

FACT SHEET

Teaching, Learning and Assessment in Clinical Reasoning

CLINICAL REASONING in PEDIATRIC PHYSICAL THERAPIST PRACTICE

Clinical reasoning (CR) is a foundational component of physical therapist practice.^{1,2} In pediatric physical therapist practice, CR is both complex and critical.³ This complexity stems from the numerous patient specific variables that influence care such as the family unit, setting, availability of resources and reimbursement, and the innate variability in the growth and development of children. Identifying and considering such contextual variables directs a clinician's actions and decisions and thus is vital to achieving patient and family outcomes. While contextual variables are most evident in the clinical setting, teaching clinical reasoning is the responsibility of both academic faculty and clinical educators. The purpose of this fact sheet is to provide pediatric physical therapists with knowledge and tools to facilitate and assess the CR process of the learner.

In this fact sheet we will 1) describe the complex CR process including the different types of reasoning, 2) provide applied pediatric PT examples of various types of CR, 3) highlight the development of clinical reasoning across time with learners at different stages, 4) identify tools to facilitate CR across various learner stages (novice versus advanced), and 5) describe tools to help educators assess CR.

Definition/Description

In the broadest sense, CR can be summarized as the thinking and decision making of a health care provider in clinical practice.² While the profession has not agreed upon a single definition, Huhn et al⁴ conceptualize CR as the integration of cognitive, psychomotor, and affective skills that are context dependent, collaborative with the patient and therapist, and adaptive. Reflection is identified as an important component of CR where the clinician, in concert with the patient and family, acknowledges the critical contextual factors that will determine an appropriate clinical intervention.⁴ In pediatric physical therapy practice, a focus on and collaboration with the family unit is a critical component of CR.⁵ While collaboration is a critical factor in pediatric CR, Sebelski et al highlight the need for the profession to more explicitly focus on movement as a central component of the CR process as movement experts.⁶

Types of Reasoning

Although a number of different types of reasoning processes exist, we chose to highlight two types of CR:

- Type 2 (slow) reasoning also known as hypothetico-deductive (Deductive Reasoning)⁷
- Type 1 (fast) or pattern recognition (Inductive Reasoning)⁷

Table 1 describes the use of these different reasoning processes.

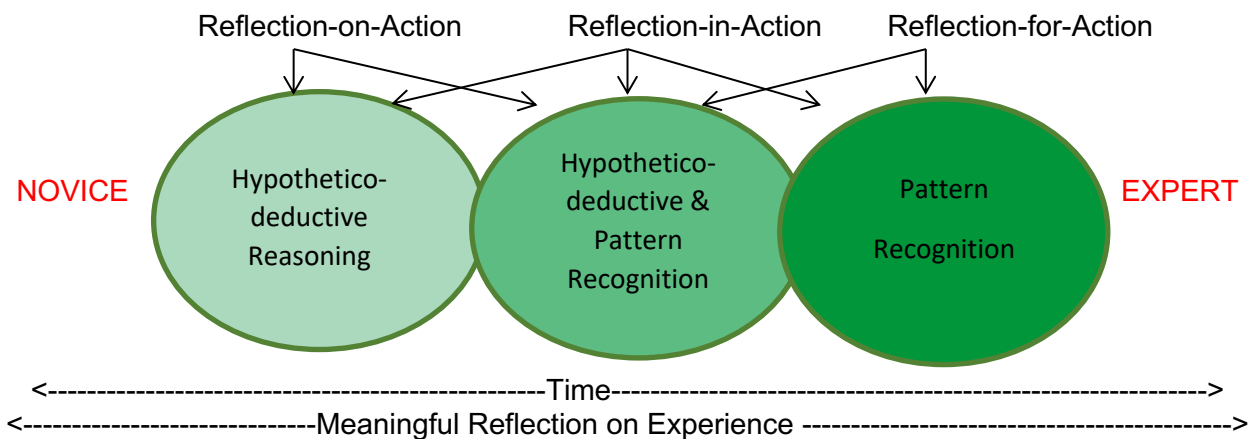
TABLE 1: Types of Clinical Reasoning

TYPE OF REASONING	DEFINITION	PRIMARY USERS ⁷
Hypothetico-deductive (Type 2 - Deductive reasoning)	Generation of hypothesis based upon results of tests/measures with subsequent testing of hypothesis	Frequently used by novices in all situations. Used by experts during challenging/unfamiliar cases or when pattern recognition is not working.
Pattern recognition (Type 1 - Inductive reasoning)	Quick retrieval of information from organized foundation of knowledge based upon previous clinical experience ⁷	Frequently used by experts during familiar situations as they recognize patterns or “scripts” they have previously heard or experienced.

Clinical Reasoning as a Developmental Process across the Educational Continuum

A basic understanding of the types of reasoning processes used by physical therapists is essential in learning about our own reasoning process and in helping students to further develop a strong set of CR abilities to optimally care for children and their families. CR occurs as a developmental process across time and is mastered throughout a career.⁸ Novice therapists are more likely to use a hypothetico-deductive reasoning processes, while expert therapists are more likely to rely on pattern recognition to solve patient problems.⁷ As noted in Figure 1, these CR processes are associated with three different types of reflection described by Schon.⁹ These include: 1) reflection-on-action, which occurs after the patient encounter when the clinician reflects “back” on what occurred,^{9,10} 2) reflection-in-action, which occurs as the clinician makes changes in “real-time” during the patient encounter,¹⁰ and 3) reflection-for-action, which entails thinking about future actions to change practice.

FIGURE 1: Clinical Reasoning: A Developmental Process



Case Vignette:

Ana is a pediatric physical therapist in an outpatient setting. She completes a physical therapy examination with Diego, a 2-year-old boy with delayed gross motor skills. Diego’s mom is a single mother with 2 older children, one of which has been having behavior problems at school. The family lives in a small apartment, has very limited financial resources, and no access to medical insurance. Diego’s mom reports that she is very concerned about his inability to walk and is worried that Diego might not be able to attend their church preschool next fall if he doesn’t start walking soon. Mom is anxious for Diego to start preschool so that she can increase her work hours and qualify for her employer’s medical insurance program. Table 2 provides examples of how a therapist may use both types of reasoning to approach Diego’s evaluation.

TABLE 2: Applied Examples of Reasoning in Pediatrics

CASE EXAMPLE	HYPOTHETICO- DEDUCTIVE REASONING	APPLICATION TO PEDIATRICS
<p>A 2-year-old child presents with delay of gross motor skills</p>	<p><i>Deductive reasoning:</i>⁷</p> <ul style="list-style-type: none"> • Gathers relevant history • Multiple hypotheses formulated based upon patient interview/ observation • Hypotheses ruled in/out based upon results of tests and measures and patient interview to determine cause and effect • Performs additional tests and measures, if necessary to substantially determine health condition 	<ol style="list-style-type: none"> 1. The novice therapist asks the mother questions around the following areas: <ul style="list-style-type: none"> • Birth history (complications during pregnancy or delivery, prematurity, or NICU stay) • Onset of motor skills since birth (when did he begin rolling, sitting, crawling) • Feeding and nutrition, sleeping, communication/cognition • Family and physical environment 2. Based on the mother’s responses including a birth history of prematurity and a Grade III Intraventricular hemorrhage, the therapist considers hypotheses of developmental delay and cerebral palsy. 3. The therapist performs several tests and measures (observation of functional movement, range of motion (ROM), strength, posture, tone, reflexes, and a standardized pediatric test). 4. The therapist interprets the results of testing and determines the child demonstrates lower extremity extensor spasticity, weakness, decreased ROM, and delayed gross motor skills. In linking this with the child’s medical history, a possible health condition of spastic cerebral palsy is considered.
	PATTERN RECOGNITION	APPLICATION TO PEDIATRICS
<p>A 2-year-old child presents with delay of gross motor skills</p>	<p><i>Inductive reasoning:</i></p> <ul style="list-style-type: none"> • Attempts to understand patient’s story • Identifies important contextual factors • Identifies “pattern” that exists between all patients that have this particular health condition 	<ol style="list-style-type: none"> 1. The expert therapist ascertains from the mother her concern about the child’s inability to walk and potential impact on preschool next year. 2. The important contextual factors are identified including: the family dynamics (single working Mom with two other older children), physical environment (ranch style apartment with little opportunity to explore environment), and Mom’s dedication to improving her child’s skills. 3. The therapist quickly recognizes the familiar movement patterns of an inability to dissociate LE’s for reciprocal creeping and extension during rolling. The therapist asks about birth history to determine risk factors for spastic diplegic cerebral palsy as this child has very similar movement patterns and history to other 2-year-old children diagnosed with this health condition.

TEACHING CLINICAL REASONING ACROSS THE EDUCATIONAL CONTINUUM

Facilitating Clinical Reasoning

Evidence supports the need for consistently defining, teaching, and assessing CR across the educational continuum, beginning early in the professional curriculum and progressing through residency education and beyond.¹¹ Additionally, a need to develop best practices for teaching and learning as well as assessing CR has been identified.^{4,11}

Dreyfus and Dreyfus¹² described a model of skill acquisition from beginner to proficient that identifies performance descriptors of each phase of learning. This model has been used to describe clinical skill development across time in the health professions and can be used to classify learners across the educational continuum. Subsequently, this can guide educators in determining which teaching and learning strategy may ideally facilitate the CR process.^{3,8}

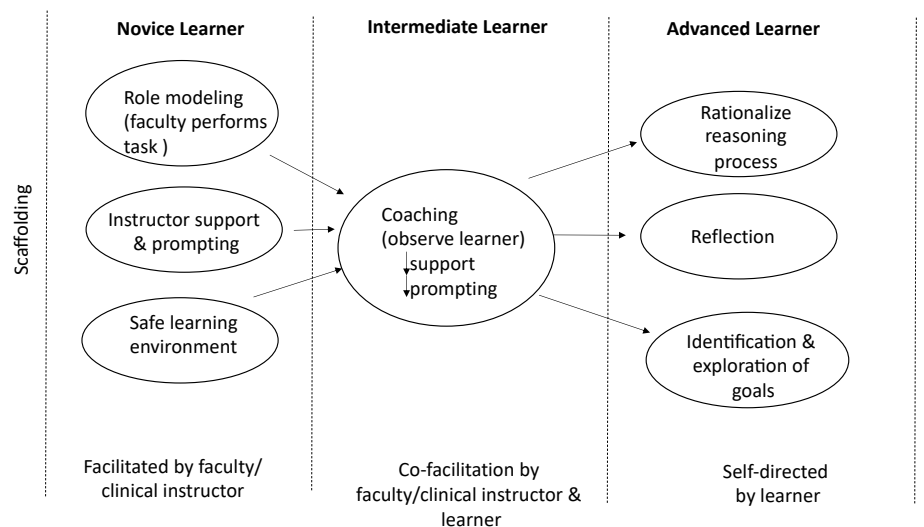
Deductive Tools

As described earlier, in the absence of clinical experience, novice learners (beginner or intermediate) may learn best using a deductive approach to CR.^{10,13} Tools that provide the novice learner with structure or a “road map” can help to facilitate CR skills. Each of the following tools uses scaffolding techniques, wherein the instructor provides just-in-time support, tailored to meet the unique needs of the learner within a particular learning experience. Learners who are just beginning to learn and apply a concept often require greater instructor support and prompting. Such support and prompting, however, should be gradually withdrawn as the learner progresses along the learning continuum and demonstrates readiness to take on more responsibility within the learning experience (see FIGURE 2).¹⁴

- 1) **Models/frameworks** - Models such as the **International Classification of Functioning, Disability, and Health (ICF)**¹⁵ may provide learners with structure for the CR process. The ICF¹⁵ is a conceptual framework that underscores the abilities of the individual and examines the interplay of both personal and environmental factors that contribute to an individual’s health status. Tools such as the **Physical Therapy Clinical Reasoning and Reflection Tool (PT-CRT)**¹⁶

incorporate the ICF¹⁵ and may be helpful in moving learners along the developmental path towards clinical expertise. Such models help clinicians to more fully appreciate the impact of a child’s condition on daily family life and routines and emphasize the important contextual factors that significantly influence CR. **The One-Minute Clinical Instructor (CI)** has been adapted to help CIs provide learners with clinically pertinent information and feedback in a timely, concise manner. Within the one-minute CI,¹⁷ the CI utilizes teaching strategies to require the learner to form opinions regarding a specific clinical problem. In this way, the CI is able to address issues in the context of patient care in an effective and efficient manner recognizing the limitation of time in the clinical setting. The one-minute CI¹⁷ includes the following steps:

FIGURE 2: Scaffolding across the Learner Continuum (Adapted from Master Adaptive Learner)¹⁴



Step 1: Ask the learner to state an opinion about the issues presented in the clinical case.

Step 2: Ask the learner for evidence to support this opinion.

Step 3: Provide the learner with specific information including elements of relevant clinical knowledge that can be directly applied to the clinical problem.

Step 4: Reinforce the learner's *correct assumptions and actions* before addressing any mistakes or misconceptions.

- 2) **Clinical practice guidelines (CPGs)** - CPGs provide a descriptive approach to patient care for specific health conditions. The American Physical Therapy Association Academy of Pediatric Physical Therapy has published two CPGs to date for management of children with Congenital Muscular Torticollis or Developmental Coordination Disorder.
- 3) **Clinical algorithms** - Clinical algorithms provide a systematic approach to patient care and can guide the novice clinician through decision-making processes. Pediatric specific algorithms, such as the Hypothesis Oriented Pediatric Focused Algorithm (HOP-FA),¹⁸ provide a systematic, step-wise guide to the management of pediatric patients/clients that promotes a child- and family-centered approach to pediatric physical therapist practice.

Inductive Tools

Learners beyond the novice level or individuals with clinical practice experience may benefit from inductive teaching and learning strategies that enable the learner to uncover patient-specific contextual factors in an effort to understand the deeper impact of these factors on the family.³ Tools and strategies that facilitate CR beyond the novice level to encourage a deeper level of reflection include:

- 1) **Purposeful Questioning** - questioning techniques may help learners to rethink and reframe a seemingly routine patient case. "What if" questions can be particularly useful in this regard: "What if the child had a progressive condition? How would that potentially impact the selection of a seating and mobility device?" Questions that ask learners to think towards the future can also be helpful: "What do you expect this child's function abilities to be in 1 year? In 5 years? What needs to be done now to maximize this child's future independence?" Questions that force learners to prioritize patient problem areas can also help learners to consider and justify specific aspects of a patient case: "What single impairment is most limiting to this patient's gait function? Why?"
- 2) **Reflection** - whether written or verbal, reflection is a necessary and powerful tool in the development of the CR process. Encouraging learners to recognize and analyze relevant events and situations can promote development of the self-awareness skills necessary to synthesize the knowledge gained from a specific event and apply that knowledge to future patient care situations.¹⁰ In addition to traditional reflection methods, peer coaching in which students meet and discuss clinical situations in pairs or small groups has been suggested as way to encourage reflection in a supportive environment.

ASSESSING CLINICAL REASONING

While facilitating the CR process of the learner is important, obtaining a baseline measurement of the learner's skills and assessing the effectiveness of various teaching strategies on learning is imperative. Due to the complexity and number of variables associated with reasoning processes, assessment of CR is challenging for educators in both academic and clinical education settings. The following tools have been developed to assess CR abilities in physical therapy students:

- 1) Clinical Reasoning Assessment Tool (CRAT)¹⁹ – (formerly known as the Clinical Reasoning Grading Rubric²⁰) evaluates the major constructs of CR using the Dreyfus and Dreyfus model of skill acquisition (content knowledge, procedural knowledge and skill, and conceptual reasoning) over time. It was developed to determine learner readiness to progress to clinical education experiences.
- 2) Think Aloud Standardized Patient Examination (TASPE)²¹ - incorporates the “think aloud” method into a standardized patient examination to assess CR competency in physical therapy students. This rubric uses three “think aloud” components to allow the learner to justify their hypothesis of the health condition and their intervention selection.

CONCLUSION

CR is an integral and critical aspect of effective pediatric physical therapy practice. By intentionally directing and guiding learning experiences in ways that promote the development of CR, therapists can facilitate the application of CR strategies and assess the learner’s abilities in both the clinic and the classroom.

REFERENCES

1. Higgs J, Jensen GM, Loftus S, Christensen N (eds). *Clinical Reasoning in the Health Professions. 4th ed.* Boston, MA. Elsevier. 2019.
2. Musolino GM and Jensen GM. (eds). *Clinical Reasoning and Decision-Making in Physical Therapy: Facilitation, Assessment, and Implementation.* Thorofare, NJ: Slack Inc; 2020.
3. Furze J, Kenyon L, Jensen G. Connecting Classroom, Clinic & Context: Clinical Reasoning Strategies for Clinical Instructors and Academic Faculty. *Pediatr Phys Ther.* 2015;27(4):368-375.
4. Huhn K, Gilliland SJ, Black LL, Wainwright SF, Christensen N. Clinical reasoning in physical therapy: a concept analysis. *Phys Ther.* 2019;99:440-456.
5. Furze J, Anderson D, Moore J. Moving Toward Excellence in Pediatric Physical Therapy Excellence: Evidence and Application. APTA Combined Sections Meeting, Session Presentation, Washington DC, January 26, 2019.
6. Sebelski CA, Hoogenboom BJ, Hayes AM, Bradford EH, Wainwright SF, Huhn K. The Intersection of movement and clinical reasoning: embodying “body as a teacher” to advance the profession and practice. *Phys Ther.* 2020;110(2):201-204.
7. Cook CE, Covington K, Tousignant-Laflamme Y. Clinical reasoning using system 1 and system 2 modeling. In: Musolino GM and Jensen GM. (eds). *Clinical Reasoning and Decision-Making in Physical Therapy: Facilitation, Assessment, and Implementation.* Thorofare, NJ: Slack Inc; 2020:157-168.
8. Black L, Christensen N. Facilitation of clinical reasoning: teaching and learning strategies across the continuum of learners. In: Musolino GM and Jensen GM. (eds). *Clinical Reasoning and Decision-Making in Physical Therapy: Facilitation, Assessment, and Implementation.* Thorofare, NJ: Slack Inc; 2020:177-182.
9. Schon DA. *The Reflective Practitioner: How Professionals Think in Action.* New York, NY: Basic Books; 1983.
10. Wainwright S, Shepard K, Harman L, Stephens J. Novice and experienced physical therapist clinicians: A comparison of how reflection is used to inform the clinical decision-making process. *Phys Ther.* 2010;90:75-88.
11. Christensen N, Black L, Furze J, Huhn K, Vendrely A, Wainwright S. Clinical Reasoning: survey of teaching methods, integration, and assessment in entry-level physical therapist academic education. *Phys Ther.* 2017;97(2):175-186.

12. Carraccio CL, Benson BJ, Nixon LJ, Derstine PL. From the educational bench to the clinical bedside: translating the Dreyfus developmental model to the learning of clinical skills. *Acad Med*. 2008;83(8):761-767.
13. Jensen GM, Hack LM, Nordstrom T, et al. National Study of Excellence and Innovation in Physical Therapist Education: Part 2—A Call to Reform. *Phys Ther*. 2017;97:875-888.
14. Cutrer W, Pusic M, Gruppen L, Hammoud M, Santen S. *The Master Adaptive Learner*. Philadelphia, PA: Elsevier. 2020.
15. International Classification of Functioning, Disability and Health: ICF. Geneva, Switzerland: World Health Organization; 2001.
16. Atkinson HL, Nixon-Cave K. A tool for clinical reasoning and reflection using the International Classification of Functioning, Disability and Health (ICF) framework and patient management model. *Phys Ther*. 2011;91(3):416-430.
17. Neher JO, Gordon KC, Meyer B, Stevens N. A five-step “microskills” model of clinical teaching. *J Am Board Fam Pract*. 1992;5(5):419-424.
18. Kenyon LK. The hypothesis-oriented pediatric focused algorithm: a framework for clinical reasoning in pediatric physical therapist practice. *Phys Ther*. 2013;93(3):413-420.
19. McDevitt A, Rapport MJ, Jensen G, Furze JA. Utilization of the Clinical Reasoning Assessment Tool Across a Physical Therapy Curriculum Application for Teaching, Learning, and Assessment. *J Phys Ther Educ*. 2019;33(4):335-342.
20. Furze J, Black L, Cochran T, Gale J, Jensen G. Clinical Reasoning: Development of a Grading Rubric for Student Assessment. *J Phys Ther Educ*. 2015;29(3):34-45.
21. Fu W. Development of an innovative tool to assess student physical therapists’ clinical reasoning competency. *J Phys Ther Educ*. 2015;29(4):13-26.

ADDITIONAL RESOURCES/SUGGESTED READINGS

- Musolino GM and Jensen GM, eds. *Clinical Reasoning and Decision-Making in Physical Therapy: Facilitation, Assessment, and Implementation*. Thorofare, NJ: Slack Inc; 2020.
- Higgs J, Jensen GM, Loftus S, Christensen N (eds). *Clinical Reasoning in the Health Professions*. 4th ed. Boston, MA: Elsevier. 2019.
- Furze J, Kenyon L, Jensen G. Connecting Classroom, Clinic & Context: Clinical Reasoning Strategies for Clinical Instructors and Academic Faculty. *Pediatric Physical Therapy*. 2015;27(4):368-375.
- Trowbridge RL, Rencik JJ, Durning SJ, eds. *Teaching Clinical Reasoning: ACP Teaching Medical Series*. Philadelphia, PA: American College of Physicians; 2015.
- Cutrer WB, Sullivan WM, Fleming AE. Educational Strategies for Improving Clinical Reasoning. *Curr Probl Pediatr Adolesc Health Care*. 2013;43:248-257.
- Wainwright S, Shepard K, Harman L, Stephens J. Factors that influenced the clinical decision-making processes of novice and experienced physical therapists. *Phys Ther*. 2011;91:87-101.
- Jensen GM, Gwyer J, Shepard K, Hack L. Expert practice in physical therapy. *Phys Ther*. 2000;80:28-43.

©2021 by the APTA Academy of Pediatric Physical Therapy, 1020 N Fairfax St, Suite 400, Alexandria, VA 22314-1488, www.pediatricapta.org

Developed by expert contributors Jennifer Furze, PT, DPT, Board-Certified Pediatric Clinical Specialist; Lisa K. Kenyon, PT, PhD, Board-Certified Pediatric Clinical Specialist; and Gail Jensen, PT, PhD, FAPTA. Supported by the Fact Sheet Committee of APTA Pediatrics.

The APTA Academy of Pediatric Physical Therapy provides access to these member-produced fact sheets and resources for informational purposes only. They are not intended to represent the position of APTA Pediatrics or of the American Physical Therapy Association.