WRITE Inpatient Pediatric Clerkship

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WRITE Inpatient Pediatric Clerkship Manual Directory

Overview Tab	
Educational Objectives	4
Pediatric Clinical Skills	5
Minimal Competency Outline for Pediatric Clinical Skills	6-11
Grading and Evaluation Tab	
Grading Rubric	13-14
Assignments	
Checklist of Assignments	16
Pediatric History Taking and Physical Exam	
Approach to the Pediatric Patient	17-18
Physical Exam Training Materials	19-31
Inpatient Experience and H&P Assignment Instructions	32
Pediatric Database	33-36
Example H&Ps (older child and infant)	37-49
Required Problem Set Exercises	
Fluids Problem Set	50-51
Medication Ordering Problem Set	52
Department Contacts and Career Advisors	
Department of Pediatrics Contact Information	54
Pediatric Career Advisors	55

OVERVIEW

Educational Objectives

The practice of Pediatrics involves addressing the health needs of children. Every child should have the opportunity to grow and develop to achieve their maximum potential; the job of the Pediatrician is to assist in that process by treating and preventing illness, guiding children and their families toward good health choices, and offering information and interventions that support the overall well-being of the child.

Goals of the core pediatric clerkship: Provide foundational skills and knowledge about the fundamental issues of childhood health and illness in order to prepare UW SOM medical students to provide safe and compassionate care to children.

Learning Objectives:

1. Apply pediatric specific medical knowledge to understand and address clinical issues.
2. Collect both focused and comprehensive, developmentally appropriate patient histories using triadic interviewing skills.
3. Perform age-appropriate physical examinations on newborns, infants, and older children.
4. Construct appropriate approaches to common pediatric clinical problems by:
    a. Identifying essential clinical features.
    b. Outlining natural history of disease processes.
    c. Creating stratified differential diagnoses.
    d. Formulating evidence-based diagnostic and therapeutic approaches.
5. Discuss the effects of growth and maturation on pharmacokinetics and use this knowledge to select the appropriate treatment regimens of commonly used fluids and medications in patients of different ages.
6. Analyze common professional and ethical dilemmas in pediatrics.
7. Deliver well-organized, appropriately focused, and accurate oral patient presentations.
8. Write well-organized, appropriately focused, and accurate patient notes, including admission and progress notes.
9. Communicate with patients and families with consideration of patient age, developmental stage, and individualized family context.
10. Work effectively as a member of the healthcare team to coordinate care.
11. Elicit and recognize the perspectives and needs of families and provide care for patients within their social and cultural context.
12. Identify gaps in knowledge and skills and demonstrate self-directed learning.

Pediatric Clinical Skills:

After completing your Pediatrics clerkship, we expect that you will have gained knowledge and developed skills in the following areas related to the care of children:

1. Health Supervision/Anticipatory Guidance
2. Growth
3. Development and Behavior (includes issues of normal development and also concerns about behavior)
4. Nutrition for Children
5. Issues Unique to Adolescents
6. Fluid/Electrolyte Management and Pediatric Therapeutics
7. Assessment of the Acutely Ill Child

For each area, we will describe the skills you are expected to learn and methods to demonstrate your capabilities.

Minimal Competency Outline for Pediatric Clinical Skills

Health Supervision/Anticipatory Guidance (includes poisoning/injury prevention)

Health supervision requires asking about nutrition, elimination, activity, and preventative strategies. "Anticipatory guidance" means providing information to parents and patients to maintain health, predict normal processes, and avoid problems. Appropriate nutrition and preventative care are of paramount importance so that children can achieve their goals of growth and development. See also subsequent sections in this Outline on Growth, Development and Behavior. You should be able to discuss anticipatory guidance in several areas:

Specific Skills	Minimum achievement
Obtain an appropriate dietary history in children of different ages	• Infants - Obtain a feeding history including contents, quantity, and frequency. • Toddler/Preschooler/School- Obtain a dietary history.
Demonstrate ability to address immunizations according to CDC guidelines	• Ask about immunization record. • Discuss risks and benefits of routine immunizations.

Learning Activities:	Assessment:
• Aquifer Pediatrics cases 8, 9, 18, 26 • COMSEP Physical Examination Video • Physical Examination Training Materials • Stanford Breastfeeding video	• Clinical Performance Assessment • Evaluation of written H&P

Growth

Normal growth is a marker of child health and well-being. Abnormal growth can be an indicator of chronic illness, genetic disorders, malnutrition, psychosocial problems, or other issues which require intervention. You should be able to address growth issues for children as follows:

Specific Skills	Minimum achievement
Demonstrate ability to measure and assess growth including height/length, weight, head circumference, and body mass index in patient encounters using standard growth charts.	• If growth data are abnormal, recheck plot. • Recognize normal and abnormal growth patterns.

Learning Activities:	Assessment:
• Interpret growth data on all physical examinations • Aquifer Pediatrics cases 8, 9, 18, 26, 31	• Evaluations of written H&P • Clinical Performance Assessment

Development and Behavior (includes issues of normal development and also concerns about behavior)

Although there is variation for each individual, childhood development and behavior should follow a generally recognized pattern. Abnormalities of development or behavior may suggest organic or psychosocial problems that require intervention; many problems can be avoided with appropriate guidance. You should be able to recognize and address development and behavior issues in children as follows:

Specific Skills	Minimum achievement
Demonstrate an ability to assess normal childhood development and behavior within the following domains: • Psychosocial development • Language development • Physical maturation • Motor development • Cognitive development	• Describe at least one aspect of psychosocial development in a specific patient. • Describe at least one aspect of language development in a specific patient. • Describe at least one aspect of physical development in a specific patient. • Describe at least one aspect of motor development in a specific patient. • Describe at least one aspect of cognitive development in a specific patient. • Demonstrate an appropriate exam. • Recognize at least one sign of puberty.
• Identify behavioral and psychosocial problems of childhood using the medical history and physical examination	• Identify common abnormal behaviors seen in either infancy, childhood, or adolescence such as sleep issues or restrictive eating. • Identify at least one common psychosocial problem in either infancy, childhood, or adolescence, such as limited family resources.

Learning Activities:	Assessment:
• Aquifer Pediatrics cases 28 • Patient care • OPENPediatrics "Developmental Milestones" video	• Clinical Performance Assessment • Evaluation of written H&P

Issues Unique to Adolescents

The changes of adolescence present unique health issues and new challenges for the patient, family, and pediatrician. You should be able to recognize and address these issues when caring for adolescents:

Specific skills	Minimum achievement
• Interview an adolescent patient with emphasis on sensitive questions about behaviors that affect health and safety (e.g. sexuality, drug, tobacco and alcohol use)	• Separate (or attempt to separate) patient from parent/guardian for part of the interview. • Address confidentiality with patient. • Ask a psychosocial history using HEADSS or another appropriate tool that includes screening for at least two risk-taking behaviors.
• Conduct a physical exam of an adolescent that demonstrates respect for privacy and modesty, employing a chaperone when appropriate	• Identify the need for a chaperone when appropriate. • Utilize appropriate draping techniques. • Assess SMR (sexual maturity rating, formerly "Tanner stage") of breast, pubic hair, and genitalia.

Learning Activities:	Assessment:
• Aquifer Pediatrics case 16 • COMSEP Physical Examination Video • Physical Examination Training Materials • Patient Care	• Clinical Performance Assessment

Fluid/Electrolyte Management and Pediatric Therapeutics

Maintaining effective circulating volume is necessary to assure organ perfusion. Children may be at increased risk for volume depletion due to their smaller size and higher propensity to develop volume-depleting ailments. Assessment of volume status and correction of fluid/electrolyte abnormalities are core pediatric skills. Since children come in many sizes, understanding how to address fluid or medication management that is appropriately scaled to the individual patient is of paramount importance. You should understand and be able to address the issues listed below:

Specific skills	Minimum achievement
Fluid/electrolyte management: • Obtain history and physical finding information necessary to assess the volume status of a child • Calculate intravenous maintenance fluids for a child considering daily water and electrolyte requirements • Calculate the fluid therapy to achieve euvolemia for a child with volume depletion • Explain how to use oral rehydration therapy for mild to moderate volume depletion	• Ask about intake and output. • Assess at least 2 physical exam findings and 1 vital sign relevant to intravascular volume status. • Choose appropriate intravenous fluid (water, sodium, glucose, other additives as indicated). • Calculate maintenance fluid delivery correctly using weight or BSA. • Choose isotonic fluid at 10-20 mL/kg for volume expansion ("rescue" IV bolus). • Reassess patient after intervention. • Choose appropriate oral rehydration solution and recognize when it is indicated.
Medication management: • Calculate a drug dose and select a formulation for a child based on patient size	• Identify “per kg” or “per body surface area” doses for common pediatric medications (antipyretics, antibiotics). • Create an appropriate medication order or prescription including name of medication, formulation, dose, dosing schedule, route, and duration. • Assure that recommended dosing regimen scaled to patient size does not exceed adult maximum dose.

Learning Activities:	Assessment:
• Aquifer Pediatrics case 15 (and various other cases that have medication administration) • Patient care • Required Problem Sets • Textbook (optional)	• Clinical Performance Assessment • Completion and discussion of Required Problem Sets (Medication and Fluids)

Assessment of the Acutely Ill Child

You may be called upon to provide emergency care to a patient at any time. One must be able to recognize and rapidly assess a sick child and understand how the presentation of illness may differ from that seen in an adult. Basic topics in pediatric acute assessment and emergency care, with which you should be familiar, include the following:

Specific skills	Minimum achievement
• Describe vital signs and other clinical clues in acute illness that are different for children as compared to adults and will vary for children of different ages • Develop a framework to identify a child who needs acute, urgent, or emergent care	• Recognize signs of circulatory compromise (tachycardia, bradycardia, weak pulse, prolonged capillary refill). • Recognize signs of respiratory distress (retractions, cyanosis, apnea, tachypnea). • Note mental status as a marker of overall illness (calm, fussy, inconsolable, agitated, somnolent, obtunded). • Note general appearance as a marker of overall illness (alert, floppy, weak cry, etc.).

Specific topics in pediatric acute care:
• Obtain history relevant to a pediatric patient with an urgent medical problem, with special recognition of variations in presentation for different age groups
• Identify need for acute, urgent, or emergent care for certain specific pediatric issues:
  ○ Asthma/respiratory distress
  ○ Dehydration/volume depletion
	• Make a rapid assessment of the patient's clinical status.
	• Obtain assistance as indicated.
	• Obtain focused history with further details as necessary or appropriate.

Learning Activities:	Assessment
• Aquifer Pediatrics Cases 7, 9-12, 14-19, 22-25, 30, 31 • OPENPediatrics "Recognizing Respiratory Distress and Failure" video • Textbook (optional)	• Clinical Performance Assessment

The previous section outlined specific **skills** that you are expected to obtain during your rotation. In addition, you are expected to obtain core medical knowledge related to the care of pediatric patients and their medical conditions. You should be able to construct an appropriate approach to common pediatric clinical problems by:

- Identifying essential clinical features
- Outlining natural history of disease processes
- Creating a stratified differential diagnosis
- Formulating evidence-based diagnostic and therapeutic approaches
- Discussing how age and development influence essential clinical features, natural history of disease processes, and differential diagnosis, as well as diagnostic and therapeutic approach

Learning Activities:	Assessment:
• Aquifer Pediatrics Cases (1-32) • Didactics • Required Problem Sets • Patient Care (inpatient settings) • Written H&P • Online MedED videos (optional) • MedEdOnTheGo videos (optional) • OPENPediatrics videos (optional) • Textbook (optional)	• Evaluation of written H&P • Clinical Performance Assessment

Grading and Evaluation

Pediatric Inpatient WRITE Clerkship Grading Rubric

To pass the Inpatient Pediatric WRITE Clerkship you must:

- Complete assignments and requirements
- Meet professionalism standards
- Perform at a passing level or higher on your clinical performance (Clinical Grade)
- Receive a Final Numeric Grade (see table below) in the passing range (≥ 2)

CLINICAL GRADE (100% of Final Grade)

Your Numerical Clinical Grade is determined by the Site Director, who reviews the information provided by each evaluator with whom you worked during the clerkship. The Site Director assigns a Numerical Clinical Grade based on submitted evaluations, with consideration given to the Recommended Levels of Evaluation for Time Spent and the quality of contact each evaluator had with you.

Evaluators indicate Time Spent with Student and provide a Recommended Level of Evaluation for Time Spent:

TIME SPENT WITH STUDENT
Little or no contact
Sporadic and superficial contact
Infrequent but in-depth contact
Frequent and in-depth contact

RECOMMENDED LEVEL OF EVALUATION FOR TIME SPENT	
Exceptional Performance (Honors)	4
Exceeds Expectations (High Pass)	3
Meets Expectations (Pass)	2
Unacceptable Performance (Fail)	1

Please note that the Recommended Level of Evaluation from each evaluator, and thus the Numerical Clinical Grade assigned by the Site Director, is not a simple average of values reported in the 11-item evaluation form. Rather, since each domain in the 11-item evaluation form may be considered differently depending on the types of patients you see and the environments where you work, the Recommended Level of Evaluation and the resultant Numerical Clinical Grade represent overall assessments of your performance as a doctor-in-training.

All evaluations are reviewed *regardless of the level of contact* for comments that may be included in your final evaluation to provide specific feedback on your performance, to highlight areas of strength or to identify areas of concern. Significant areas of concern may constitute special circumstances which require individualized review.

ASSIGNMENTS

All assignments, including required Aquifer cases, are due by the end of the clerkship. For each missing assignment on Canvas, 5% will be deducted from the final grade. All assignments must be completed and turned in by 5PM PST on the last day of the rotation.

FINAL GRADE

Your Final Grade will be your clinical grade minus any penalties for missed assignments.

FINAL GRADE		
Numerical Grade (0-4 scale)	*Percentage*	*Grade Category*
≥3.5	≥87.5%	Honors
2.75 – 3.49	68.75-87.49%	High Pass
2.0 – 2.74	50-68.74%	Pass
<2.0	<50%	Fail

GRADING PHILOSOPHY

There is no curve and no forced normal distribution of grades for the Pediatric Clerkship. Each student is evaluated individually on the merits of clinical performance, knowledge of pediatric medicine, assignment completion and professionalism. Therefore, any student is eligible for any grade based on demonstrated performance.

We believe that every student who participates in the Pediatric Clerkship will be able to demonstrate the knowledge, skills, and attitudes necessary to achieve a passing grade. Given our faith in you, we assume that every student starts the Pediatric Clerkship at the level of Pass. If you participate fully, complete all assignments, act in the appropriately professional manner, and demonstrate the expected clinical skills, you will have met expectations and will achieve a Clinical Grade with a numerical value in the range of Pass. If you exceed the expected level of performance in multiple areas, you will be eligible for a Clinical Grade with a numerical value in the range of High Pass. If you do not meet the minimum expectations for knowledge, skills, attitudes, or professionalism you may receive a Clinical Grade of Fail; students who appear to be at risk for a failing grade will meet with the Site Director promptly to review performance and develop a plan for improvement.

A Clinical Grade in the numerical range of Honors is awarded to students who consistently perform at an exceptionally high level throughout the Pediatric Clerkship in all clinical settings. To be eligible for a Clinical Grade in the numerical range of Honors we would expect you to demonstrate the following attributes, consistently over time, in multiple settings:

- Show an exceptional dedication to patients and their care
- Exhibit superior clinical skills, collecting data (History/Physical/Medical record review) with ease, precision, and accuracy
- Have appropriate, intuitive, facile engagement with patients and families
- Synthesize and prioritize data with the development of patient specific differential diagnoses and assessments
- Offer logical, cogent, thoughtful, and comprehensive patient care plans and provide organized, thorough, concise presentations
- Demonstrate a high level of engagement that exemplifies self-directed learning
- Seek, accept, and implement feedback in an iterative manner
- Engage in collaborative and respectful interactions with all team members
- Assume responsibility for the care of patients and serve as an active member of the team

To receive a Final Grade of Honors, we believe that a student must demonstrate a high level of clinical skill and engagement as noted above along with showing mastery of the knowledge base related to Pediatric medicine.

Questions regarding the grading rubric, grading philosophy or your final grade should be directed to the clerkship director, Dr. Rebekah Burns (rebekah.burns@seattlechildrens.org).

SPECIAL CIRCUMSTANCES

Final Grade of Fail or other special circumstances will be referred to the Associate Dean for Student Affairs and/or Student Progress Committee in accordance with UWSOM policy.

ASSIGNMENTS

Checklist for Inpatient Pediatric Clerkship (WRITE Program)

The following list is an outline of the assignments you will need to complete to pass your clerkship. You will be using Canvas to upload and log all your completed assignments. PDFs of all required forms can be found linked on Canvas. There is a link to the Canvas page on the Pediatrics Patient Care Clerkship website. You'll access Canvas using your UW NetID. **All assignments, including the Aquifer cases, must be completed and turned in by 5PM PST on the last day of the rotation.**

Required Assignments

- ☐ Aquifer Pediatrics cases (https://aquifer.org/) - ALL are recommended. The following are REQUIRED:
  - Case 1
  - Case 25
- ☐ Log patients using the EValue Clinical Encounters Program. There are 2 domains; log one patient per domain. **(**https://sites.uw.edu/medevalu/clinical-encounters/**)**
  - Acute Illness
  - Hospitalized Children
- ☐ Mid-Clerkship Feedback form (during the second week on inpatient)
- ☐ Complete one full history and physical examination write-up for evaluation and feedback.
  - Turn in this write-up to your attending AND to the clerkship director indicated on your personal calendar/schedule you received at orientation.
  - Note: Upload this H&P to Canvas with feedback comments (from clerkship director for Seattle) included.
- ☐ Medication Ordering Problem Set (Seattle completes during day-one orientation)
- ☐ Fluids Problem Set (Seattle completes during day-one orientation)

Required Tasks

- ☐ At the end of your clerkship, please turn in your ID badge and return borrowed books and/or pagers.
- ☐ Save and Forward all electronic Notes to your direct supervisor BEFORE you leave on your last day.

Approach to the Pediatric Patient in the Medical Setting

Taking a history & physical exam from toddlers, children, or adolescents & their caregivers

What is a "*Pediatric* Patient-Centered" Approach?

- Takes into account the patient's ***previous experience*** with medical illness
- Considers the patient's ***cognitive ability & developmental stage***
- Involves the patient in ***age-appropriate*** ways
- Views the patient and caregiver as "***the expert(s)"*** on the patient, including ***historical details*** and how the patient may ***cope*** with illness

Why does a "*Pediatric* Patient-Centered" Approach Matter?

- Improves collection of historical data & physical exam findings
- Enhances the patient & family's ability to ***cope*** with illness
- Improves ***adherence*** in-house & with out-patient regimens
- **SAVES time** because it improves care!

Common Reactions of Pediatric Patients in the Hospital Setting

- **Overt or Active:** crying, resisting treatment**,** destructive to the environment
- **Passive:** decreased eating**,** decreased communication & activity
- **Regressive:** temper tantrums**,** toileting accidents**,** dependency on parents

General Principles when Communicating with Pediatric Patients

- ***Get their attention*** before speaking: engage the patient with a non-judgmental, non-specific comments about surroundings, TV, interests, etc.
- ***Get on the child's eye-level*** when speaking (i.e., avoid standing over the bed).
- ***Always introduce yourself and explain who you are (<u>including your role on the team, i.e. as medical student</u>)***. Don't be shy about showing your name on your badge.
- Don't ask if you are not ok with the possible answer (e.g., Can I come in? Can I examine you?).
- ***Don't minimize or ignore*** the patient's experience or feelings (i.e., don't say "it's okay!").
- Ask children to ***repeat*** what you said in order to correct misunderstandings.
- ***BE HONEST!***
  - Always ***answer questions truthfully*** (i.e., It's okay to say "I don't know").
  - Use honest, simple, minimally threatening explanations that are developmentally appropriate.
  - Avoid reassurance with potentially false/vague statements. (e.g., Don't promise it won't hurt!).
  - In being honest, you avoid creating mistrust between the patient and the medical team.

When Communicating with Patients: Developmental Stage Considerations

Toddlers/Preschoolers

- Are afraid of being away from their parents
- Have difficulty sitting still
- May conceptualize illness as a punishment
- Engage in concrete and "magical" thinking (e.g., "I am in the hospital because I didn't listen to mommy last night.")
- Often rely on imitation and look to others, especially parents, for how they should respond

Childhood/School Age

- Begin to understand their bodies and how they work
- Will likely have many questions
- May be afraid that their bodies won't work or they will look different

Adolescents

- Are very worried about privacy and how they look
- Want to feel competent and have their opinions validated
- Can cognitively understand most things about their care, but behaviorally they continue to require monitoring. Adherence difficulties are common, often due to poor education/transfer of skills and desire to fit in
- Can fail to see long-term consequences (e.g., explaining that poor diabetes control can lead to dialysis is not often a convincing way to improve adherence in teenagers with diabetes)
- Will often not be forthcoming with sensitive topics unless asked directly

* * *

Involving and Interacting with Parents/Caregivers

- ***Always introduce yourself in full, <u>including role on team</u>***. Again, don't be shy about showing your name on your badge.
- With younger children, try to meet with one or both parents alone first (although this can be challenging in the in-patient setting).
- With adolescents, it is often better (when possible) to meet with them first. Better yet: give adolescents the choice!
- Remember that caregivers have a ***unique understanding*** of their child's medical experiences and therefore provide key details of the medical history including:
    - Patient's experience of and expression of pain or discomfort
    - Patient's knowledge of or understanding of diagnosis
    - Treatment regimen
        - Medication dosage and tolerance
        - Previous hospitalizations & frequency of outpatient care
        - Previous degree of cooperation with each aspect of the regimen
        - Patient's previous level of involvement in care
        - Developmental history, school history, and cognitive functioning

* * *

Tips on Entering the Room & Doing the Physical Exam

- Seat yourself to include patient *and* caregiver at patient's eye-level.
- With toddler/school-age patients, demonstrate use of the stethoscope or other instruments on yourself, a caregiver, a toy, or a non-threatening body part (e.g. hand) first.
- If the child appears intimidated by you, try providing distance from the child and visibly engage with the caregiver(s) first before turning to the child. It allows the child to see a positive interaction between you and the caregiver, making the child more amenable to approaching you.
- Leave the most invasive or painful parts of the physical examination to the end.
- Use distraction as much as possible.

Pediatric Physical Examination

Students often feel intimidated about performing the pediatric physical examination.

We have provided some tools to make learning this skill easier and hopefully fun for you!

A few pearls for the examination:

- You may have to do the physical examination out of order in many children. Be flexible.
- You can't stop and write down your findings as you go. You have to remember what you saw/heard/felt. Write it down afterwards.
- Save the most invasive parts for last (ears and mouth).
- Children over 5 can usually follow directions, so their examination is similar to adults.
- Enlist the caregiver's help as needed!
- Have fun and think of how to make this a game (for yourself and your patient).

Review the following video that provides additional tips for performing physical examinations in children. The video is found on the COMSEP website (Council of Medical Student Education in Pediatrics—the national pediatric clerkship organization).

https://uthvideo.uth.tmc.edu/Panopto/Pages/Viewer.aspx?id=1eeb71ad-dfcc-4a61-b518-94e1a6565113

After you have watched the video, look through the Benchmarks for the Pediatric Physical Examination below.

Watch your preceptor/faculty member/resident do an exam, and then go for it!

Use the Physical Exam CEX as a way to track your progress.

Remember, the more you practice, the better you will become. Ask the people you work with to show you how to do the physical examination. Be honest if you don't hear or see a physical exam finding. And remember, the more you practice….

Benchmarks for the Pediatric Physical Examination

General Approach

One should be flexible when examining children. You must establish rapport with the child and the parent before starting the exam. In general, children between the ages of 8 months and 4 years require the most flexible approach. For younger children you should perform the most "invasive" part of the examination (e.g. the head and neck examination) last.

Do

Use an age-appropriate approach to the examination

- Newborn: Place the newborn on the examination table. Conduct a general assessment by observing the child and then listen to the heart and lungs. Once those are accomplished proceed with the remainder of the exam.
- Infant/Toddler: You may examine the child in the caregiver's lap. Begin slowly with a non-threatening part of the examination, perhaps the hands. Then move to the heart and lung exam. End with the head and neck examination, focusing on the ears and throat last.
- Older child/adolescent: The sequence of the examination is the same as that of the adult. Pay particular attention to modesty and whether parents will remain in the room.

Assess the child's growth

- Review the child's height/weight (and head circumference for infants) and percentiles. Determine BMI if not done.
- Plot/review growth measurements:
  - Assessing growth is a part of each pediatric encounter because this is a sensitive measure of overall health of the child. There are growth curves available for different age groups (0-36 months, 2-20 years). Review growth curves generated by an electronic health record or plot the data yourself for review.
- Weight:
  - Infants should be weighed naked or in a diaper only. If the weight is too high/low, recheck the weight and accuracy of the scale. Fluctuations in weight influence management of children, especially those who are hospitalized.
- Height:
  - Most children younger than 2 years cannot/will not stand by themselves so their length is measured instead of their height. There are measuring devices to assist with accurate assessment. If there is any concern about growth, measure the length at least twice.
- Head circumference:
  - The tape should encircle the most prominent portions of the head. For increased accuracy, measure three times; it is easy to make an error. Do not start your examination with this measurement as the infant may start crying!
- Body mass index (BMI)
  - BMI should be calculated in all children and followed in addition to height and weight. To calculate BMI:
    - Wt (kg)/ stature (cm) / stature (cm) x 10,000
    - Or Wt (lb) / stature (in) / stature (in) x 703

- Special situations:
    - Premature infants: the growth of premature infants is typically "corrected" for their premature birth. Although special growth charts are available, many pediatricians plot the current weight at the "chronological" age and then subtract the months/weeks of prematurity (e.g. if the child was born at 30 weeks they subtract 10 weeks) and plot the growth parameters at the "corrected" age. Plotting the corrected age usually continues until age 2 years.
    - Other populations: there are special growth charts available to plot the growth for children with Down syndrome, Turner syndrome and achondroplasia.

Know

- Be alert to the possibility of a problem when the head circumference is at one extreme or the other.
- Sequential measurements of growth are sensitive measures of overall health.
- Alteration in the rate of growth, such as "crossing percentiles," should alert you to possible underlying problems.
- Typical weight gain in the newborn period: 20-30 grams/day.
- Typical height velocity:
    - In children 5 years –puberty, normal growth velocity is ≥ 5 cm/year;
    - < 5 cm/year should be investigated; <4 cm/year is pathologic.
- Patterns of growth:
    - Growth hormone deficiency: high weight-to-height ratio.
    - Chronic disease (e.g. inflammatory bowel disease): low weight-to-height ratio.
    - Constitutional growth delay: normal weight-to-height ratio.

The maneuvers you use in the adult physical examination are also used when examining children with appropriate adjustment for age and size. It is expected that you will be able to correctly execute the basic physical examination maneuvers commonly used for all patients.

Newborn Examination

You should be able to conduct a complete examination of all organ systems in a newborn using an age-appropriate approach. These examination techniques are the same as for adults with adjustments for age and size. Specific maneuvers that are a part of the neonatal examination that you should be able to demonstrate include:

Fontanel assessment:

Do

- Palpate the anterior fontanel, assessing size and firmness
  - Place the infant in an upright position (and hopefully the infant will remain calm!).
  - Gently place your fingers over the anterior fontanel, located midline on the superior temporo-frontal portion of the skull.
  - Gently palpate for the edges of the fontanel.
- Palpate the posterior fontanel (closes earlier than anterior)
  - Repeat the same procedure outlined above, feeling for the posterior fontanel, located in the midline occipital region.

Know

- The posterior fontanel usually closes by 6 weeks of age. The anterior fontanel closes by 18 months in most infants.
- Changes in intracranial pressure or hydration status can be reflected in changes of the palpable tension of the fontanel (increased with increased intracranial pressure, decreased with dehydration).
- Fontanel size varies tremendously; persistent delays in closure or unusually large size of fontanels (particularly the posterior fontanel) may indicate pathologic bone growth delay.
- Craniosynostosis: premature closure of cranial sutures. It may result from a primary defect of ossification (primary craniosynostosis) or, more commonly, from a failure of brain growth (secondary craniosynostosis).
- Conditions associated with a large anterior fontanel (greater than 3 cm) include hydrocephaly, achondroplasia, hypothyroidism, osteogenesis imperfecta, and vitamin D deficient rickets.

Eye Exam:

Do

- Assess whether the red reflex is present
  - Set the ophthalmoscope lens power to "0". Turn on the lamp and look through the ophthalmoscope into both eyes of the child simultaneously from approximately 18 inches away.
  - The newborn infant spontaneously opens their eyes if the head is gently tipped forward/backward. This is easier than trying to force open tightly shut eyelids!
- Test corneal light reflex
  - Shine your ophthalmoscope or penlight in the newborn's eyes; you are assessing whether the light symmetrically reflects from the corneas bilaterally.

Know

- A normal red reflex emanates from both eyes and is symmetric.

- Leukocoria (white pupillary reflex) suggests cataracts, chorioretinitis, retinopathy of prematurity, persistent hyperplastic vitreous, or retinoblastoma. Leukocoria mandates an urgent ophthalmologic evaluation.
- Many newborns appear to be "cross eyed" because of prominent epicanthal folds. A normal (symmetric) corneal light reflex suggests normal alignment (no strabismus).
- Asymmetric corneal light reflex is a sign of strabismus, an imbalance of ocular muscle tone. Uncorrected strabismus can lead to blindness. Proper coordination of eye movements should be achieved by 3-6 months. Persistent eye deviation requires evaluation.
- Visual acuity of a newborn is approximately 20/400; this rapidly normalizes and by 2-3 years of age is 20/30-20/20.

Hip Exam:

Do

- Assess the neonate for developmental dysplasia of the hip by performing the Barlow maneuver and Ortolani test:
  - Place the baby on a firm surface in the supine position.
  - Flex the thighs to a right angle to the abdomen and the knees at right angles to the thighs.

    Barlow maneuver
    - Grasp each thigh with your forefinger along the outside shaft of the femur with your middle finger on the greater trochanter and thumb medially.
    - Adduct the femora fully and push down toward the bed.

    Ortolani test
    - Gently abduct each leg from the position of full adduction so that the knees come to lie laterally on the table.
    - During abduction, push the greater trochanters medially and forward with your fingers.

Know

- The infant may have a congenitally dislocated or subluxable hip if:
  - You feel or hear a click during either adduction or abduction.
  - There is spasm or discomfort of the adductor muscles of the femur.
- Developmental dysplasia of the hip:
  - 1/100 infants have clinically unstable hips; 1/800-1000 experience true dislocation. There is a positive family history in 20% of patients and associated generalized ligamentous laxity. 9:1 female-to-male ratio of occurrence.
  - Developmental dysplasia typically presents after birth in most infants. If it is present at birth, you should look for an underlying neuromuscular disorder. This type of developmental dysplasia of the hip is called teratologic DDH.

Newborn reflexes:

Do

- As part of your newborn exam, elicit the following primitive reflexes:
  - Asymmetric tonic neck reflex (Fencer's position)
    - Place the infant on their back.
    - Turn the newborn's head to one side.
    - Observe the gradual extension of the arm on the side to which the head is turned.
    - Observe the flexion of the other arm.

- Moro reflex (startle response)
  - Hold the infant supine and support the infant's head with one hand.
  - Gently move the infant's head (while supporting it) below the level of the rest of the body.
  - Observe the infant extend both arms suddenly and rapidly with open hands.
  - Observe the infant bring both hands back to midline in an "embrace" movement.
- Palmar grasp
  - Place your index finders in each of the infant's open hands.
  - Observe the infant's fingers close around your fingers in a firm grasp.
- Plantar grasp
  - Place your thumb on the sole of the infant's foot under the toes.
  - Observe the toes curl around your thumb.

Know

- Reflexes should be symmetric. Asymmetry suggests weakness in a particular muscle group.
- Primitive reflexes disappear as the infant matures; persistence of these reflexes is a signal of underlying neurological dysfunction.
  - Asymmetric tonic neck reflex (Fencer's position)
    - Appears by 35 weeks gestation, is fully developed at 1 month & lasts 6-7 months.
  - Moro reflex (startle response)
    - Appears by 28-30 weeks gestation; is fully developed at term & lasts 5-6 months.
  - Palmar grasp
    - Appears by 28 weeks, is fully developed by 32 weeks gestation & lasts 2-3 months.

Skin exam

Do

- Inspect all of the infant's skin (including diaper area).
- Describe size, shape, color, distribution of any rashes.
- Note any areas lacking skin.

Know

- Benign lesions that parents may have questions about include:
  - Small angiomata present on the eye lids, nape of the neck, forehead.
  - Milia: small white spots on the skin, particularly on the nose and cheeks.
  - Erythema toxicum: yellowish/white pustules on an erythematous base that occur singly or in groups.
  - Hyperpigmented macules or slate gray macules: blueish-green to black in color, more common in people of color, can be mistaken for bruises.
- Concerning changes include large angiomatous lesions, vesicles, pustules, or areas lacking skin.
- Midline abnormalities (dimple, hair tuff, moles) on the back may indicate an underlying abnormality in the bones/nervous system.

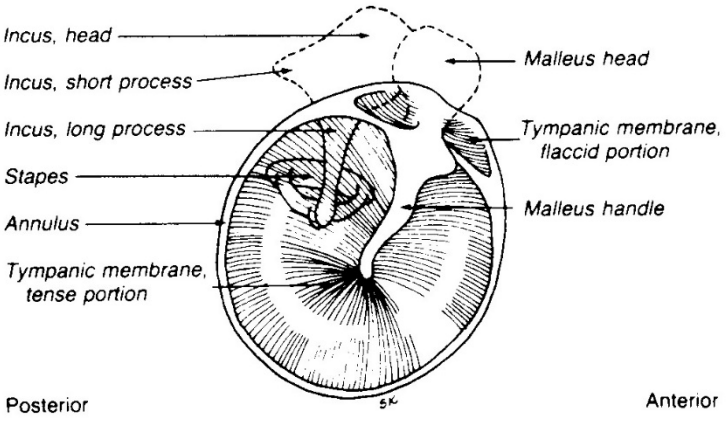
Infant/Toddler Examination

You should be able to conduct a complete examination of all organ systems in all infants/toddlers using an age-appropriate approach. These examination techniques are the same as for adults with adjustments for age and size. Specific maneuvers that are a part of the infant/toddler examination include:

Ear examination

Do

- Ask about hearing concerns
  - Inquire about infant's response to noises, voice.
  - Observe an older infant's/toddler's speech pattern.
- Inspect the ears
  - Assess the shape of the ears
    - Determine if both ears are well formed
  - Assess the position
    - Examine the child from the front, with the child's head held erect and the eyes facing forward.
    - Draw an imaginary line between the inner canthi and extend it around the head.
    - This line should be below the top of the pinnae.
- Palpate the tragus and posterior auricular area
- Perform otoscopic exam including insufflation
  - Position the child for an ear examination
    - This part of the exam can be performed either on the examination table or in the caregiver's lap. The head should be stabilized to prevent movement during otoscopy.
    - A parent or assistant can help with the examination by folding the child's wrists and arms over the child's abdomen with one hand and then holding the child's head against the parent's/assistant's chest with the other.
  - Visualize the external canal
    - Gently hold the tragus and insert the otoscope while visualizing the canal. In contrast to adults, gentle posterior traction may help you visualize the canal and eventually the tympanic membrane.
  - Visualize the tympanic membrane
    - Identify the landmarks starting with the long handle of the malleus then moving to the "cone of light" in the pars tensa.
    - Carefully visualize the pars flaccida.



Courtesy of M. Whipple, MD

- Perform pneumatic otoscopy
  - Hold the otoscope and bulb with one hand and retract the pinna with the other.
  - Gently apply a small "puff" of air to the tympanic membrane.
  - Normal movement: medially (away from you) with the application of air and laterally (toward you) when the bulb is released.

Know

- Hearing:
  - Any delay in language acquisition or loss of language milestones should prompt a referral for formal hearing testing.
  - Hearing impairment is estimated to occur in 1-2/1000 live births.
  - Some etiologies of hearing loss in childhood:
    - Sensorineural: cochlear malformation, damage to hair cells (due to noise, disease, ototoxic agents), or 8th nerve damage.
    - Conductive (most common): ear canal atresia, cerumen impaction, otitis media with effusion.
- Position/shape of the ears
  - Malformed external and middle ears may be associated with serious renal or craniofacial malformations.
- Palpation:
  - Tenderness to palpation of the tragus is indicative of otitis externa.
    - You will also typically see white cheesy material in the external auditory canal.
    - Treatment is aural toilet and topical antibiotics.
  - Tenderness to palpation and/or redness in the posterior auricular area may suggest mastoiditis.
- Otoscopy:
  - Areas of retraction in the pars flaccida may represent a cholesteatoma and should be further evaluated. A cholesteatoma acts as a benign tumor causing local bone destruction and is a nidus for bacteria to grow and cause chronic infections.
  - The most common reason for an immobile tympanic membrane (TM) with pneumatic otoscopy is a poor seal between the otoscope and ear canal.
  - You must assess the movement of the TM to determine if a patient has otitis media. In addition to pneumatic otoscopy, acoustic tympanometry can be used.

- Changes in the appearance of the TM that are highly suggestive of acute infection include bulging or purulent material visualized behind the tympanic membrane. Guidelines for the diagnosis and treatment of otitis media.
- Removal of cerumen is difficult but sometimes necessary to adequately see the TMs. The external auditory canal bleeds easily with minor trauma, so ask for help if you need to clear out cerumen. It can be done by gentle irrigation with warm water, H_2O_2, or with direct visualization and use of a wire/plastic loop.

Mouth examination

Do

- The approach:
  - In young children, save the mouth exam for the very last.
  - Ask child to open their mouth and show you their teeth (appropriate for an older toddler/child). If this doesn't work, be prepared to be fast with your tongue blade.
  - An alternative is to be flexible and look in the mouth when the child is crying for some other reason!!!
- Inspect the teeth
  - Count the number of teeth and note position.
  - Note any defects or discolorations.
- Inspect gums, mucosal surfaces, and posterior pharynx
  - Inspect the buccal mucosal and gums looking for ulcers, candida, or trauma.
  - To see the posterior pharynx, you may have to use the tongue blade and gag the child. Alternative tricks you can use include asking the child to "roar like a lion," "pant like a dog," have their parents model what you would like the child to do, or have the child look in your mouth.

Know

- The numbering system for primary teeth is different than the system used in adults.
  - There are 20 primary teeth
    - Time for first tooth eruption is variable. Delayed eruption may be familial or associated with other syndromes/conditions (like hypothyroidism).
    - There may be developmental anomalies associated with tooth development.
- Dental caries is the most common chronic illness in the United States. More than half of children within the U.S. have dental caries. *Streptococcus mutans* is associated with the development of dental caries.
  - Early childhood caries may occur on the smooth surfaces of upper/lower incisors because of prolonged exposure to sugar containing substances.
  - Sites for caries in older children (> 3 years) include pits/fissures of biting (occlusal) surfaces.
- Using a tongue blade in this population is challenging. Inserting it along the side of the mouth and then gagging the child will allow for an unobstructed view of the posterior pharynx in most children.
- The size of tonsils are described in the following way:

Grade	Appearance
0	Absent
1	Visible between the tonsillar pillars
2	Easily visible outside of the tonsillar fossae
3	Enlarged and occupying >75% of posterior pharynx

4	Touching in the midline occupying all of the posterior pharynx

- The diagnosis of streptococcal pharyngitis is a laboratory, not clinical diagnosis. Other infections that can cause tonsillar exudates include EBV infections, CMV infections, S. aureus infections, and adenovirus infections.

Heart Examination

The approach to the pediatric heart examination is the same as in an adult. Included here is a brief discussion of murmurs in children.

- Newborn period
  - As the pulmonary vascular resistance decreases, flow through the ductus ateriosus or foramen ovale stops as these structures close. Some murmurs heard shortly after birth will disappear.
  - However, as the pulmonary vascular resistance decreases, this may allow left to right shunting, and new murmurs may appear (such as seen with a VSD).
  - Presence of central cyanosis is an important clue for congenital heart disease. Those lesions associated with cyanotic heart disease are the "Ts": tetralogy of Fallot, tricuspid atresia, transposition of the great arteries, total anomalous venous return, and truncus arteriosus (there are others, but these are easy to remember).
- Beyond the newborn period
  - 50% of children have innocent murmurs at some point.
  - Non-pathologic murmurs include:
    - Peripheral pulmonary flow murmur:
      - Soft (1-2/6) systolic ejection murmur heard at L upper sternal border with radiation to the axilla and back.
    - Venous hum:
      - Soft (1-2/6) continuous murmur heard in 1^{st} or 2^{nd} intercostal space.
    - Innocent murmur:
      - Soft (<3/6) early systolic murmur heard along the L sternal border between the $2^{nd}/3^{rd}$ or $4^{th}/5^{th}$ ribs. Intensity varies with position & might be heard with the bell. "Vibratory/blowing/musical" in quality.
    - Hemic murmur (flow murmur):
      - Heard in states with increased physiologic need (fever, anemia). Heard at base of the heart, soft (<3/6), and often associated with tachycardia.

Musculoskeletal Examination

Do

- Observe the child closely, noting in particular range of motion and limb use
  - An excellent time to get this information is before the examination while the child is playing or interacting with their parents.
- Inspect the joints for redness or swelling
  - Start with the hands or some non-threatening part of the examination; examine the affected joint last.
- Palpate the involved area and all other areas that influence the involved area methodically and in a systematic manner.

    - Note muscles, bony prominences, other important landmarks, and joints of the involved body part.
    - Be observant for pain or warmth.
- Assess active and passive range of motion for each major joint.
    - Young children may not cooperate with this part of the examination; you may have to range their joints and gauge how much they resist you to judge function.

Older child/Adolescent Examination

You should be able to conduct a complete examination of all organ systems in all adolescents using an age-appropriate approach. The physical examination in an older child/adolescent is very similar to that done in adults. Pay particular attention to patient modesty. Specific maneuvers that are a part of the older child/adolescent examination include:

Sexual maturity rating (formerly Tanner staging)

Do

Assess sexual maturity rating for both male and female patients. You should assess and report pubic hair development separately from breast or genitalia development.

Girls	Hair (Pubic/Axillary)	Breasts
Stage I	No coarse/pigmented hair	Papilla elevated only
Stage II	Scant course pigmented hair on labia	Breast buds palpable, areola enlarge
Stage III	Course, curly hair over mons pubis; Axillary hair develops	Elevation on contour, areola enlarge
Stage IV	Hair of adult quality, not on lateral thigh	Areola forms a secondary mound on the breast
Stage V	Spread of hair to lateral thigh	Adult breast contour

Boys	Hair (Pubic/Axillary)	Testes length	Penis
Stage I	No coarse/pigmented hair	<2.5 cm	No growth
Stage II	Scant course pigmented hair at base of penis	2.5-3.2 cm	Earliest increase length/width
Stage III	Course, curly hair over pubis	3.6 cm	Increased growth
Stage IV	Hair of adult quality, not on lateral thigh Axillary hair develops	4.1-4.5 cm	Continued growth
Stage V	Spread of hair to lateral thigh	>4.5 cm	Mature genital size

Know

Pubertal changes typically occur between the ages of 8 and 14 in girls and 9 and 16 in boys. Occurrence of pubertal changes outside these ranges should be evaluated.

- Precocious puberty:
  - Benign precocious adrenarche: may occur in boys before age 9 and girls before age 8. Absence of penile enlargement in boys or of clitoral enlargement in girls distinguishes this from pathologic virilization.
  - Precocious thelarche: isolated premature breast development in girls.
  - Other causes include CNS tumors, ovarian cysts, gonadal tumors, congenital adrenal hyperplasia, exogenous sources.
- Delayed puberty:
  - Constitutional (physiologic): most common, occurs in boys more often and is associated with delayed growth and bone age; ask about family history.
  - Other causes include malnutrition (including anorexia nervosa), chronic disease, central causes (hypothalamic/pituitary abnormality, tumors, drugs, other endocrine problems like hypothyroidism), gonadal causes (chromosomal—XXY, XO, anatomic abnormalities, immunologic).

Musculoskeletal exam

An excellent demonstration of the 2-minute orthopedic examination in an older child can be found in Aquifer Pediatrics case # 6 (Mike pre-sports physical).

Do

- Be able to perform a basic musculoskeletal examination (see Foundations-level resources).
- Additional techniques:
  - Assess the strength of the upper and lower extremities' major muscle groups.
    - Pelvic girdle strength: Ask the patient to sit on the floor and then stand up.
    - Lower extremity strength/joint function: Ask the child to squat and walk like a duck across the room.
  - Back examination
    - Inspect the back for spinal dimples & midline abnormalities, such as a tuft of hair, midline nevi, or central dimple. This should be done beginning in infancy.
    - Assess whether the spinal dimples are level:
      - Inspect the patient back from behind when they stand. If the spinal dimples are at the same level, there is not significant leg length discrepancy.
    - Assess symmetry/screening for scoliosis:
      - Shoulders should be at the same level, as should posterior superior iliac crests.
      - Inspect the patient's back when they are facing away from you.
      - Have the child bend forward at the waist keeping knees straight and allowing arms to hang freely; ribs/thorax should be symmetric.

Know

- Gowers' sign occurs when a child is unable to rise from a sitting to standing position without assistance. This sign indicates proximal muscle weakness.
- Midline abnormalities may indicate an underlying spinal cord or vertebral abnormality.
- Scoliosis is common in children, and screening is a part of the adolescent examination.
- Excessive thoracic kyphosis that persists when the child lies down is pathologic.

Inpatient Experience - Pediatric H&Ps

Performing H&Ps in the inpatient setting helps you both improve and demonstrate your skills of gathering, organizing, and synthesizing information about a pediatric patient, developing an assessment of the patient's status, and then building a plan. Depending on your site, there will be different opportunities for seeing patients with varied complaints and complexity. Challenge yourself to do full evaluations on the patients newly admitted or transferred to your service, or a patient who has been there for a while but who is "new to you." The more you do, the more practice you get, and the more your preceptors can observe your skills and provide feedback.

We expect you to complete 2-3 full H&Ps for every week that you participate on the inpatient service. Since the number of weeks on inpatient service, the inpatient census, or the nature of the experience may differ at the various sites (e.g. inpatient-only at some sites vs. blended inpatient/outpatient at others), the exact number of full H&Ps done by the end of the rotation may vary. Please remember that the more you engage in this activity, the more you learn and improve, and the more your preceptors can observe your skills.

You are required to write up and submit at least one of your H&Ps to your site director/preceptor for formal review and feedback. Your local site will clarify the method. Make sure that you upload the H&P that includes the feedback and comments to Canvas.

Explanation of Pediatric H&Ps/Pediatric Database

History:

CC: Same as for adults - a few words describing the main complaint(s)

HPI:

The information is the same for any medical problem. A careful and complete description of the presenting problem with appropriate chronology is key. Always include pertinent positives/negatives and family history or social history items relevant to the chief complaint. An important distinction is that much of the history will be observations from a third party (parent/caregiver). Important questions include: mood, activity level, eating pattern, urine output (specific as possible), sleep pattern, and a description in the parent's words what the problem is, how it has changed, what they have tried to alleviate the symptoms, and what they think is causing the child's illness. This section often ends with the presentation to care, e.g. ED course.

Past Medical History:

Birth/Pregnancy History:

For infants (less than 1 year of age), this component is particularly important. Often birth/pregnancy history is either relevant to the chief complaint or represents the majority of the PMH. Make sure to include these questions on all infants, as well as any child with a problem that might be related to perinatal/neonatal issues.

Maternal: Birthday parent's age, gravida, para, health problems and medications

Pregnancy: Complications, prenatal care/labs/tests

Labor: Duration of membrane rupture and complications

Delivery: Gestational age (at a minimum whether term or premature), Mode (vaginal/C-section/forceps/vacuum), Apgars.

Neonatal: Duration of hospitalization and any events that occurred shortly after birth.

Medical History:

Any medical problems or hospitalizations with a brief summary and dates.
Specifically ask about the last health supervision visit.

Surgical History:

Any surgeries and dates

Allergies:

Allergies and reactions

Medications:

Any prescription medications, over the counter medications, and/or herbs/supplements. Include doses when known.

Diet:

Description of diet. Particularly important in the first year of life or if growth is abnormal. For infants, comment whether breast feeding (frequency, duration, and volume if known) or

formula feeding (type of formula, volume, and frequency). For older children, ask about typical diet and about concerns the parents may have.

Growth and Development:

This should be part of every history.

The way you ask the questions will change over time. Start with an open-ended question , such as "tell me what types of things your child is doing now." Childhood development is often categorized into 4 domains - social, fine motor, gross motor. and language. Screening questions in each domain should be explored. Assess academic achievement from parents/patient.

Immunizations:

In every patient ask about receipt of immunizations; there are standard immunizations given at specific ages. Parents sometimes have the immunization record. If the child has not received immunizations, explore the reasons why. Saying "up to date" without checking actual documents or registries is an insufficient response. Try to document what immunizations were given and when.

Family History (include genogram):

Explore any diseases that are in the family (e.g. hypertension, diabetes, or other problems resembling the child's problem), as well as diseases pertinent to the chief complaint. Also, gently explore any miscarriages or childhood deaths in the family. Ask about the state of any siblings' health.

Social History:

Ask who lives in the home and whether there are other siblings. Explore childcare arrangements—whether it is the family, an in-home setting, or center-based (larger classrooms). Inquire about what languages are spoken at home. If the child is verbal, directly ask them about school/daycare, friends, favorite pastimes/toys, pets, and siblings/family members. In older children, make sure to ask about their hobbies, activities, school and friends. Identify sources of stress for the patient and family.

Environmental History:

Ask about whether anyone who lives in the house smokes, firearms, seatbelts, hot water heaters, and car seats.

Also ask about travel history, pets, and exposures to ill people.

Review of Systems:

This section is similar to that for adult patients. Remember that preverbal children cannot report many of the symptoms, so parental observation is the main source of information. A sample review of systems:

General: fever, weight loss, activity	GU: frequency, dysuria ,urine output, hematuria
Endocrine: change in habitus, weight gain	Skin: rashes
Eyes: crossing, pain, redness, drainage	Neuro: seizures, loss of consciousness
HENT: ear pain, drainage, hearing loss Nose: drainage, discharge, sinusitis Throat: tooth pain, sore throat, hoarseness	GI: feeding/appetite, vomiting, diarrhea, constipation, blood in the stool, abdominal pain

Resp: cough, wheezing, apnea, cyanosis, difficulty breathing	Musculoskeletal: joint swelling, tenderness, weakness
CV: murmurs, chest pain	Psych: mood changes, sleep problems
Heme/lymph: bleeding, anemia, jaundice, swollen glands	

Physical Examination:

The approach to the physical examination will vary with the age of the child. There are special maneuvers that are done at each age. There are specific benchmarks and appendices available in the clerkship manual.

Vital Signs: HR RR Temp BP

Height_____ % Weight_____ % OFC_____% BMI_____

General: Describe the state of alertness, mood, and willingness to cooperate with the exam and whether the child is in distress

Head: For infants and children feel for the fontanelle. Comment on the shape of the head

Eyes: Note presence of the red reflex in **all** children. Check pupillary reaction, lids/conjunctiva
NB: Fundoscopic exam is difficulty to perform on infants but can usually be done in children over 5-6 years of age. (The examination in this age group provides an excellent opportunity to see the optic disc and vessels.)

Ears: Check for tenderness of pinna, discharge, and gross assessment of hearing. Check tympanic membranes bilaterally with insufflation.

Nose: Check for discharge, turbinate color.

Mouth/Throat: Check for teeth/caries. Inspect the tongue, buccal mucosal, and the posterior pharynx for erythema, enlarged tonsils. Feel for submucosal cleft palate.

Neck: Gently palpate neck for masses and assess range of motion (often by observation).

Lymphatic: Check lymph nodes in neck, axilla, and groin.

Chest: Observe for signs of respiratory distress (nasal flaring, retractions, and grunting). Normal respiratory rate varies with age. Palpate for tactile fremitus, then auscultate anterior and posterior lung fields. Note the inspiratory:expiratory ratio (I:E ratio).

Cardiovascular: Observe for cyanosis, respiratory distress, and hyperdynamic precordium. Palpate the precordium for thrills. Auscultate as in adults---pediatric heart rates are faster than adults, thus distinguishing systole and diastole is more difficult. An S3 may be normal in children (represents rapid ventricular filling). Many children will have benign murmurs of no medical importance ---train your ears to hear them! Palpate the peripheral pulses and note capillary refill, as in adults. Femoral pulses are particularly important to check in neonates when screening for coarctation of the aorta.

Abdomen: Observe, auscultate, and palpate as in adults. Children often have a palpable liver edge, so always palpate from the pelvic brim up.

GU: See Sexual Maturity Rating (SMR) information in the Aquifer Pediatric cases and physical exam benchmarks in the clerkship manual.

Musculoskeletal: Much of this portion of the examination is observation for tone and strength. In neonates, observe for increased or decreased tone as both are pathologic. When children are older and can follow directions, the approach is similar to an adult exam. There are also special maneuvers to screen for congenital hip dysplasia (Barlow/Ortolani maneuvers).

Neurological: Much of this exam is done by observation (especially the cranial nerves). Children have deep tendon reflexes just like adults that should be tested. Neonates have primitive reflexes that are considered normal (like an upgoing toe with a Babinski test).

Assessment:
Start with a summary statement that synthesizes the important history, exam findings, and results in order to frame the clinical problem and lead your reader to your assessment of the likely diagnosis. This is not simply a restatement of the ID chief concern as you add key features identified in your H&P. It is similar to the mental 'problem representation' created by experienced clinicians as they perform an H&P. Also, include a clinical assessment of the patient's current clinical status. Then, document your clinical reasoning related to the patient's chief problem(s).
For a new problem: Provide a differential diagnosis of 3-5 possible causes of the patient's problem. Discuss the most likely cause(s) and link the features of your patient's history and physical that either support or argue against this diagnosis. Use terms like "most likely because" or "very unlikely given" rather than the more definitive "rules in" or "rules out".
Next, discuss the 2-4 other diagnoses you are considering. Again, link the features of your patient's history and physical to =support whether a diagnosis is more or less likely.

For an exacerbation of a chronic problem: Address the most likely reasons for the exacerbation, as suggested by your patient's history and exam findings.

Plan:
Includes diagnostic and treatment plan typically organized by problem, monitoring plan for assessing improvement/resolution, follow-up needed, and patient education needed.

Example H&P (Adolescent Patient)

CC: AB is a 16-year-old female presenting to the Emergency Department with 4 days of bloody diarrhea, abdominal pain and fever.

HPI: AB was in her usual state of health until 7 days prior to admission when she started experiencing nasal congestion, clear rhinorrhea and low-grade fever (maximum temperature 99-100). She went to her primary care provider, had a CT scan of her sinuses done, was diagnosed with a sinus infection and was treated with a nasal spray (patient not sure what type). Five days prior to admission, she began having intermittent fevers to 101.9, which have continued until the time of admission. Four days prior to admission, AB started having severe (7/10) generalized abdominal pain, worse in her subgastrium. She describes the pain as constant, dull, non-migratory, not relieved by anything, including acetaminophen, and exacerbated by eating. During the three days prior to admission, she has also had 3-4 episodes of bloody red diarrhea with the abdominal pain. She says that having a bowel movement makes her abdominal pain worse. AB has also had 2 episodes of nonbloody, nonbilious emesis in the past two days. She has noticed increased fatigue and has lost 2 lbs in the last week, though she still has a good appetite.

Notably, AB was seen approximately 5 months ago in the Emergency Department in Everett with abdominal pain. She had no diarrhea or emesis at that time. Her stool guaiac was negative, but was diagnosed with iron deficient anemia with a hemoglobin of 12.2 g/dL. She was sent home on iron supplements and no clear diagnosis for her abdominal pain. Since that episode she has noticed intermittent abdominal pain, fatigue and has lost 10 lbs.

She denies any rashes, arthralgias or myalgias, eye discharge or inflammation, oral lesions, cough, jaundice, petechiae or easy bruising. She has normal urine output. Her past medical history is also remarkable for cholecystitis requiring cholecystectomy at the age of 10. She has no recent travel. She has two dogs and one cat. Her LMP was last week and was normal in volume and duration. AB does not have a family history of inflammatory bowel disease or rheumatological diseases.

Past Medical History:

BH: Term, vaginal delivery, no complications
PMH: Abdominal pain, cholecystitis and anemia described in the HPI. Otherwise negative.
G0P0, regular menses
Immunizations: Up to date, including HPV and influenza (checked online vaccine registry)

Past Surgical History: Cholecystectomy, 6 years prior to admission (see HPI)

Medications: Ferrous sulfate for anemia
Multi-vitamin
No over the counter meds or alternative therapies

Family History: No history of inflammatory bowel disease (Crohn's or ulcerative colitis); No history of childhood rheumatological diseases or systemic lupus erythematosus. Paternal grandmother has psoriasis. Maternal grandmother with osteoarthritis. Paternal grandfather with heart disease and diabetes. No sick contacts.

Social History: Lives in Marysville with Mother, Step-Father, 15 mo brother
Is in the 11th grade, same school as last year; good grades (A's and B's).
Plays soccer and tennis; sings in the school choir

Denies EtOH, nicotine, and other drug use.
Is not and has not been sexually active. No current partner (boyfriend or girlfriend).

Review of systems:

General: See HPI
Endocrine: Weight loss as in HPI. No polyuria/polydipsia
Eyes: see HPI; no redness, no blurred vision or double vision.
Ears, Nose, Throat:
Ears: ear pain or drainage, no hearing loss.
Nose: see HPI
Throat: no tooth pain, sore throat or hoarseness
Cardiovascular: no chest pain or murmurs
Genitourinary: normal urine output, no frequency, dysuria, hematuria
Gastrointestinal: see HPI
Musculoskeletal: See HPI
Hematology/Lymphatic: see HPI; no jaundice or swollen glands
Psychiatric: no mood changes or sleep problems

Admitting PE:

Vitals: T 37.8 HR 110 RR 18 SaO2 97% on RA BP 113/82 Pain 5/10
Weight 42.5 Kg (< 3%) Height: 158 cm (25%)
General: well developed but thin young female, looks fatigued w/o significant distress
Skin: pale skin, no rashes or erythema, no petechiae or bruising
HEENT:
Eyes: PERRLA, full EOM, conjunctiva without exudates; sclera anicteric without injection, no periorbital edema
Ears: pinna and canals normal; TMs gray w/o erythema
Nose: nasal turbinates are slightly swollen and mildly pale with some clear rhinorrhea
Oropharynx: dry lips, mildly dry oral MM, 2+ tonsils w/o exudates or crypts, no pharyngeal erythema.
Neck: Supple with full range of motion; non tender to palpation. Thyroid soft and without nodules.
Lymphatic: no cervical, supraclavicular, axillary, inguinal adenopathy.
Chest: Symmetric inspiration, clear to auscultation bilaterally with no wheezes, crackles or rhonchi.
Breasts: SMR stage V
CV: Tachycardic, regular rhythm, prominent PMI over 5th intercostal space ~ MCL, normal S1 and S2, I-II/VI systolic ejection murmur over L sternal border, < 5cm CVP; 1+ radial and pedal and inguinal pulses which are symmetric, capillary refill 2-3 seconds.
GI: several small well healed scars from previous lap cholecystectomy, active bowel sounds, tenderness on light palpation in all 4 quadrants and worse in LLQ and RLQ, + guarding in LLQ, + peritoneal signs by moving the patient and rebound tenderness in LLQ, negative obturator and psoas signs, liver edge and spleen not felt. Liver span estimated to be 7 cm. No masses palpated.
Rectal examination: normal tone, no masses; no fissures; guaiac positive.
GU: 3 skin tags in the peri-anal region, no abscesses, erythema or fistulas in perineal region, SMR stage V genitalia and pubic hair.
MS: full ROM w/o pain, no erythema or increased warmth over joints, no effusions. No clubbing
Neuro: CN II-XII intact, Muscle strength 4-5+ throughout, 1+ and symmetric patellar reflexes, sensation to light touch intact in all extremities

Laboratory:
CBC: 8.1 WBC (28%pmns, 33%lymphs, 12%mono, 23%bands); Hemoglobin 9.1, Hct 27.4; MCV 89; RDW 13; RBC morphology is normal; Platelets 622K
U/A: pH 6.5; 1.025 sp gravity; tr protein; 0-5 WBC; 0-5 RBC; LE neg; Nitrite neg
Chemistry: Na 143, K 3.8, Cl 103, HCO3 29, BUN 11, Cr 0.7, Glu 97
CRP 4.3
ESR 114

Assessment:
AB is a 16 y.o. female with several month history of intermittent diffuse abdominal pain, fatigue, ten pound weight loss, with an acute course of profuse bloody diarrhea with low-grade fever. Her physical examination is remarkable for signs of peritonitis and volume depletion without signs of shock. Notable laboratory data include elevated inflammatory markers, anemia, normal platelet count and a left shift on her CBC.

AB's bloody diarrhea with fever and abdominal pain can be from infectious enterocolitis (parasite and bacteria), inflammatory bowel disease (IBD), malabsorptive (celiac), vasculitis (HSP, PAN), carcinoma of ileum or colon, carcinoid tumor, intestinal lymphoma as well as other less likely diseases. Given AB's long standing illness course with weight loss and anemia it is likely that she has a chronic illness thus making inflammatory bowel disease (IBD) the most likely diagnosis. Other chronic illnesses such as carcinoma, lymphoma or carcinoid tumors are unlikely in this age group. There are no specific signs/symptoms that differentiate ulcerative colitis (UC) and Crohn's disease (CD). Weight loss, bloody diarrhea, abdominal pain, fever and anemia can occur in both CD or UC. Given her skin tags, and past cholecystitis, it is more likely that she has CD than UC. In addition, she has significant elevation of CRP and ESR, and a left shift on her CBC indicating severe acute inflammation, which is all consistent with inflammatory bowel disease.

An infectious agent is less likely because of the chronic course, no significant travel risks, lack of suspicious foods eaten and no sick contacts. Possible agents could include E. coli O157:H7, E. coli (other pathogenic strains), Shigella, Salmonella, Yersinia enterocolitica, C. jejuni, C. difficile, amebiasis, giardiasis and cryptosporidium. Stool culture and O&P exams are necessary to diagnose an infection. Celiac disease rarely presents with bloody stools, but could explain her weight loss and abdominal pain. She has no other features of vasculitis, such as rash, swollen joints or kidney dysfunction to suggest these possibilities as the cause of her symptoms. However, if no unifying diagnosis is determined, further consideration and testing of these causes of her symptoms should be pursued.

AB's anemia is normocytic with an MCV of 89 and a Hct of 27.4. Typically iron deficiency anemia is microcytic making this diagnosis less likely. Her RBC morphology is normal, making intravascular hemolysis less likely. The anemia is most likely due to acute blood loss, and/or anemia due to chronic inflammatory state and poor iron utilization. Her anemia can also be complicated by B12 or folate deficiencies due to poor absorption. Her RDW is within normal range. If needed, a ZPPH, iron studies, B12 and folate levels, and reticulocyte count can be ordered to work up a continued anemia. Since she is likely volume depleted as suggested by her tachycardia, she may be more anemic that she appears to be at the time of admission.

Plan:
Bloody Diarrhea:

1. Abdominal x-ray for focal abdominal pain. Monitor abdominal exam for increased pain, nausea, continued bloody diarrhea and signs of obstruction (bilious emesis, severe abdominal pain, leukocytosis, SIRS, sepsis).
2. Consider H2 or PPI for gastritis.
3. Consult gastroenterology for consideration of diagnostic endoscopy.
4. Obtain Stool Cx, stool O&P, C. difficile toxin screen. No empirical antibiotics but monitor closely for clinical deterioration or signs of sepsis. If C. difficile toxin positive, initiate treatment.

Anemia:

1. Recheck CBC x 2 if she continues to have bloody diarrhea
2. Consider transfusion if Hbg < 8.5 gm/dL. It is very possible that she will need a transfusion because she is volume depleted and has on going hematochezia which will make her hematocrit lower.

Fluids/Electrolytes/Nutrition:

1. FEN: D5 + NS + KCl 20meq/L @ 100cc/hr. Monitor urine output to determine if additional normal saline boluses will be needed to correct volume depletion. Continue IV fluids until she is taking adequate PO and vitals are stable. Monitor vitals for orthostasis. Optimize fluids to maintain normal heart rate for age.
2. Clear diet, ad lib.

Example H&P

ID/CC:

J is a 14-month-old otherwise healthy child who presents with acutely worsening respiratory distress, acute fever, and ear pain.

HPI:

J presents to the ED with her father, who provides the history.

She is in daycare and for about the past month has had frequent cough, congestion, and rhinorrhea. Over the past three days, she has had low-grade fever at home and increased congestion. Yesterday, she developed a fever with Tmax of 103.8° F. She was seen by her primary care doctor, who diagnosed her with bilateral acute otitis media. She additionally tested positive for influenza A. At her PCP's office she was noted to have increased work of breathing and desaturations into the 80s, so she was sent to the ED for further care.

Her parents have not noticed any wheezing. She has been tolerating PO food and fluids and has shown interest in eating. She has been urinating and stooling at her normal rate. She has not had any vomiting or diarrhea. No constipation. No rashes. She has been somewhat more fatigued and fussy, but her parents state she has not been excessively drowsy. No external ear redness, drainage, or swelling around the ears. No loss of consciousness or seizure activity.

ED course:

In the ED, J was found to have increased work of breathing with retractions and desaturations into the 80s. She was suctioned and started on 1 L/min supplemental O2 and has not tolerated weaning. She was febrile to T 39° C and was given acetaminophen. She was tachycardic and had delayed capillary refill, and was given a normal saline bolus at 20 mg/kg and was started on maintenance fluids at a rate of 33 mL/hr. She additionally tested positive for RSV. A chest x-ray showed perihilar prominence with concern for possible early pneumonia. She was also given oseltamivir, as she tested positive for influenza. One dose of ceftriaxone 50 mg/kg was given to treat the acute otitis media and possible early pneumonia.

Past medical history:

J has otherwise been healthy. She was born at full term after an uncomplicated pregnancy to a G2P1 mother. She has never required hospitalization before. She is up-to-date on vaccinations including influenza at 12 months of age.

Developmental history:

She has met expected developmental milestones, including walking and beginning to speak a few words. Parents do not have concerns about her growth or development. She is seen regularly by her PCP for well child visits.

Past surgical history:

None

Home medications:

Acetaminophen 15 mg/kg dosing, 32 mg/mL suspension, for 4 mL total PRN q6 hours

Allergies:

No known drug allergies.

Social history:

She attends daycare. She lives with her parents and older sister (age 3), who is also in daycare. Parents and sister have also been sick with URI symptoms recently.

Review of Systems:

Constitutional: Fever. No change in appetite, no weight loss.
HENT: Congestion, rhinorrhea, tugging at ears. No scleral icterus or injection. No eye or ear drainage.
Resp: Cough, increased work of breathing.
GI: No vomiting, no diarrhea, no dark or bloody stools.
GU: No change in urine output. No difficulty urinating.
Neuro: No change in alertness.
Derm: No rash.

Vital Signs (in ED):

HR: 171
BP: 105/70, R leg
RR: 54
Temp: 39° C (102.2° F)
O2: 90s on 1 L NC, range 85% (RA) to 98%

Weight: 8.25 kg, 15th percentile. No prior data points in chart available for review of growth trends.

Physical Exam:

General: Laying in father's arms, alert. Crying but consolable.
HNT: Normocephalic, atraumatic. Mucous membranes are pink and moist.
Ears: External ears appear normal without drainage or erythema. Tympanic membranes are erythematous with small fluid pockets behind them, R>L, but are not bulging.
Eyes: Sclera white, no injection. Conjuctiva clear. Extraocular eye movements intact.
Resp: Nasal cannula periodically in place due to toddler irritability. Breathing rapidly with mild belly push and subcostal retractions. No intercostal retractions, tracheal tug, or nasal flaring. Breath sounds are coarse bilaterally, R>L.
CV: Regular rate and rhythm, clear S1 and S2, no murmurs. Capillary refill 2-3 seconds.
Abd: Soft, non-distended, non-tender to palpation. No masses.

Neuro: Awake, alert, and interactive. Cranial nerves grossly intact and symmetric. Moving all extremities spontaneously with normal tone. No focal defecits.
Extremities: Warm, well-perfused.
Skin: Warm, dry. No rashes or lesions.
Psych: Appropriate for age and situation.

Imaging:

Chest x-ray shows prominent bilateral perihilar interstitial markings but no focal pulmonary consolidations. Per radiology, findings are consistent with viral infection or possible early pneumonia with component of atelectasis.

Assessment and Plan

J is a 14-month-old female presenting with respiratory distress and a new-onset fever in the setting of influenza A, RSV, and acute otitis media. She has increased work of breathing with tachypnea and mild belly push. Her respiratory distress is most likely caused by influenza A. Lower on the differential are a bacterial pneumonia, RSV bronchiolitis, and asthma. With possible early pneumonia on CXR and absence of wheezing, highest suspicion is for influenza A causing her symptoms, more than an RSV bronchiolitis or asthma. Given her respiratory symptoms over the past few weeks, there is an unclear start date of her symptoms. With her positive influenza test, she was given a dose of oseltamivir in the ED, which has been shown to reduce the duration of illness by about 17 hours when initiated within 48 hours of symptom onset, and ideally within 24 hours (Malosh et al., 2018). With her unclear timeline, after discussion with parents and shared decision-making, we will discontinue oseltamivir, as the likelihood of her benefitting from this medication is lower. She is not currently tolerating weaning from supplemental O2, so will be admitted for continuing respiratory support with supplemental O2 and suctioning.

Her course of illness, with fever and worsening respiratory symptoms after weeks of URI symptoms, is concerning for development of a secondary pneumonia. However, given the absence of focal findings on lung exam and bilateral interstitial prominence on CXR (vs. unilateral or focal consolidation), a bacterial pneumonia is less likely. Additionally, she has received ceftriaxone for AOM, which is expected to cover *Strep*, *H. influenzae*, and *Staph* bacteria often involved in community acquired pneumonia (Popovsky and Florin, 2020).

She is mildly dehydrated on exam with a slightly delayed capillary refill time of 2-3 seconds, but with moist mucous membranes and making tears. Her volume loss is likely related to increased metabolic demand in the setting of acute illness. She has not had vomiting or diarrhea. She is still interested in feeding, so will continue PO fluids in addition to maintenance fluids overnight. We will trial her off the maintenance fluids as her condition improves.

Her AOM is likely secondary to her congestion and rhinorrhea in the past few weeks, with reduced eustachian tube drainage leading to fluid accumulation and infection. She was given one dose of ceftriaxone 75 mg/kg in the ED, which is expected to be adequate treatment for uncomplicated AOM, equivalent to the 10-day course of amoxicillin suspension prescribed by her PCP (Green and Rothrock, 1993; Wang et al., 2004). Additional doses could be considered if symptoms persist, but we will monitor for symptoms and expect no further antibiotics will be required.

Influenza

- STOP oseltamivir
- Respiratory support with low-flow supplemental O2, wean as tolerated.
- Frequent suctioning q4h or more often as needed
- Maintenance fluids at 33 mL/hr D5 NS (based on 8.25 kg weight). PO fluids as tolerated.

RSV

- Respiratory and fluid support as above

Acute otitis media

- Ceftriaxone 75 mg/kg IM, single dose, given in ED
- If symptomatic improvement, no further antibiotics indicated.
- If no improvement, consider second dose of ceftriaxone tomorrow

Diet: Regular for age
PRNs: Tylenol 15 mg/kg q6h for fever, pain
Lines: Peripheral IV
Dispo: Admit to general medicine.

References:

Green SM, Rothrock SG. Single-dose intramuscular ceftriaxone for acute otitis media in children. Pediatrics. 1993 Jan;91(1):23-30. PMID: 8416502.

Malosh RE, Martin ET, Heikkinen T, Brooks WA, Whitley RJ, Monto AS. Efficacy and Safety of Oseltamivir in Children: Systematic Review and Individual Patient Data Meta-analysis of Randomized Controlled Trials. Clin Infect Dis. 2018 May 2;66(10):1492-1500. doi: 10.1093/cid/cix1040. PMID: 29186364.

Popovsky EY, Florin TA. Community-Acquired Pneumonia in Childhood. Reference Module in Biomedical Sciences. 2020:B978-0-08-102723-3.00013-5. doi: 10.1016/B978-0-08-102723-3.00013-5. Epub 2020 Aug 31. PMCID: PMC7458534.

Wang CY, Lu CY, Hsieh YC, Lee CY, Huang LM. Intramuscular ceftriaxone in comparison with oral amoxicillin-clavulanate for the treatment of acute otitis media in infants and children. J Microbiol Immunol Infect. 2004 Feb;37(1):57-62. PMID: 15060689.

Example H&P (infant)

ID/CC: 7 mo old ex-40 week AGA healthy infant male presents w/ a 3 month history of faltering growth and a 1 mo history of recurrent upper respiratory symptoms

HPI
TS's mother believed her infant to be in good health until earlier today when during a routine primary care visit his pediatrician was alarmed by his thin appearance and fall in his weight for age from the 30th percentile to the 2nd over the past 3 months. His length and head circumference for age also dropped across percentiles during this period but have remained on the normal curve. The mother denies any recent changes in TS's appetite and explains that he eagerly breastfeeds every 2-3 hours for 5-10 minutes at a time during the day (without nighttime feedings from 10 pm to 7 am) plus soft baby foods 1-2 times per day. She believes that this "is approximately the same amount that her two older daughters ate at that age". She also believes that her milk supply is "good" because she is easily able to express milk by squeezing her breast. She is also currently 16 weeks pregnant.

She denies TS having symptoms of fatigue, diaphoresis or rapid breathing during feeding as well as post-feeding fussiness, emesis or diarrhea. He has 2-3 wet or mixed diapers per day and his stools are brown in color without melena, clay color or bright red blood, and they are not particularly foul smelling. TS's development thus far has been appropriate for age and growth was following a normal curve at least until 4 months of age. Neither parent has a known history of HIV or other sexually transmitted infections nor any high risk behaviors. There is no history of recent travel or exposure to persons infected with TB. He has had one newborn metabolic screen at 1 day old which was normal; the second screen was not obtained.

Of note, TS has also experienced approximately 1 month of recurring fever, cough and rhinorrhea that lasts for 3-4 days at a time. He is having some of these symptoms today with a transient fever to 101.2 earlier today but no wheezing, stridor or increased work of breathing. He has had all of his childhood immunizations up to the age of 4 months with the exception of rotavirus and influenza. Several family members have also had these symptoms all of which have self-resolved. The mother describes no changes in TS's appetite or feeding frequency/duration while ill.

ED Course
On arrival to SCH ED, TS was afebrile and all vital signs were within normal limits. He was given a 300 ml NS bolus via peripheral IV. CBC, electrolytes, CRP and a viral panel were obtained. He arrived to the floor shortly thereafter.

Birth Hx
Born at 40 +3/7 AGA to G3P2 mother via uncomplicated vaginal delivery. APGARs at birth were 7 at one minute, 8 at five minutes. The mother's screening was remarkable only for lack of Rubella immunity. Neonatal course remarkable for mild jaundice (Tbili max = 6.8) which required no intervention and initial difficulty latching. Both resolved prior to discharge.

PMH
Stable/Resolved Problems
1. Neonatal jaundice: see Birth Hx
2. Difficulty breastfeeding: see Birth Hx

PSH
None

Allergies
None known

Medications
No medications or supplements

Diet
See HPI.

Growth and Development
Weight for age: 30th percentile (age 4 months) -- 2nd percentile (age 7 months)
Length for age: 85th percentile (age 4 months) --15th percentile (age 7 months)
Head circumference: 70th percentile (age 4 months)--40th percentile (age 7 months)

TS is able to sit up on his own with good head control, starting to crawl, reaching for objects, stacking blocks and babbling. His mother reports that he is developing similarly to his sisters, even during the time he has lost weight.

Immunizations
Routine vaccinations up to age 4 months with the exception of Rotavirus and Influenza

Family Hx
Hyperthyroidism: paternal grandfather and cousins
Type II DM: maternal grandmother
Both parents and 2 older siblings with no significant PMH

Social/Environmental Hx
Lives in home in Everett, WA with mother, father and two sisters (ages 2 and 4). Father stays at home while mother works outside of the home as an engineer during the day. No additional care providers. TS does not attend day care. Mother does not have any concerns for safety in the home.

Exposures: both parents are non-smokers, cleaning supplies and toxins out of reach, pets include 2 Guinea pigs.

ROS
Gen: +transient fevers over past month (see HPI), no chills or sweats, activity at baseline,
Endo: no change in habitus, + weight loss (see HPI)
HEENT: no head trauma, + stork bites over bilateral eyelids, no eye crossing, no rhinorrhea, +moderate clear nasal drainage, no ear pain, drainage, or hearing loss, + thick white coating on tongue and lips, no hoarseness.
Resp: + intermittent wet cough (see HPI), no snoring, apnea, increased work of breathing, cyanosis or wheezing
CV: no murmurs, no fatigue, sweating or tachypnea with feeding, no cool extremities
Heme/Lymph: no easy bruising or bleeding, anemia, jaundice or lymphadenopathy
GI: no signs of abdominal pain, normal appetite, no dysphagia or choking, no hematemesis, diarrhea, melena or hematochezia, no constipation
GU: no change in frequency, urine output or urine color, no hematuria
Neuro: no seizures or LOC
MSK: no joint swelling or erythema, no asymmetry or weakness
Skin: erythematous papules in diaper region
Psych: no changes in sleep pattern or appetite

Physical Examination:
Vital Signs (on admission)
Weight: 6.322 kg (2%); Height 65cm (15%); Head Circumference 42.5 cm (40%)

HR: 148 BP: 81/67 RR: 32 SpO2: 100% on RA Temp: 37.6

Gen: pale and thin appearing, alert and interactive, consolable when fussy

HEENT
Head: NC/AT, anterior fontanelle 1 cm and flat, sutures normal with no overriding.
Eyes: normal position, normal red reflex, PERRLA, EOMI, conjunctiva somewhat pale, no scleral icterus
Ears: pinna normally positioned; no drainage, external canal without erythema or exudate, TMs slightly red bilaterally but no bulging or pus.
Nose: non-purulent drainage, nares patent, no nasal flaring
Throat: 2 erupting bottom teeth, palate intact, posterior pharynx without erythema or exudate, normal appearing tonsils without pus, tongue, buccal mucosa and soft palate with thick white plaque

Neck: no masses; thyroid normal size and consistency

Lymphatic: shotty anterior cervical lymphadenopathy; no inguinal or axillary lymphadenopathy

Chest: normal inspiratory: expiratory ratio, symmetrical chest expansion, no wheezing, rales, ronchi or stridor, no increased WOB

CV: RRR, no murmurs, rubs or gallops, brachial, femoral and dorsalis pedis pulses full and symmetrical, no cyanosis

Abdomen: soft, non-tender, non-distended, no masses, 1 cm reducible umbilical hernia, normoactive bowel tones, liver edge is palpable 2 cm below the right costal margin; no spleen tip is palpable.

Back: normal curvature, no sacral dimples or hair tufts

MSK: normal ROM, joints without erythema or swelling

GU: SMR stage 1, normal genitalia, testes descended bilaterally, anus patent, erythematous patch with satellite lesions along inguinal folds and beneath scrotum

Neuro: alert and interactive
Cranial nerves: II-X and XII intact by gross examination
Motor: 5/5 strength upper and lower extremities
Tone: normal, no fasciculation
Sensory: responsive to light touch
Reflexes: 1+ patellar reflexes, +Babinski, no moro, rooting, palmar or plantar grasp
Cerebellar: unable to assess
Gait: unable to assess

<u>Labs/Studies</u>
CBC w/diff
WBC: 8.6
Hb: 10
Hct: 30 (L) MCV 72 (L)
Plts: 167K

Electrolytes: Na 139 K 3.9 Cl 110 HCO3 25 BUN 10 Cr 0.3

CRP: 1.4 (H)

Viral PCR: + for RSV

Assessment/Plan

7 month old previously healthy and developmentally normal breastfed male presents with poor growth since last assessed by PCP at age 5 months. He has a normal appetite without vomiting or diarrhea, no loss of developmental milestones but 1 month of recurring URI symptoms of fever, cough and rhinorrhea. Physical examination is remarkable for white plaques on his tongue/buccal mucosa, rhinorrhea, and erythematous diaper rash. Viral PCR positive for RSV.

Problem 1: Faltering Growth

TS meets faltering growth criteria due to a decrease in weight from 7.0 kg at age 4 months to 6.32 kg at age 7 months (from approximately 30th percentile to 2nd percentile on weight for age). His length and head circumference have also crossed percentiles but remain on the normal curve. The DDx for faltering growth broadly includes nutritional causes (neglect, abuse, inadequate feeding) vs metabolic/increased demand causes (CHD, diabetes, RTA, malignancy, inborn errors of metabolism, etc) vs infectious (UTI, HIV, TB) vs. malabsorption causes (CF, cow-milk-protein intolerance, IBD, GERD, pyloric stenosis, etc).

The most likely cause of faltering growth in this previously healthy and developmentally normal 7 mo male is inadequate nutrition both because it is epidemiologically most likely and because there are no obvious signs/symptoms of organic causes. There is also some suggestion from his mother's lactation history and current 16 week pregnancy that her breast milk may be inadequate to support this infant. In addition, TS is being offered only once daily table foods which is likely too little to make up for deficiencies in breast milk. Poor latching and inadequate frequency of feeding are unlikely given the mother's ability to provide detailed history of his feeding schedule. UTI and prolonged URI are also possible given the recent fevers and accompanying symptoms, however these would be unlikely to cause such a dramatic change in growth over a 1 month period in the setting of normal PO intake.

The report of recurrent URI symptoms, mouth plaques c/w thrush, and yeast infection also raises suspicion for possible congenital immune deficiencies such as severe combined immune deficiency (SCID), selective IgA deficiency or x-linked agammaglobulinemia. SCID commonly presents with faltering growth and thrush but usually also includes chronic diarrhea which TS has not had. I would also not expect normal growth for the first 4 months of life with this etiology. Agammaglobulinemia fits TS's age (decreased maternal IgG by 6 months) but he has not experienced recurrent bacterial infections and tonsils are present. Selective IgA deficiency is possible in the setting of recent recurrent URI symptoms but usually doesn't present as faltering growth as the first symptom; I would expect more sinopulmonary symptoms. HIV and TB are much less likely given no maternal or paternal h/o HIV infection or risky sexual behavior and lack of travel or exposure to contacts with TB. Malignancy should also be considered given his recent pattern of fevers and weight loss; however this is also less likely than inadequate feeding. Neglect and/or abuse should be considered although there are no overly concerning findings on social history or physical exam to raise significant suspicion.

Other possibilities including CHD, CF, milk protein intolerance, IBD, GERD, pyloric stenosis, diabetes, inborn errors of metabolism, and RTA are least likely given the lack of suggestive history and physical exam findings. CHD would likely present as fatigue, diaphoresis, tachypnea during feeding. CF would present with greasy, foul smelling stools and possibly rickets. He has no h/o high blood glucoses or polyuria to suggest diabetes. Milk protein intolerance and IBD would be suggested by bloody stools of which there is no history. GERD and pyloric stenosis would present with significant post-feeding symptoms (projective vomiting, fussiness, tachypnea). Inborn errors of metabolism would have likely been discovered on his newborn screen (although he did not have a 2nd screen) and presented earlier in infancy. I would also expect developmental delays with this etiology. RTA or chronic renal insufficiency would be considered if urinalysis and/or electrolyte abnormalities were present (elevated BUN, creatinine), but there is no e/o this currently.

-Pre- and post-feeding weights to determine adequacy of breast feeding
-Calorie counts
-Strict I&O's

-Nutrition and lactation consults
-Social work consult to evaluate for psychosocial contributors
-UA to r/o UTI and renal causes
-Stool elastase to r/o malabsorption
-Q6 vital signs
-No maintenance fluids at this time, reassess if become tachycardic or hypotensive
-Nutrition and lactation consults as above
-Consider re-feeding labs

Problem 2: Anemia
TS's anemia is most likely secondary to combined iron and possibly folate deficiencies given current state of malnutrition. Will want to reassess as outpatient if does not resolve with improved nutrition.
-Multivitamin supplementation
-Consider infant formula if breastfeeding determined to be inadequate
-F/u CBC as outpatient

Problem 3: URI symptoms (low grade fever, cough, rhinorrhea)
TS has been afebrile since arrival to the ED but most likely etiologies of transient low grade fever, cough and rhinorrhea in this 7 month old infant w/viral panel positive for RSV and no increased WOB is URI. Recent contacts with similar, self-resolving symptoms support this diagnosis. UTI or other bacterial infections are also possible but less likely given the long duration and self-resolving nature of symptoms.

-UA as above to screen for other common causes of fever

Problem 4: Elevated CRP
Likely 2/2 a combination of malnutrition and current respiratory illness.
-Address malnutrition as above
-Monitor for signs of worsening illness

Problem 5: Diaper rash/ mouth plaques
Likely 2/2 yeast, such as Candida, given the location and satellite lesions. Mouth/tongue plaques also c/w oral candidiasis.
-Oral and topical nystatin

Disposition
-home, pending ability to gain weight in hospital and parental education regarding adequate intake or determination of organic cause.

Fluids Problem Set
Fluid Management for Pediatric Patients

Things to remember:

- Always evaluate your patient's volume status
- Use weight changes and/or your clinical judgment to assess a volume deficit
- The volume of fluid required to keep a patient in normal balance is often called "maintenance" and may differ from person to person or day to day
- Based on assumptions of normal physiology, it is possible to calculate maintenance needs
- The assumptions about maintenance needs do not always hold in the setting of illness
- Enteral therapy and IV therapy both have a place in treating children with volume depletion
- Ongoing monitoring and review of your patient's progress is required

Full materials for the exercise are on Canvas. You can find a link on the Pediatric Clerkship website.

Clinical Problems

Write the intravenous maintenance fluid order for the following patients. Remember to include the type of intravenous fluid (i.e., amount of dextrose, sodium chloride, potassium, etc.) and the hourly rate. How did you select the fluids and rate?

1. A previously healthy 8-year-old is seen in the pediatric emergency department with abdominal pain. An ultrasound shows concerns for appendicitis. The patient must remain NPO (nothing by mouth) until after surgery. Weight is 29kg.

2. An 18-month-old is seen in the emergency department with 48 hours of vomiting and diarrhea. The family tried to give oral fluids at home, but over the last 24 hours the child has only taken a small amount. In the emergency department we note a normal heart rate but delayed capillary refill. The patient weighed 11 kg two weeks ago and now weighs 10.2 kg. What would you do to assess and treat this child's volume status?

   Unfortunately, 40 minutes after the start of your initial management, the patient has recurrent emesis, now also with tachycardia and appearing more tired. What is the appropriate intervention now?

   The patient looks better after your last intervention but will only take small sips of clear liquids. Since this child is unable to maintain hydration orally, they will be admitted for maintenance fluids. What will you recommend for IV fluids, and why?

3. A newborn term infant, birth weight 3400 grams, is admitted to the neonatal ICU for observation due to tachypnea. Baby has good oxygenation and does not require mechanical ventilation, but the neonatology team wishes to observe. The baby will be NPO for the first 12-24 hours. What fluids do you use and at what rate?

Required Problem Set Exercises

Medication Ordering Problem Set

Some things to remember:

1. Medications and other therapeutics need to be dosed in a manner appropriate for children. This most often requires scaling a drug dose to body weight or body surface area. Accurate weight and height are therefore necessary to both evaluate and treat a pediatric patient.
2. In some rare circumstances (e.g., extremes of abnormal weight, fluid excess, etc.), measured body weight/height may not be appropriate for dosing calculations. Rather, "ideal" weight/height would be used.
3. Not all medications come in forms that are usable in all children (e.g., liquids for oral use in a small child who cannot swallow a pill) and not all medications are acceptable for use in children. These issues must be considered when prescribing.

Complete Medication Ordering:
Full materials for the exercise are on Canvas. You can find a link on the Pediatric Clerkship website.

Using a pediatric formulary reference, determine the appropriate dose of medications for the following clinical situations. Write the dose, route, frequency, and if necessary, the duration, formulation (tablets, liquid, etc.) and/or the "as needed" (PRN) indication.

Clinical Situation	Medication
18-month-old admitted for fever and respiratory distress Weight: 12kg Height: 82cm	Rx: ACETAMINOPHEN
4-year-old admitted for pyelonephritis Weight: 16kg Height: 100cm	Rx: CEFTRIAXONE
16-year-old seen in the clinic with probable UTI Weight: 72kg Height: 155cm	Rx: TRIMETHOPRIM-SULFAMETHOXAZOLE
7-year-old treated in the ER for acute asthma exacerbation Weight: 21 kg Height: 122 cm	Rx: ALBUTEROL
3-year-old with new-onset nephrotic syndrome Weight: 14 kg Height: 95 cm	Rx: PREDNISONE

Departmental and Career Advising Contacts

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Pediatrics Career Advisors

Our career advisors are happy to provide individualized help with your decision making. These advisors are excellent resources and are happy to meet with you at various points throughout the long application process. With your initiative, your advisor will become acquainted with you and your record, and will be able to provide you with individual feedback to help you with these important decisions.

The current Department of Pediatrics faculty members who serve as advisors for aspiring pediatricians:

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