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CRISP: An Inpatient Pediatric Curriculum for Family Medicine Residents Using Clinical Reasoning and Illness Scripts

Gayatri B. Madduri, MD*, Elizabeth L. Torwekar, MD, Shaban Demirel, PhD, Megan Durham, MD, Kimberlee I. Hauff, MD, MS, Rajat Kaul, MD, MS, Tristan Nichols, DO, Noga L. Ravid, MD, Mason A. Shaner, MPH, Caroline E. Rassbach, MD, MAEd

*Corresponding author: gboddupa@stanford.edu

Abstract

Introduction: Clinical reasoning enables safe patient care and is an important competency in medical education but can be challenging to teach. Illness scripts facilitate clinical reasoning but have not been used to create pediatric curricula. **Methods:** We created CRISP (Clinical Reasoning with Illness Scripts in Pediatrics), a curriculum comprising four 1-hour learning sessions that deliberately incorporated clinical reasoning concepts and illness scripts to organize how four common chief complaints were taught to family medicine residents on inpatient pediatric rotations. We performed a multisite curriculum evaluation project over 6 months with family medicine residents at four institutions to assess whether the use of clinical reasoning concepts to structure CRISP was feasible and acceptable for learners and instructors and whether the use of illness scripts increased knowledge of four common pediatric chief complaints. **Results:** For all learning sessions, family medicine residents and pediatric hospitalists agreed that CRISP's format was preferable to traditional didactic lectures. Pre-/posttest scores showed statistically significant increases in family medicine resident knowledge (respiratory distress [$n = 42$]: pretest, 72%, posttest, 92%; abdominal pain [$n = 44$]: pretest, 82%, posttest, 96%; acute febrile limp [$n = 44$]: pretest, 68%, posttest, 81%; well-appearing febrile infant [$n = 42$]: pretest, 58%, posttest, 73%; ps < .05). **Discussion:** By using clinical reasoning concepts and illness script comparison to structure a pediatric curriculum, CRISP represents a novel instructional approach that can be used by pediatric hospitalists to increase family medicine resident knowledge about diagnoses associated with common pediatric chief complaints.

Educational Objectives

By the end of this activity, learners will be able to:

1. Describe concepts related to clinical reasoning: semantic qualifiers, problem representation, illness scripts, and differential prioritization.
2. Apply frameworks for conceptualizing four common pediatric chief complaints: (a) localization of upper versus lower airway using physical exam findings for respiratory distress; (b) urgent versus nonurgent characteristics for abdominal pain; (c) localization within the muscle, joint, or bone for acute febrile limp; and (d) age as a risk factor for invasive bacterial infections for well-appearing febrile infants.
3. Evaluate case vignettes for pertinent characteristics related to a specific diagnosis.
4. Compare and contrast illness scripts (history, demographics, physical exam, workup, and management) for diagnoses related to four common pediatric chief complaints.

Introduction

Diagnostic errors by physicians cause preventable adverse events in health care, leading to the recognition that clinical reasoning (CR) is fundamental for safe patient care.[1] CR comprises the cognitive steps by which physicians gather, synthesize, and act upon information to create differential diagnoses and therapeutic plans for patients.[2] In both undergraduate[3] and graduate[4] medical education, CR is an important competency. Yet experienced physicians may find that teaching CR is challenging[5] because experts may unconsciously employ CR cognitive steps without insight, reflecting its dual-process nature.[6] Physician educators with metacognition of their

diagnostic thought process can deliberately facilitate CR with learners.[7]

Illness scripts (IS), a key component of CR, help physicians store and recall noteworthy features of diseases[8] in order to compare them with a patient's presentation in a real-world context.[9] Teaching with IS enables comparison,[10] a higher-order cognitive skill in Bloom's taxonomy,[11] rather than rote memorization of disease presentation. Within pediatrics, IS are an effective way to teach CR[12] and to improve diagnostic accuracy among novice learners.[13] Yet the use of IS has been limited to assessing clinical decision-making among pediatric hospitalists[14] and facilitating feedback to pediatric clerkship students.[15] Outside of pediatrics, *MedEdPORTAL* provides CR and IS curricula for medical students[16-18] and for adult inpatient contexts.[19] To date, no peer-reviewed pediatric curricula utilizing the concepts of CR and IS have been published.

We developed a curriculum called CRISP (Clinical Reasoning with Illness Scripts in Pediatrics) using the conceptual framework of making thinking visible[20] to allow instructors to deliberately teach CR concepts and the theoretical framework of IS[21] to allow learners to compare and contrast multiple diagnoses related to common pediatric chief complaints. The context for creating and implementing the curriculum was four community hospitals where pediatric hospitalists teach family medicine (FM) residents on inpatient pediatric rotations. Within these settings, pediatric hospitalists have curricular guidelines[22,23] but limited bandwidth to create educational experiences specifically for FM residents.[24] In addition, FM residents have limited time on inpatient pediatric rotations and limited exposure to certain pediatric

diagnoses if they do not rotate during a specific season or time frame.

We propose that CRISP, a pediatric curriculum designed with CR concepts and comparison of IS, is feasible and acceptable to FM residents and pediatric hospitalists and can increase FM resident knowledge of diagnoses related to four common pediatric chief complaints. CRISP addresses the following educational gaps: (1) It provides instructors a deliberate way to teach CR concepts, (2) uses IS to compare key features of pediatric diagnoses, and (3) addresses a curricular need on inpatient pediatric rotations by offering a standardized curriculum that mitigates variation in learner clinical encounters.

Methods

Design

CRISP was designed by pediatric hospitalists with backgrounds in medical education who taught FM residents on inpatient pediatric rotations at four different academic-affiliated community hospitals. We based the learning sessions on four pediatric chief complaints, each with four to eight differential diagnoses framed as IS, commonly encountered by pediatric hospitalists in inpatient settings and by FM providers in outpatient settings.

First, we used the conceptual framework of making thinking visible[25] to design an overarching curricular structure. Each CRISP learning session was organized by a concept from making thinking visible paired with a specific action within the curriculum: (a) Naming the thinking required was paired with defining a CR concept and framework to approach a chief complaint (Table 1); (b) identifying thinking behaviors was paired with analysis of

Table 1. Learning Sessions Structure and Content

Learning Session Based on Chief Complaint	Framework	Clinical Reasoning Concept	Illness Scripts
Respiratory distress	Upper vs. lower airway pathology	Differential prioritization: short list of the most likely diagnoses that is hypothesis-driven and supported with data	• Asthma • Bronchiolitis • Croup • Pneumonia
Abdominal pain	Surgical vs. medical abdomen	Illness scripts: mental summary of a disease with predisposing conditions, pathophysiology, and clinical consequences	• Appendicitis • Intussusception • Pyloric stenosis • Small bowel obstruction • Bacterial enterocolitis • Constipation • Pancreatitis • Viral gastroenteritis
Acute febrile limp	Presenting characteristics and anatomic location	Semantic qualifiers: paired opposing descriptors that abstract patient illness characteristics	• Osteomyelitis • Septic arthritis • Transient synovitis • Viral myositis
Well-appearing febrile infant	Age as a risk factor for invasive bacterial infection	Problem representation: one-sentence summary defining patient case in abstract terms	• 8-21 days • 22-28 days • 29-60 days

case vignettes; (c) grouping behaviors into useful heuristics was paired with comparing and contrasting IS; and (d) enculturation was paired with reinforcing how to approach a pediatric chief complaint within a clinical context.

Second, we used the theoretical framework of IS to summarize key features of pediatric diagnoses (history, demographics, physical exam, workup, and management) to facilitate comparing multiple diagnoses without inundating learners with detailed information. We incorporated clinical practice guidelines and evidence-based resources to support features of IS.

Each CRISP learning session was conducted in 1 hour:

- 10 minutes: Learners completed a pretest (Appendices A-D) accessed by a QR code embedded in the corresponding learning session (Appendices E-H).
- 40 minutes: The instructor delivered the learning session (Appendices E-H) with the following format based on making thinking visible:
  - Instructor introduced a CR concept and framework related to the chief complaint.
  - Instructor asked learners to highlight pertinent characteristics of case vignettes.
  - Instructor reviewed features of IS for each diagnosis. Learners could use a blank worksheet to fill in features of IS to facilitate comparison (Appendices I-L).
  - Instructor summarized and reinforced the thought process of physicians when encountering an undifferentiated patient with the pediatric chief complaint.
- 10 minutes: Learners completed a posttest accessed by a QR code embedded in the learning session. The end of the posttest automatically directed learners to the learner survey (Appendix M). Instructors completed the instructor survey (Appendix N) while learners completed the posttest and learner survey.

Pilots
From January to June 2021, we conducted the first curriculum pilot at a hospital in California (CA). After receiving feedback from learners and instructors, we modified the learner pre-/posttests. We also modified the learning sessions to remove any components of workup and management that might be influenced by institutional practice variation and cited evidence-based guidelines in the notes section of each learning session.

From July through December 2021, we conducted a second pilot at a hospital in Oregon (OR). We created a new learning session

and pre-/posttest for the well-appearing febrile infant based on updated American Academy of Pediatrics guidelines.[26] No further changes were made to curricular materials for the other three learning sessions.

We then posted on an electronic mailing list of pediatric hospital medicine educators and recruited representatives from two additional hospitals in Washington (WA) and Ohio (OH) to participate in the final curriculum implementation to ensure the curriculum was applicable to other sites that had not participated in the pilots.

Implementation
From January through June 2022, we implemented CRISP as a required curriculum for FM resident learners on inpatient pediatric rotations at four hospitals (CA, OR, WA, and OH). Pediatric hospitalists taught CRISP during in-person noon conferences (OR), virtual didactic half-days (OH), or during breaks in clinical care (CA and WA). All instructors received a 15-minute introduction to the curriculum prior to implementation. Instructors accessed the learning sessions through shared cloud-based software (Google Drive, Microsoft Teams). Learners and instructors used their personal smartphones to scan the QR codes embedded in the learning sessions to access the pre-/posttests and learner/instructor surveys via Qualtrics.

Evaluation
We aligned our evaluations with Kirkpatrick's levels of training evaluation.[27] Pre-/posttest questions (Kirkpatrick level 2: learning) were based on learning objectives for each session. We created brief clinical vignettes for the four to eight diagnoses presented in each learning session, with corresponding multiple-choice questions related to the diagnosis, workup, or management of each diagnosis. Questions were not based on previously published material but created based on best practices for writing vignette-based multiple-choice questions.[28] Learner and instructor surveys (Kirkpatrick level 1: reaction) asked respondents to indicate their level of agreement with statements on a 5-point Likert scale (1 = *strongly disagree,* 5 = *strongly agree*).

We obtained institutional review board approval (CA, OR) or exemption (WA, OH) prior to the project and obtained consent for pre-/posttests and learner/instructor surveys. Learners received the curriculum regardless of whether they had consented to complete the surveys and participate in the project. We analyzed the paired pre-/posttests using the nonparametric Wilcoxon test and the learner/instructor evaluations using descriptive statistics.

We performed statistical analyses using the R language and environment for statistical computing (R Foundation).

Results

Paired pre-/posttests from 42-44 FM residents were analyzed (Table 2). Response rates for learner surveys ranged between 48% and 52% (Table 3). Seven to eight pediatric hospitalists completed instructor surveys (Table 4).

On average, learners agreed that CRISP developed CR skills (4.8 out of 5 on a 5-point scale), helped organize knowledge with IS (4.8 out of 5), and was applicable to clinical practice (4.9 out of 5). Instructors agreed that they preferred teaching with CRISP's CR format compared to traditional lectures (4.3 out of 5) and that material was accurate (4.8 out of 5) and easy to deliver without additional preparation (4.6 out of 5).

Pre-/posttest scores showed statistically significant increases in learner knowledge at all four sites for all four learning sessions: respiratory distress: pretest, 72%, posttest, 92%; abdominal pain: pretest, 82%, posttest, 96%; acute febrile limp: pretest, 68%, posttest, 81%; well-appearing febrile infant: pretest, 58%, posttest, 73% (all ps $< .05$).

Discussion

CRISP is a pediatric curriculum that is feasible and acceptable to FM residents and pediatric hospitalists and increases FM resident knowledge of diagnoses associated with four common pediatric chief complaints. CRISP represents an instructional approach that advances our understanding of how CR concepts can be deliberately used to structure a curriculum. By using the conceptual framework of making thinking visible, we emphasize the cognitive steps required for CR, which is important for both learners and instructors to develop metacognition into their diagnostic thought process.

We designed CRISP by purposefully incorporating IS as a theoretical framework, a strategy that has proven efficacy but has not been specifically described in other published pediatric curricula. While traditional lectures may emphasize knowledge acquisition by focusing on a single diagnosis, CRISP actively moves learners up Bloom's taxonomy by comparing multiple diagnoses related to a single chief complaint. In this way, CRISP adds to our knowledge of how pediatric curricula can use comparison of IS to promote knowledge gains.

Finally, CRISP addresses a context-specific curricular gap in settings where pediatric hospitalists educate FM residents. CRISP purposefully reviews common pediatric chief complaints and diagnoses to create a standardized curriculum for FM residents who have limited time on inpatient pediatric rotations where they may encounter diagnoses based on the seasonality of their rotation experience. In addition, we are not aware of published curricula that use CR to teach pediatrics across specialties or CR curricula studied at multiple sites in graduate medical education.

In our implementations, CRISP instructors were pediatric hospitalists and medical educators knowledgeable about CR. Other instructors who are less familiar with CR may need to familiarize themselves with these concepts to effectively deliver CRISP, potentially by using other *MedEdPORTAL* CR faculty development curricula.[29] Nevertheless, CRISP is practical and feasible. Instructors can deliver CRISP with minimal preparation and in multiple formats such as large-group didactics or

Table 2. Family Medicine Resident Paired Pre-/Posttest Knowledge Scores by Learning Session

Learning Session	M Pretest Score	M Posttest Score	M Score Percentage Increase[a]	95% Confidence Interval of M Scores	No. of Family Medicine Residents
Respiratory distress	72%	92%	20% ($p < .001$)[b]	1.6-3.2	PGY 1: 22 PGY 2: 2 PGY 3: 18 Total: 42
Abdominal pain	82%	96%	14% ($p < .001$)[b]	1.8-4.8	PGY 1: 26 PGY 2: 2 PGY 3: 16 Total: 44
Acute febrile limp	68%	81%	13% ($p = .03$)[b]	0.4-1.4	PGY 1: 30 PGY 2: 2 PGY 3: 12 Total: 44
Well-appearing febrile infant	58%	73%	15% ($p = .006$)[b]	0.2-3.0	PGY 1: 22 PGY 2: 4 PGY 3: 16 Total: 42

[a]Positive values indicate better scores on posttest compared to pretest.
[b]Significance indicated where $p < .05$.

Table 3. Family Medicine Resident Anonymous Survey Responses to Learning Sessions

Survey Statement[a]	M Scores per Learning Session				
	Respiratory Distress[b]	Abdominal Pain[c]	Acute Febrile Limp[d,e]	Well-Appearing Febrile Infant[f]	Average
1. The framework at the beginning the lecture provides a useful way to organize my thought process of this chief complaint.	4.7	4.9	4.6	4.7	4.7
2. Reviewing the clinical reasoning principle was helpful for me to develop clinical reasoning skills.	4.7	4.8	4.8	4.7	4.8
3. Comparing/contrasting illness scripts was a useful way to organize my knowledge for this lecture topic.	4.9	4.8	4.9	4.6	4.8
4. The lecture was interactive and engaging.	4.8	4.8	4.8	4.7	4.8
5. I prefer learning with this clinical reasoning lecture format vs. a more traditional lecture format.	4.9	4.8	4.8	4.8	4.8
6. I will apply what I learned in this lecture to my clinical practice.	5.0	4.8	4.9	4.9	4.9

[a]Rated on a 5-point Likert Scale (1 = strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = strongly agree).
[b]Response rate: 48% (20 out of 42).
[c]Response rate: 50% (22 out of 44).
[d]Response rate: 48%-50% (21-22 out of 44).
[e]For questions 1 and 6, $n = 22$.
[f]Response rate: 52% (22 out of 42).

small-group sessions. Learning sessions can be presented in any order.

CRISP is purposefully structured around common diagnoses and chief complaints, but some learners may find this content too simplistic. We encourage those learners to either deliver CRISP as instructors, thus facilitating their ability to teach with a CR lens, or to create additional CRISP learning sessions with other chief complaints. In addition, free-response comments by hospitalists in the instructor pilot surveys indicated that some instructors wanted more details within IS related to the diagnosis and management of specific diagnoses. We purposefully chose to keep information broad to emphasize comparing key features of IS.

Last, clinical practice guidelines change, and curricular content may become outdated. However, content of IS in CRISP can easily be updated while preserving the general CR curricular structure. This was exemplified by modifications we made to the well-appearing febrile infant learning session during our

pilot. In addition, new learning sessions can be created for other pediatric chief complaints (neonatal hyperbilirubinemia, syncope, etc.) by utilizing the same IS structure of comparing key features of pediatric diagnoses (history, demographics, physical exam, workup, and management).

Our curriculum evaluation has several limitations. We implemented CRISP at four academic-affiliated community hospitals, which limits generalizability to other practice settings where there may be different learners, instructors, or contexts. We demonstrated a significant increase between pre-/posttest results but did not ask learners to take posttests longitudinally, which could have determined if CRISP promotes long-term knowledge acquisition. However, the immediate implementation of posttests after delivering CRISP allowed us to associate knowledge gains directly with the curriculum. We inferred that structuring a curriculum based on CR was acceptable and feasible from reaction surveys but did not have a control group of learners who received a more traditional pediatric curriculum to compare to learners who received CRISP. In addition, we

Table 4. Pediatric Hospitalist Anonymous Survey Responses to Teaching Learning Sessions

Survey Statement[a]	M Scores per Learning Session				
	Respiratory Distress ($n = 7$)	Abdominal Pain ($n = 8$)	Acute Febrile Limp ($n = 8$)	Well-Appearing Febrile Infant ($n = 8$)	Average
1. The lecture content was accurate and reflected current standard of care for these diagnoses.	4.6	4.9	4.9	4.9	4.8
2. I prefer teaching with this interactive clinical reasoning-based format over giving traditional didactic lectures.	3.9	4.5	4.1	4.5	4.3
3. The lecture was interactive and engaging for residents.	4.0	4.8	4.3	4.5	4.4
4. The lecture was self-explanatory and easy to deliver without additional preparation.	4.6	4.8	4.5	4.4	4.6

[a]Rated on a 5-point Likert (1 = strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = strongly agree).

chose multiple-choice questions as a familiar and practical assessment over other methods of assessing application of IS.[30] We conducted pilot testing that informed changes to our pre-/posttests and IS content but did not build other validity evidence for our surveys or multiple-choice questions. Finally, our evaluation focused on Kirkpatrick levels 1 (reaction) and 2 (learning). Future studies may focus on the effectiveness of CRISP in improving CR skills in practice (Kirkpatrick level 3: behavior) or patient care (Kirkpatrick level 4: results).

CRISP uses CR concepts and comparison of IS to structure a pediatric curriculum that also fills a curricular gap for FM residents on inpatient pediatric rotations. By presenting a curriculum that makes CR concepts visible, CRISP benefits both the novice learner and the expert diagnostician—the novice to hone CR skills, the expert to hone the teaching of CR skills. The safe care of children depends on both.

Appendices

    A. Respiratory Distress Pre-Post Test.docx

    B. Abdominal Pain Pre-Post Test.docx

    C. Acute Febrile Limp Pre-Post Test.docx

    D. Well-Appearing Febrile Infant Pre-Post Test.docx

    E. Respiratory Distress Learning Session.pptx

    F. Abdominal Pain Learning Session.pptx

    G. Acute Febrile Limp Learning Session.pptx

    H. Well-Appearing Febrile Infant Learning Session.pptx

    I. Respiratory Distress Worksheet.docx

    J. Abdominal Pain Worksheet.docx

    K. Acute Febrile Limp Worksheet.docx

    L. Well-Appearing Febrile Infant Worksheet.docx

    M. CRISP Learner Survey.docx

    N. CRISP Instructor Survey.docx

All appendices are peer reviewed as integral parts of the Original Publication.

Gayatri B. Madduri, MD: Assistant Professor, Division of Pediatric Hospital Medicine, Department of Pediatrics, Stanford University School of Medicine; Family Medicine Inpatient Pediatrics Rotation Director, John Muir Medical Center; ORCID: https://orcid.org/0000-0002-1646-6986

Elizabeth L. Torwekar, MD: GME Director of Pediatric Education and Pediatric Hospitalist, Department of Pediatrics, Randall Children's Hospital, Legacy Health

Shaban Demirel, PhD: Vice President of Research, Legacy Research Institute, and Director of Clinical Research, Legacy Health

Megan Durham, MD: Clinical Instructor, Department of Pediatrics, Randall Children's Hospital, Legacy Health

Kimberlee I. Hauff, MD, MS: Associate Professor, Department of Family Medicine, University of Washington; Family Medicine Inpatient Pediatrics Rotation Director, Swedish Medical Center

Rajat Kaul, MD, MS: Associate Professor, Division of Hospital Medicine, Department of Pediatrics, Ebeid Children's Hospital; Pediatric Clerkship Director, University of Toledo College of Medicine and Life Sciences

Tristan Nichols, DO: Assistant Professor, Division of Pediatric Hospital Medicine, Department of Pediatrics, Stanford University School of Medicine; Family Medicine Inpatient Pediatrics Rotation Director, John Muir Medical Center

Noga L. Ravid, MD: Assistant Professor, Division of Pediatric Hospital Medicine, Department of Pediatrics, Stanford University School of Medicine; Chair, Department of Pediatrics, John Muir Medical Center

Mason A. Shaner, MPH: Third-Year Medical Student, University of Michigan Medical School

Caroline E. Rassbach, MD, MAEd: Professor, Division of Pediatric Hospital Medicine, Department of Pediatrics, and Program Director, Pediatrics Residency and Pediatrics-Anesthesiology Residency, Stanford University School of Medicine

References

1. National Academies of Sciences, Engineering, and Medicine. *Improving Diagnosis in Health Care*. National Academies Press; 2015. Accessed February 6, 2024. https://doi.org/10.17226/21794

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2. Gruppen LD. Clinical reasoning: defining it, teaching it, assessing it, studying it. *West J Emerg Med*. 2017;18(1):4-7. https://doi.org/10.5811/westjem.2016.11.33191

3. ten Cate O. Trusting graduates to enter residency: what does it take? *J Grad Med Educ*. 2014;6(1):7-10. https://doi.org/10.4300/JGME-D-13-00436.1

4. Connor DM, Durning SJ, Rencic JJ. Clinical reasoning as a core competency. *Acad Med*. 2020;95(8):1166-1171. https://doi.org/10.1097/ACM.0000000000003027

5. Eva KW. What every teacher needs to know about clinical reasoning. *Med Educ*. 2005;39(1):98-106. https://doi.org/10.1111/j.1365-2929.2004.01972.x

6. Pelaccia T, Tardif J, Triby E, Charlin B. An analysis of clinical reasoning through a recent and comprehensive approach: the dual-process theory. *Med Educ Online*. 2011;16(1):5890. https://doi.org/10.3402/meo.v16i0.5890

7. Cutrer WB, Sullivan WM, Fleming AE. Educational strategies for improving clinical reasoning. *Curr Probl Pediatr Adolesc Health Care*. 2013;43(9):248-257. https://doi.org/10.1016/j.cppeds.2013.07.005

8. Charlin B, Tardif J, Boshuizen HPA. Scripts and medical diagnostic knowledge: theory and applications for clinical reasoning instruction and research. *Acad Med*. 2000;75(2):182-190. https://doi.org/10.1097/00001888-200002000-00020

9. Lubarsky S, Dory V, Audétat MC, Custers E, Charlin B. Using script theory to cultivate illness script formation and clinical reasoning in health professions education. *Can Med Educ J*. 2015;6(2):e61-e70. https://doi.org/10.36834/cmej.36631

10. Charlin B, Boshuizen HPA, Custers EJ, Feltovich PJ. Scripts and clinical reasoning. *Med Educ*. 2007;41(12):1178-1184. https://doi.org/10.1111/j.1365-2923.2007.02924.x

11. Anderson LW, Krathwohl DR, eds. *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Longman; 2001.

12. Fleming A, Cutrer W, Reimschisel T, Gigante J. You too can teach clinical reasoning! *Pediatrics*. 2012;130(5):795-797. https://doi.org/10.1542/peds.2012-2410

13. Rissmiller B, Castro D, Minard CG, et al. The Diagnostic Expertise Acceleration Module (DEAM): promoting the formation of organized knowledge. *Med Educ Online*. 2019;24(1):1679945. https://doi.org/10.1080/10872981.2019.1679945

14. Ottolini MC, Chua I, Campbell J, Ottolini M, Goldman E. Pediatric hospitalists' performance and perceptions of script concordance testing for self-assessment. *Acad Pediatr*. 2021;21(2):252-258. https://doi.org/10.1016/j.acap.2020.10.003

15. Bhardwaj P, Black EW, Fantone JC III, Lopez M, Kelly M. Script Concordance Tests for formative clinical reasoning and problem-solving assessment in general pediatrics. *MedEdPORTAL*. 2022;18:11274. https://doi.org/10.15766/mep_2374-8265.11274

16. Levin M, Cennimo D, Chen S, Lamba S. Teaching clinical reasoning to medical students: a case-based illness script worksheet approach. *MedEdPORTAL*. 2016;12:10445. https://doi.org/10.15766/mep_2374-8265.10445

17. Weinstein A, Pinto-Powell R. Introductory clinical reasoning curriculum. *MedEdPORTAL*. 2016;12:10370. https://doi.org/10.15766/mep_2374-8265.10370

18. Duca NS, Glod S. Bridging the gap between the classroom and the clerkship: a clinical reasoning curriculum for third-year medical students. *MedEdPORTAL*. 2019;15:10800. https://doi.org/10.15766/mep_2374-8265.10800

19. Ohmer M, Durning SJ, Kucera W, et al. Clinical reasoning in the ward setting: a rapid response scenario for residents and attendings. *MedEdPORTAL*. 2019;15:10834. https://doi.org/10.15766/mep_2374-8265.10834

20. Ritchhart R, Church M, Morrison K. *Making Thinking Visible: How to Promote Engagement, Understanding, and Independence for All Learners.* Jossey-Bass; 2011.

21. Custers EJFM. Thirty years of illness scripts: theoretical origins and practical applications. *Med Teach*. 2015;37(5):457-462. https://doi.org/10.3109/0142159X.2014.956052

22. American Academy of Family Physicians. *Curriculum Guideline Reprint No. 260: Care of Infants and Children*. American Academy of Family Physicians; 1998. Updated August 2018. Accessed February 6, 2024. https://www.aafp.org/dam/AAFP/documents/medical_education_residency/program_directors/Reprint260_InfantChild.pdf

23. Krugman SD, Hodo LN, Alfasi G, Patil S, Tepperberg S, Estroff D. *Guidelines for the Care of Children for Family Medicine Residents*. American Pediatric Association; date unknown. Accessed February 6, 2024. https://www.academicpeds.org/wp-content/uploads/2020/04/Revised-and-edited-APA-FP-Guidelines.pdf

24. Baldor R, Savageau JA, Shokar N, et al. Hospitalist involvement in family medicine residency training: a CERA study. *Fam Med*. 2014;46(2):88-93.

25. Delany C, Golding C. Teaching clinical reasoning by making thinking visible: an action research project with allied health clinical educators. *BMC Med Educ*. 2014;14:20. https://doi.org/10.1186/1472-6920-14-20

26. Pantell RH, Roberts KB, Adams WG, et al; Subcommittee on Febrile Infants. Clinical practice guideline: evaluation and management of well-appearing febrile infants 8 to 60 days old. *Pediatrics*. 2021;148(2):e2021052228. https://doi.org/10.1542/peds.2021-052228

27. Kirkpatrick DL. *Evaluating Training Programs: The Four Levels*. Berrett-Koehler; 1994.

28. National Board of Medical Examiners. *NBME Item-Writing Guide: Constructing Written Test Questions for the Health Sciences*. National Board of Medical Examiners; 2021. Accessed

February 6, 2024. http://resources.nbme.org/NTUyLVFlQy0w NDYAAAGRHusmckhAFhbS0VXUvB7IOS_Wscb9Ehhux05mGBl SnsYNVnA0Tdyi1WFI7zqn834t0aEQyDo=

29. Weinstein A, Gupta S, Pinto-Powell R, et al. Diagnosing and remediating clinical reasoning difficulties: a faculty development workshop. *MedEdPORTAL*. 2017;13:10650. https://doi.org/10.15766/mep_2374-8265.10650

30. Daniel M, Rencic J, Durning SJ, et al. Clinical reasoning assessment methods: a scoping review and practical guidance. *Acad Med*. 2019;94(6):902-912. https://doi.org/10.1097/ACM.0000000000002618