Lang Doctor's In Training Lesson Plan Shell -

Title: Introduction to Radiology
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To the Presenter: *Please read through the lesson plan and make any notes prior to the session. Arrive 15 minutes before session begins to write out Lesson Objectives (see below) on whiteboard, and to lay out and organize all supplies.*

Please refer to the Teaching 101 Lesson on the Community Pediatrics Website prior to giving your lesson

Objectives: (have these written before the lesson begins)
LSWBAT (Lang Scholar Will be Able to) #1– define the terms "subjective" and "objective" as it pertains to the medical profession. - (5 mins)
LSWBAT #2 – Understand what a differential diagnosis (DDx) is and create an example of one working with partners. - (10mins)
LSWBAT #3 – Understand pertinent BASICS of radiology - (5mins)
LSWBAT perform the following DOCTORING SKILL – Use real cases and images to practice making differential diagnoses and using radiology to narrow a DDx or make the diagnosis! - (40mins)

Supplies:
PowerPoint presentation
Multiple laptop workstations with the PowerPoint and images easily accessed
AV hookup with Internet
Copies of this lesson plan for presenters
Copies of the Differential Diagnosis Generator – 60 copies, see last page of Lesson

Do Now: (display on power point for students to complete as they walk in)
Slide 2 – On this slide there are two chest x-rays, a normal and an abnormal. The emphasis is for the scholars to generate descriptions in their own language (e.g. "white area" or "darker" as opposed to "consolidation" or "infiltrate").

Task - List 3 similarities and 3 differences between the two films.
Give students 3-5 minutes to look at the film and write down answers.

Intro:
1) Always start lessons reviewing Lang Classroom Rules – **(2 min)**
Slide #3 - *Feel free to ask scholars to share these rules to you!*

a. **Excellence:** We are not satisfied with mediocrity. We strive for exceptional quality in our academics, professionalism, and service. We are hard workers who aim to go above and beyond what is expected of us.

b. **Innovation:** We are creative problem-solvers who think critically and devise out-of-the-box solutions.
c. **Respect:** We esteem and honor the inherent worth of every person and seek to show regard and consideration for each person, including advisors, guest speakers, and ourselves, at all times.
d. **Empathy:** We identify with the thoughts and attitudes of others. We listen, understand, and then respond.
e. **Responsibility:** We fulfill our commitments. Our word is reliable and we hold ourselves accountable for our own actions.
f. **Teamwork:** EMPHASIZE FOR THIS LESSON - We listen, help, share, participate, and communicate. Each of us contributes to a positive peer-support network that strives to help every member to reach common goals and aspirations. We learn from each other! **(slide #4**)

2) Review your objectives for the lesson – **(1 min)**
3) Specifically state that the goal for the lesson, like all DIT lessons, is to learn a doctoring skill (point our your Doctoring skill) **(1 min)**

Solicit prior knowledge

i. Review "Do Now" **(2 min) –** Slide #5
    a. Again, urge scholars to use their own words and positively reinforce that those observations are exactly how doctors learn how to read films
    b. Also as we transition to the meat of the lesson, try and identify their observations as "Objective" or "Subjective" and remind them we will soon define these terms in our lesson
    c. You can point out that a doctor called a radiologist trains to read films where a radiology technician trains to take excellent pictures

Communicating the new Knowledge…

1) ***Objective #1 –*** "Subjective vs. Objective" – Slide #6 and #7
    a) **Subjective** – personal perspective, feelings, beliefs, opinions… what a patient describes as what is wrong with them… their "symptoms."
    b) **Objective** – factual, results of a diagnostic test.
    c) Subjective complaints/concerns guide which diagnostic tests to order in order to back up subjective findings with objective facts that can confirm a diagnosis.
    d) Example – Slide 7 – Review the two chest x-rays and try and use some of the words the scholars came up with during the "Do Now" activity and point out why some words are objective while others are subjective
        i) *Patient was probably coughing, having trouble breathing = subjective*

ii) White, Colors, X number of ribs on the normal film and Y number of ribs on the abnormal film, one is bigger or smaller (sizes) = objective

2) ***Objective #2 –*** Defining a Differential Diagnosis – DDx – ***Slide #8***
   a) **DDx** = Taking a patient's major symptom (aka Chief Complaint) and thinking about the many different causes of their complaint
      i) Many of the scholars have learned or are going to learn the mnemonic A VITAMIN C – Acquired, Vascular, Inflammatory (infectious/non-infectious), Trauma/toxins, Autoimmune, Metabolic, Idiopathic, Neoplastic, and Congenital.
      ii) Others tend to organize by organ system = our preference and how the rest of the lesson's activities will be organized…
      iii) THINK, PAIR, SHARE – The Causes of COUGH- **Slide #9**
         (1) Presenters – USE A TIMER HERE
         (2) Organize answers by lung organ system ***– lungs, heart, ENT, toxin***
         (3) Solicit answers from the different groups and track them on the board. Feel free to add to their lists.

   b) Transition to **introducing radiology** by stating something like "*After we ask the patient questions based on our differential diagnosis, then do a physical exam looking and listening for findings that would support our top diagnoses, we may want to consider a radiological test to narrow down or even **make** the diagnosis."*
      i) For this example case, radiology helps to make the Dx

https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=8&caseID=227&GBcaseid=&GBtopicID=99&GBsearchText=&GBsearchCriteria= IMAGE #1
and
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageID=2&historyID=8&caseid=227&GBcaseid=&GBtopicID=99&GBsearchText=&GBsearchCriteria= IMAGE #2

***To the presenter – Demonstrate the battery trapped in the child's esophagus. Note how something in the Esophagus can cause fast breathing as it impinges on the child's airway. Point out that problems in many organ systems can account for the same complaint.

3) ***Objective #3 – Radiology Basics…*** **Slides #11 and 12**
   a) Using the outlined CXR on **Slide 12**, please point out some of the important distinctions when reading plain films:
      i) Black = Air/gas/fat
      ii) White = Fluid, blood, bones, pus, CONTRAST, metal
      iii) Grey = some types of fluid, soft tissues like muscles
      iv) The major concept to communicate here is what you see with your eyes is meaningful, and if you can remember some basic rules of radiology and think like a doctor by using a DDx, you will be reading scans like a pro.

v) Ask the class if they are Ready to be a RADIOLOGIST?! **Slide #13**

4) ***The Doctors in Training Objective – Being a Radiologist while working in Teams***

****NOTE TO THE PRESENTERS - A WORD ABOUT TEACHING IN STATIONS…*
This can be a really successful way to get the kids moving around and learning in a controlled, task oriented manner while keeping track of time. It is also very fun! Working this way allows for the students to share ideas with each other, learn from each other and learn from you as the director of each station.

****HOWEVER – if you do not take 5 minutes to set your expectations and introduce the activity, it can be utter chaos. So please read through this part of the lesson plan thoroughly so you can both set your expectations with the scholars and you can lead the activities effectively!*

a) **The Activity** – *FOR THE PRESENTERS*
   i) *Each station will be lead by 1 Resident, there are 4 stations total*
   ii) *The format at each station will be to follow the "medical process" as much as possible.*
      (1) *To use a chief complaint to*
         (a) *Formulate a differential diagnosis*
         (b) *Use the case information (H&P) to narrow their differential*
         (c) *Interpret the radiological test in the context of the case.*
      (2) *Students will be traveling around from station to station with a worksheet guiding them through these tasks.*
         (a) *PLEASE familiarize yourself with the cases, the images, and the Ddx Generator Worksheet*
      (3) *Use a timer to make sure scholars have an appropriate amount of time to see as many of the stations that time allows for – e.g. estimate around 10mins per station.*
         (a) *If time is an issue, it is OK for scholars to complete 3 of the 4 stations… sometimes teaching is all about being flexible*
      (4) *Please also note that some cases will have to be driven by you the presenter v. the scholar's original ideas. It may be helpful for you to go through each disease process on the DDx Generator Worksheet to help clarify what each is and help the Scholars choose if they want to include it in their DDx for a specific case.*

b) **Introducing Your Expectations and The Activity to the Group –** *TO SHARE WITH THE SCHOLARS* – ***Slides 14&15***
   i) **Expectations –** ***Slide 14***
      (1) Work together
      (2) Ask questions to the station supervisors

(3) Follow the timer, move quietly between stations, be efficient

ii) **The Activity – Review the following once as a group and then before the first case for each station**
(1) Station supervisor presents the group with the Chief Complaint and the relevant organ systems for them to brainstorm potential diseases / etiologies for the patient's complaint – start their DDx.
(2) Scholars will then use the "DDx Generator" worksheet to fill in as many potential diagnoses to account for the CC.
(3) Station supervisor then gives the relevant info from the "H and P."
(a) See if the scholars can cross off diagnoses, you may need to help them do this.
(4) Then station supervisor pulls up the scans.
(a) Let Scholars run the mouse over significant findings and step through how you, the MD, approach the scan with them.
(5) Then give the scholars the opportunity to justify the final diagnosis.
(6) Review the "DDx Generator Worksheet"
(a) Pass around the DDx Generator Sheet, read the instructions at the top out loud
(b) Make sure each scholar has at least 5 copies each
(7) Break everyone up into appropriate sized groups
(8) Start your timer!

c) ***The Stations – Slide #15***
i) ***To the presenter, assign station supervisors before the lesson so you can each become familiar with your cases prior to the lesson.

<u>Station #1 – Focusing on the Airway/Chest –</u>
Case #1 – Chief Complaint = Stridor in a 2.5y/o Male – **Slide #16**
OF NOTE TO PRESENTER – PLEASE DEFINE AND DEMONSTRATE STRIDOR
a. DDx – ENT –laryngomalacia, upper airway anatomical anomalies. ID: Croup, Upper airway congestion from a URI. Other: Foreign Body
b. H&P Key Findings – Started 3 days ago and has now gotten worse as now it is heard at rest. Sometimes with very barky sounding cough, also worsening in last day. Sibling at home also sick. Fever to 101.2 this morning. Normal physical exam except for audible stridor at rest.
c. Narrowed Differential – Croup v URI
i. Film - http://en.wikipedia.org/wiki/File:Croup_steeple_sign.jpg
ii. Dx - Croup

Case #2 – CC: Wheeze in a 3y/o Female
OF NOTE TO PRESENTER – PLEASE DEFINE AND DEMONSTRATE WHEEZE
-DDx – Pulm: Asthma, lung cyst. ID: PNA, Bronchiolitis, Bronchitis. Onc: Mediastinal mass. Other: Foreign Body

-H&P Key Findings – Started this morning with coughing and now wheezing is heard. She is not eating much and looks a little tired but breathing seems easy. Physical exam significant for body temperature of 99 and respiratory rate of 28 (both normal for age). When you listen to the lungs you hear scattered wheezing that is worse at bases of lungs. The rest of the exam is normal.
-Narrowed DDx - PNA v asthma
-Film: **Slide #17**
-Dx: Normal CXR consistent with Asthma

Please feel free to show this link to compare the CXR of an Asthmatic with that of a child with PNA – **Slide #18**
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=1&caseID=127&GBcaseid=&GBtopicID=100&GBsearchText=&GBsearchCriteria

Station #2 – Focusing on bones/trauma

Case #1 – CC: Lethargic male baby
-DDx: ID: Sepsis, UTI, PNA, Meningitis, Encephalitis. GI: Vomiting, hunger, dehydration. Other: ingestion of a poison. Musculoskeletal: Accidental trauma, non-accidental trauma.
-H&P Key Findings – A 19y/o woman brings in her newborn baby who she says all of a sudden seemed very sleepy. The mother says that when she left for work 4 hours ago, the baby was smiling and playful like always. Her babysitter who is a male friend was not home when the mother came home during her lunch break and found the baby in her crib with eyes open but appeared sleepy. She rushed to the ER out of concern the baby was very sick. The baby's vital signs are stable but the eye exam is significant for slow to react pupils. There are old appearing scars on the baby's torso and more fresh appearing scratches.
-Narrowed DDx: NAT v. Accidental Trauma v. Ingestion
-Films: - First = CT head, Second = Rib fractures
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=1&caseID=135&GBcaseid=&GBtopicID=104&GBsearchText=&GBsearchCriteria
AND
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=10&caseID=136&GBcaseid=136&GBtopicID=&GBsearchText=&GBsearchCriteria=
-Dx: NAT **Slide #19**

Case #2 – CC: Hand/Wrist Pain in a 8y/o Female Skateboarder
-DDx: Musculoskeletal: Broken wrist, Broken hand bone, sprained wrist, and muscle bruise.

-H&P Key Findings: Patient skateboarded in the park and fell on her outstretched hand. Immediately she noted swelling, pain and decreased ability to move her hand around.
-Narrowed DDx: Broken bone, sprain, bruise all still in DDx
-Film:
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=16&caseID=133&GBcaseid=&GBtopicID=103&GBsearchText=&GBsearchCriteria=
-Dx: Broken Wrist – **Slide #20**

Station #3 – Focusing on Abdominal Imaging

Case #1 – CC: Vomiting an a one month old male

-DDx: GI: Reflux, overfeeding, obstructions like (pyloric stenosis or duodenal atresia or Hirschsprung's or intussusception). Neuro: Mass causing vomiting. ID: Gastroenteritis.
-H&P Key Findings: Baby was always a fussy eater. At about 3 weeks of age he started to spit up more after each meal. Parents started to get really concerned in the last couple of days as the vomiting looks "projectile" and they are concerned the baby looks dehydrated. In the last week, the baby has not gained any weight. The vomit looks like the milk he drinks. Physical exam shows a fast heart rate and that the baby is a little dehydrated. When you push on the belly a small olive shaped mass is palpable above the belly button.
-Narrowed DDx: Pyloric Stenosis v Happy Spitting V Reflux.
-Films:
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=5&caseID=122&GBcaseid=&GBtopicID=101&GBsearchText=&GBsearchCriteria=
And
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=9&caseID=122&GBcaseid=&GBtopicID=101&GBsearchText=&GBsearchCriteria=
-Dx: Pyloric Stenosis – **Slide #21 and 22**

Case #2 – CC: 14y/o M with belly distension and fullness.

-DDx: GI: Constipation, Obstruction, Gas. ID: Gastroenteritis
-H&P Key Findings: For about a month or so the patient notes that his belly feels full and distended. He is not vomiting but sometimes his belly becomes painful with eating. His last bowel movement was 5 days ago and on detailed questioning it sounds like the stool was very hard and difficult to pass. His diet is mainly junk food and very few veggies. He is otherwise of normal height and weight. He has had two abdominal surgeries in the past, one for appendicitis and another for a hernia repair. On physical exam his vitals are normal and the only pertinent findings is a distended belly with mild pain on palpation throughout. His scars appear normal.

-Narrowed DDx: Constipation v Obstruction from prior surgeries
-Film - http://en.wikipedia.org/wiki/File:Constipation.JPG
-Dx: Constipation secondary to poor fiber intake – **Slide #23**

Station #4 – Focusing on imaging the head

NOTE TO PRESENTER…. PLEASE BE SURE TO REINFORCE TO THE SCHOLARS THAT WHILE BRAIN TUMORS HAPPEN, THEY ARE VERY RARE AND THUS NOT EVERY HEADACHE IS A TUMOR! REINFORCE ELEMENTS FROM THE H&P THAT MAKE US CONCERNED WITH TUMOR OVER BENIGN HEADACHES

Case #1 – CC: 4y/o Male with headache x 1 month.

-DDx: Neuro: Tension HA, Migraine HA, Other types of Headaches. Onc: Brain tumor. Cardiovascular: Aneurysm, Vasculitis. ID: Meningitis, encephalitis, sinusitis.
-H&P: This 4y/o male and father present to the ER and share that the boy is having practically daily headaches for the last month. The headaches have substantially worsened in the last week and now are waking him up from sleep. He occasionally vomits with the headaches. He does not complain of blurry vision, loss of balance or other neurological problems. His physical exam is completely normal except for the fact that the child looks a bit tired.
-Narrowed DDx: Brain tumor v Benign Headache
-Films:
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=2&caseID=1873&GBcaseid=&GBtopicID=104&GBsearchText=&GBsearchCriteria=

-Dx: Brain tumor **Slide #24 and 25**

Case #2: CC: 13y/o Female comes to the ER with a seizure

-DDx: ID: Meningitis, encephalitis. Other: Toxic ingestion. Neuro: Epilepsy, stroke. Cardiovascular: Aneurysm rupture. Oncology: Brain tumor
-H&P: This 13y/o F was previously well until this morning when she was in gym class she suddenly collapsed and started having convulsions. During her convulsions she bit her tongue and loss continence of her urine. She arrives to the ER very confused and lethargic but is not longer having seizures as the paramedics gave medicines to stop the seizures. Her physical exam is significant for a temperature of 100.2 and her other vitals are normal including her respiratory rate. She is responsive to pain but otherwise very out of it and sleepy. Her eyes are deviated to the right side. She does not know her name. The rest of her exam is normal. You put an oxygen mask on your patient and rush her to the radiology to image her head.
-Narrowed DDx – Same as above as the patient is unable to give much more history. You need imaging here ASAP to narrow your DDx and treat appropriately!

-Film -
https://www.cchs.net/pediatricradiology/imagegallery/default.asp?imageid=1&historyID=95&caseID=1873&GBcaseid=&GBtopicID=104&GBsearchText=&GBsearchCriteria=
-Dx – Brain Tumor **Slide #26**

5) Summarize the lesson.
Refer to your posted lesson objectives and perhaps ask some of the scholars to share one thing they have learned about medicine and or radiology today

6) Always leave time for student questions.

Name:_____ Station #_____ Case #_____

Differential Diagnosis (DDx) Generator

The following worksheet is your tool to help make your differential diagnoses as you go from station to station & case-to-case. This list will help you think about some of the common problems doctors think about before obtaining radiological imaging. If you don't know what a term means, please look it up online or ask your station supervisor for help.

ID: Pneumonia, Upper respiratory infection, Croup, Bronchitis, Bronchiolitis, Gastroenteritis, Meningitis, Encephalitis, Sepsis, Urinary tract infection, Sinusitis
GI: Appendicitis, Constipation, Hirschsprung's Disease, Pyloric Stenosis, Small Bowel Obstruction, Overfeeding, Dehydration, Duodenal Atresia, Happy Spitter, Reflux
ENT: Laryngomalacia, Tracheomalacia, Upper Airway Anatomical Anomaly
Pulmonary: Asthma, Lung Cyst
Neurology: Tension headache, Migraine headache, Brain Bleed, Epilepsy/Seizure
Cardiovascular: Aneurysm, Heart Failure, Vasculitis, Stroke
Oncology: Brain tumor, Chest/Mediastinal Mass
Musculoskeletal: Broken bone, Sprained tendon, Muscle Bruise
Other: Foreign body, Accidental Trauma, Non-accidental trauma (aka child abuse), Toxic Ingestion (i.e. poisons, drugs, alcohol)

Chief Complaint:	
DDx: Write in the potential causes for your patient's complaint. You can use the list above or add your own! Use your classmates and doctor / teachers for help!!!	ID: GI: ENT: Pulm: Neuro: CVS: Onc: MSK: Other:
Key Points from H&P:	
Narrowed DDx:	Circle possible diagnosis or add to list above
Image:	Key Finding:
Final Dx:	