeding Milestones

- Birth- 4 months:
  - Sucks on fingers
  - Puts hands on bottle
- 5-6 months:
  - Holds a bottle independently
  - Mouths and gums solid food
  - Opens mouth when a spoon is presented
- 6-9 months:
  - Can drink out of a cup with assistance
  - Can self-feed with foods like crackers
- 9-12 months:
  - Can bite through a soft cookie
  - Eats mashed, lumpy foods
  - Chews using rotary action
- 12-18 months:
  - Begins to drink through a straw
  - Can drink with 4-5 consecutive swallows
- 18-24 months:
  - Scoops food with a spoon and brings it to mouth with some spillage
  - Drinks from a cup with limited spillage
  - Swallows with lip closure
  - Chews a broad range of foods
- 24-36 months:
  - Bites through foods with a variety of thicknesses
  - Self-feeds with little spillage
  - Chews with lips closed
  - Chews using stable rotary jaw action

Information from http://www.linguisystems.com/pdf/Milestonesguide.pdf

Pediatric Dysphagia-Differences Between Infants and Adults

- It is estimated that 3-10% of children experience a significant problem with feeding or swallowing at some point
- Differences between anatomy in adults and infants
  - In infants, the tongue is relatively larger and fills the oral cavity
  - The velum is lower and close to the tip of the epiglottis
  - The lower jaw is smaller and somewhat retracted
  - The larynx and hyoid are higher in the neck
  - The larynx does not elevate as much during the swallow
- Infants and young children cannot describe the type problem he/she is having or how it feels
- Swallow may change quickly because the infant is still growing and undergoing physical changes
- There is more often a relationship between symptoms in the esophageal phase and pharyngeal phase in infants

Speech Milestones

- Birth-1 month: reflexive noises such as crying, burping, coughing, sneezing
- 2-3 months: cooing and gooing (uses sounds that are similar to velars)
- 4-6 months: vocal play (raspberries, squeals, growls), bilabials
- 7-9 months: canonical babbling (reduplicated syllables), alveolars
- 10-12 months: variegated babbling (combining different syllables with adult-like intonation)
- Age 2: 50% intelligible
- Age 3: produces h, w, p, b, m correctly, 75% intelligible
- Age 4: produces t, d, n, f, k, g, y, 90% intelligible
- Age 5: produces ng, v, 95% intelligible
- Age 6: produces l
- Age 7: produces s, z, ch, sh, r, “J”
- Age 8: produces th, zh

Language Milestones: One to Two Years Old

- Points to a few body parts when asked
- Follows simple commands (give me the shoe, open the door)
- Listens to simple songs and rhymes
- Points to a few pictures in a book when named
- Says new words each month
- Asks some basic questions using 1 or 2 words
- Combines two words together
- Using many different consonant sounds at the beginning of words
- Vocabulary of at least 50-75 words

Information from: http://www.asha.org/public/speech/development/12.htm

Language Milestones: Two to Three Years Old

- Understands basic descriptors such as big/little, stop/go, up/down, in/on
- Follows two-step directions that are related
- Uses 2-3 word sentences consistently
- Directs others attention to objects verbally
- Asks basic “what” and “where” questions
- Answers basic “what,” “where,” “who” questions
- Labels most common objects in his/her daily environment
- Identifies common body parts
- Vocabulary of 300-500 words
- Starting to use plural –s and present progressive –ing
- Matches pictures, objects, and colors

Information from: http://www.asha.org/public/speech/development/23/, http://www.ldonline.org/article/6313/

Language Milestones: Three to Four Years Old

- Uses sentences that have 3-4 words
- Tells about what happened during his/her day
- Answers more complex “who,” “what,” “where,” “when” questions
- Uses a variety of different pronouns
- Has vocabulary of around 1,000 words
- Understands more complex 2-step directions
- Understands most basic positional and descriptive words
- Uses more grammar markers, such as possessive –s, articles, and some auxiliary/copular verbs
- Identifies and names basic colors
- Sorts objects by size, color, shape
- Rote counts to 10

Information from: http://www.asha.org/public/speech/development/23/, http://www.ldonline.org/article/6313/

Language Milestones: Four to Five Years Old

- Answers questions about short stories that are read aloud
- Understands basic time concepts
- Uses sentences that are at least 4-5 words long
- Uses past tense verbs
- Understands comparatives and superlatives
- Understands quantity concepts such as “more, less, most, least”
- Answers “why” questions
- Vocabulary of around 1,500 words
- Identifies and names basic shapes
- Identifies some letters (particularly those in his/her name)
- Extends a simple AB pattern
- Counts with 1:1 correspondence to 10

Information from: http://www.asha.org/public/speech/development/23/, http://www.ldonline.org/article/6313/

Language Milestones: Five to Six Years Old (Kindergarten)

- Understands “same” and “different” (and explains why something is different)
- Names objects in basic categories
- Makes statements about cause/effect (makes basic predictions)
- Follows 3-step directions
- Uses adjectives for describing
- Grammar should sound similar to adult speech (with some errors possible on irregular forms)
- Identifies “right” and “left”
- Completes basic sequences (understands first, next, last)
- Identifies words that rhyme
- Identifies most letters and numerals
- Knows the sounds that letters make
- Knows 50-100 sight words by the end of Kindergarten

Information from: http://www.asha.org/public/speech/development/kindergarten/, http://www.ldonline.org/article/6313/

Behavioral Considerations

- If possible, ask caregivers what time of day is best for therapy sessions
- Choose shorter, more frequent sessions when possible
- Generate a list of rules for speech therapy with the child (make sure rules are appropriate to child's ability level) and display the rules during session
- Use a visual schedule, to-do list, or "first-then" board
- Use a timer and take scheduled sensory/reinforcement breaks during session or teach child how to ask for a break
- Involve child in setting goals and tracking progress - use simple graphs and let child help your graph progress
- Use simple social stories- take pictures of the child and his/her actual environment to use in the stories
- Celebrate progress and achievements- if the child is at an inpatient facility, display info about achievements in room

AAC

- Many children who have suffered a TBI may benefit from AAC, either as a primary method of communication or to facilitate verbal communication
- There is a large variety of options, ranging from low to high tech
- It may be very beneficial to work with OT when selecting an AAC device and access method
- Sign Language
  - Free videos for signs at www.signingsavvy.com
- Picture Symbols
  - Communication board
  - Communication binder- Velcro on outside of binder so that child can make sentences or choose between a limited number of pictures- pages with Velcro inside binder to hold all of the pictures
- Communication Devices
  - Big Mack Switches
  - Go Talk- 4, 9, 20 pictures
  - Free iPad apps- SoundingBoard- make your own communication boards using photos and voice recordings
  - Paid iPad apps- DynaVox Compass TouchChat, SonoFlex, LAMP Words for Life
  - DynaVox, Prentke-Romich, and Saltillo offer a range of devices
    - These devices are costly, but allow for different access options, such as eye-gaze, scanning, alternative mouse/joysticks, and head-tracking

Activities to Target Making Basic Requests

- These activities may be particularly useful for children learning to use AAC or children with poor initiation/communicative intent
- Set up communication temptations
  - Put a small snack or toy inside a container that the child is unable to open
  - Give the child a toy that he/she is unable to use independently
    - Wind-up toys, bubbles, balloons (blow them up and let them fly around the room), make paper airplanes, play-doh containers
    - iPad with the screen locked
    - Favorite toy without batteries
  - Put a favorite toy or snack somewhere the child can see it, but can't reach it
  - Play with a toy that has multiple parts (puzzles, blocks, train track, stacking cups) and give the child one piece at a time
  - Sing a familiar song like "Itsy Bitsy Spider" or "Row your Boat" and stop suddenly before an important word- don't continue singing until the child fills in the word
- Children can make requests using words, signs, picture symbols or a communication device
- Communication temptations are most successful in a environment where you can control the child's access to other toys and fun activities

Moving Beyond Basic Requests

- These activities are appropriate for children that communicate verbally or with AAC
- Add descriptive words to the request- For example “I want the big cookie” or “I want the red car”
  - Make sure you have multiple examples of the desired object (such as a big cookie and a small cookie or a red car and a blue car)
- Have the child tell you who they want to play with- For example “I want to play train with mommy” or “listen to music with daddy”
- Have the child tell you where he/she wants to play- For example “play dollhouse on the floor” or “I want to read books outside”
- Give the child an incorrect item when he/she requests something (for example- give the child a train when he/she asks for a car) and wait for the child to correct you by saying “not the train”
- Give the child a toy with an essential piece missing and wait for him/her to ask where it is. For example, give the child a picture-to-picture puzzle with one piece missing and have him/her ask “Where is the piece?” or “Where is the dog?”
- Do something silly, such as wearing your jacket backward or wearing gloves inside, and act like nothing is different until the child makes a comment

Games for Elementary Speech Therapy

- AnimaLogic- (ages 5 and up) attention, Memory, planning, reasoning
- Sequence for Kids -(ages 6 and up) Strategy building, planning, reasoning
- Spot It- (ages 6 and up) Attention, basic concepts
- Tell Tale- (ages 6 and up) Narrative construction, creative thinking
- Guess Who?- (ages 7 and up) Asking questions, answering questions, reasoning, attention
- HedBanz - (ages 7 and up) Asking questions, answering questions, reasoning
- Don’t Say It- (ages 8 and up) Vocabulary, descriptive language, synonyms, reasoning (like Taboo)
- Apples to Apples Jr.- (ages 9 and up) Descriptive language, vocabulary, reasoning, humor
- Blurt- (ages 9 and up) Expressive vocabulary and word retrieval
- You’ve Been Sentenced- (ages 9 and up) Sentence construction, grammar
- In a Pickle- (ages 10 and up) Spatial awareness, creative thinking, reasoning

Memory Activities for Children

- Create a rhythm by clapping your hands, snapping your fingers, patting your knees, stomping your feet, etc. See how many steps the child can remember in a sequence.
- Make a design or tower with blocks and let the child study it briefly. Then, cover up your blocks and see if the child can create a design/tower that matches.
- Make a line out of animals or other small figurines and then see if the child can re-create the line with the animals/figurines in the same order.
- Put a group of toys or common objects on a tray and let the child study the tray briefly. Then, cover up the tray and remove one object. See if the child can remember which item was removed.

More Memory Activities for Children

- Get 3-4 cups and hide a small toy under one of the cups. Move the cups around as the child watches and see if he/she can remember which one has the toy underneath. Start by moving the cups slowly and then move them more quickly.
- Lay out a row of flashcards with pictures, numbers, or letters on them. Let the child study the cards and then turn them face-down. See how many cards the child can remember in a row.
- Make 2 copies of a coloring page and put several stickers on one of the pages. Let the child study the page with the stickers and then see if the child can put stickers in the same locations on his/her own coloring page.
- Play “Simon Says” with multi-step directions and see how many actions the child can remember in order.

Treatment for Dysarthria in Children

- Dysarthria in children is most commonly caused by cerebral palsy, TBI, or stroke
- To determine if a child can generate adequate respiratory support for speech- have a child blow bubbles in a cup of water through a straw with the bottom of the straw taped 5-10 cm below the surface of the water (try to sustain for 5 seconds)
- Research has shown positive results using LSVT with children who have CP
- Teach compensatory strategies using visual cues
  - Pacing boards
  - Volume thermometer
  - Visual that reminds child when to take a breath
  - Create a signal for when you did not understand the child and need him/her to repeat
- Videotape the child talking and let the child critique his/her own speech to improve self-monitoring
- Children with severe dysarthria may benefit from AAC

Treatment for Childhood Apraxia of Speech

- Research has shown that treatment is most effective when it incorporates the principles of motor learning
  - Amount of Practice- Children with apraxia need a large amount of practice with a large number of repetitions for each target
  - Practice Distribution- Break therapy into shorter, more frequent sessions
  - Practice Schedule- When a child is learning a new target, use blocked practice (a child repeats the same word/utterance many times in a row). Then, transition to random practice (a child practices several different targets in a random order).
  - Variability of Practice- Make sure to practice the targets in different contexts and environments
  - Amount of Feedback- Start by giving frequent feedback (after each trial) and transition to providing feedback less frequently so that the child begins to self-monitor
  - Timing of Feedback- When learning a new target, start by giving feedback immediately and then transition to delaying feedback a few seconds so that the child has time to process and judge for him/herself
- Children with apraxia benefit from multi-sensory prompting with visual, verbal, and tactile cues

Treatment for Social Deficits

- Create social stories using actual pictures of the child
- Use visuals such as rolling a ball or placing blocks of 2 different colors on a tower to teach conversational turn-taking
- Teach topic maintenance during structured situations first and then move to less structured conversation
  - Use visuals, such as a graphic organizer to make lists of on-topic comments and questions about a particular topic
  - Have the child sort on-topic vs off-topic remarks
  - Develop a visual signal that can be used when the child makes an off-topic remark
  - Play role-playing games and have the child think about what a certain person or character might say in a given situation
  - Have the child think of dialogue to go along with comic strips or pictures in a book
  - Use sequencing cards to help the child create a short narrative
- Talk about new social situations before they occur and sort behaviors according to “good choices” vs. “bad choices”

Pediatric Dysphagia Treatment

- There are 4 types of feeding/swallowing disorders in children
- A child may demonstrate characteristics of more than 1 type
- A child may initially present with 1 type of disorder, but characteristics can change throughout treatment
  - Motor- Based Problems
    - These children have difficulty with coordination and timing of movements or problems with muscle tone
    - Treatments may include postural/positioning techniques, diet modification, adaptive equipment/utensils, oral-motor treatments
  - Sensory- Based Problems
    - These children have impaired sensory systems and are unable to process all of the sensory information necessary for eating and drinking
    - Treatments may include gradually introducing children to new food textures/types (such as the Sequential-Oral-Sensory Approach), sensory stimulation techniques, modifying the feeding environment or appearance of food

Pediatric Dysphagia Treatment

- Structurally-Based Problems
  - These children have structural problems of the face and mouth or GI tract
  - Treatments may include surgery or other medical management as well as postural/positioning techniques, diet modification, adaptive equipment/utensils, oral-motor treatments
- Behaviorally-Based Problems
  - These children refuse certain types of foods or refuse to eat/drink anything by mouth for behavioral reasons (many children previously had motor, sensory, or structurally based problems that are resolved)
  - Treatments include behavior modification with positive reinforcements , gradually introducing new foods
- Provide education to caregivers so that the same strategies can be implemented at home- consistency in expectations and presentation of food can be very important

Return to School

- After a new injury, students may need special education services or accommodations/modifications when they return to school
  - The public schools serve children aged 3-21
  - If the child is aged birth-3, they can be referred to an early intervention program
- The school district can do an evaluation and determine if the student qualifies for an IEP (Individualized Education Program)
  - An IEP can provide services including speech therapy, OT, PT, specialized instruction in a resource room or special education classroom
  - An IEP can also provide an aide that is 1:1 or shared between a couple students if the child's needs are severe
  - An IEP can provide modifications and/or accommodations in the classroom
  - A medical diagnosis does not automatically mean a child will qualify for an IEP. The child has to meet eligibility criteria and the disability has to show an impact on the child's education.
    - Eligibility Criteria varies by state, but TBI is an educational disability under IDEA
    - The process takes time- The school district has 60 days to complete an evaluation and then 30 days to write an IEP
  - If the student attends private school or is homeschooled, the public schools will still provide some services (the exact amount and type varies by school district)

Return to School- Continued

- If the student does not qualify for an IEP, he/she may be eligible for a 504 plan
  - To qualify for a 504, a student must have an impairment or condition that has been diagnosed by a doctor, and that impairment must impact the child's ability to fully participate in school in some way
    - A 504 plan can provide accommodations/modifications in the classroom
    - A 504 plan can also provide specialized instruction within the regular classroom or related services such as ST, OT, PT (but this is less common)
- Common modifications/accommodations for a child with TBI:
  - Preferential seating
  - Shortened assignments
  - Extended time for tests or untimed tests
  - Taking tests in a quiet environment to limit distractions
  - Shortened school days or scheduled rest breaks
  - Notes or study guides provided by teacher
  - Tests completed orally instead of in writing
  - Typing instead of hand-writing
  - Special Training for Staff

Return to School- Continued

- Good communication between the family and school is key
- The earlier the family can begin talking to the school about their concerns and the child's potential needs, the better
- The family needs to be a strong advocate for the child
- For younger children, it may be helpful if the parents educate the child's classmates about what to expect and how to help before the child returns to school
- For older children/adolescents, it may helpful if the child and family talk to a core group of friends about how they can provide support during the return to school.

Resources

- General Stats:
  - http://www.asha.org/uploadedFiles/2015-SLP-Health-Care-Survey-Caseload.pdf
- Language Milestones:
  - http://www.linguisystems.com/pdf/Milestonesguide.pdf
  - http://www.asha.org/public/speech/development/chart/
  - http://www.asha.org/public/speech/development/communicationdevelopment/
  - http://www.ldonline.org/article/6313/
- TBI:
  - http://www.cdc.gov/traumaticbraininjury/get_the_facts.html
  - http://www.brainline.org/content/2011/02/pediatric-traumatic-brain-injury_pageall.html
  - http://www.biausa.org/brain-injury-children.htm
- Dysarthria:
  - http://www.speech-language-therapy.com/index.php?option=com_content&view=article&id=90:dysarthrias&catid=11:admin
  - http://speech-language-pathology-audiology.advanceweb.com/Article/Dysarthria-in-Children-with-CP.aspx
- Apraxia:
  - http://community.advanceweb.com/blogs/sp_1/archive/2010/01/29/effective-apraxia-therapy.aspx
- Dysphagia:
  - http://www.asha.org/PRPSpecificTopic.aspx?folderid=8589934965&section=Overview