## OVERVIEW

**BIG IDEA**
Many illnesses appear to have similar symptoms and no two people will experience an illness in exactly the same way; this often makes diagnosis a challenging process.

**OBJECTIVE**
**5.8:** Develop an evidence-based differential diagnosis for an illness.

**AGENDA**
1. What's this rash, Doc?
2. Medical Error & Horses vs. Zebras
3. What is Differential Diagnosis?
4. 8 Ways to Help Your Doctor Reading
5. Which Disease?

**HOMEWORK**
Choose an illness to research and create a differential diagnosis list with information on how to rule them out.

# LESSON **5.8**
# Differential Diagnosis

**SUMMARY:**

Students will learn the thinking process behind how doctors make a diagnosis in this lesson. First, students will consider the case of a rash, a common ailment that can be difficult to diagnose. Then they will learn about differential diagnosis and read about how patients can help doctors in the process. Finally, they will practice differential diagnosis by researching and identifying the distinguishing characteristics between heartburn and heart attack and influenza and gastroenteritis ("stomach flu").

**STANDARDS:**

**NHES 1.12.1:** Predict how healthy behaviors can affect health status.

# Differential Diagnosis

**Obj. 5.8:** Develop an evidence-based differential diagnosis for an illness.

## DO NOW — What's This Rash?

You are a nurse practitioner (NP) and a patient comes in to your clinic with a bright red, streaky, bumpy rash the size of a deck of cards on his right forearm. The patient reports that the rash itches intensely. He just got back from vacation in the Upper Peninsula of Michigan, where he spent time fishing, hiking, and hunting.

1. What possible diseases might this patient have?

2. How would you, as an NP, determine the right diagnosis?

3. You have narrowed down the possibilities to poison ivy, shingles, or an allergic reaction. Which diagnosis do you think is correct? Why?

4. What additional data would you need to be more certain?

## DISCUSS — Avoiding Medical Error

- How certain must a clinical health professional be before making a diagnosis?

- What are the potential consequences in the case of misdiagnosis?

## NEW INFO — What is a Differential Diagnosis?

**Differential diagnosis:** A systematic method of information gathering used by clinical health professionals to determine the cause of illness when multiple alternatives are possible; the process focuses on eliminating diseases that are suspected in order to arrive at the correct diagnosis with as much objective evidence as possible.

## DISCUSS — Horses or Zebras?

A common adage, *Occam's razor,* is taught in medical school. It states that *"When you hear hoofbeats, look for horses, not zebras."* How do you think this relates to differential diagnoses?

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**NOTE:** This lesson reverts back to a medical perspective, despite being located in a public health unit. Give students this heads up so that they are more aware of this brief detour. Also, emphasize the importance of seeing the great overlap in so many health professions.

**DO NOW:  Possible Answers:**
1. Some possibilities: poison ivy (correct diagnosis), allergic reaction, shingles, poison oak or sumac, psoriasis, contact dermatitis, etc.
2. Answers will vary. Encourage students to explain their thinking step-wise.
3. Answers will vary.
4. Students should discuss possible tests they could run, or additional symptomatic/history of illness information they could gather.

**DISCUSS:**
1. A health care practitioner would ideally like to be 100% certain, but this is not always possible. There are still a great deal of unknowns about medicine and the body. While we have come a long way in our ability to diagnose, especially with the aid of new diagnostic technologies and computers, errors still occur due to incomplete information, physician negligence and other causes.
2. Medical errors can lead to complications, injury/illness, and even death. Ask students if they have heard about any of these types of cases in the news. Many medical errors are not necessarily the result of misdiagnosis (ex: amputating the wrong limb (extreme), medication errors, etc.) but some errors certainly are.

**DISCUSS:**  Horses or Zebras? -- see pg. 3

**NEW INFO**

## Conducting the Differential Diagnosis

**How do healthcare providers do differential diagnosis?**
Generally, a health care provider will begin by considering the most common diagnosis first. For example, if a patient comes in with a stuffy nose and sore throat, the first thing you would suspect is a head cold, rather than meningitis, an inflammation of the protective membrane around the nervous system caused by a bacteria or virus. However, a step-wise process is important and should always be done even if the common cause is suspected.

### Steps in Differential Diagnosis
**Step 1.** Review the symptoms reported in the Subjective patient interview and the data already collected in the Objective portion of the patient visit (or from medical records).
**Step 2.** Create a list of all possible causes of the symptoms and objective data.
**Step 3.** Prioritize the list based on the most urgently dangerous conditions first.
**Step 4.** Rule out (if possible) the most dangerous conditions first by conducting tests. If not possible to rule out and safe treatment can be given, treat the patient for the most urgent conditions first.

*Steps applied to SOAP note process for patient case studies:*

| Assessment: | |
|---|---|
| **Summary** | **Step 1.** Review the symptoms reported in the Subjective patient interview and the data already collected in the Objective portion of the patient visit (or from medical records). |
| **Differential Diagnoses** | 1. **Step 2.** Create a list of all possible causes of symptoms and objective data *(in the real world, this will often be more than 3!)* <br> 2. **Step 3.** Prioritize the list based on the most urgently dangerous conditions first *(reassign numbers to keep track of priority)* <br> 3. **Step 4.** Rule out the most dangerous conditions first by conducting tests. *(Indicate your logical elimination process in the Reasoning section)* |
| **Final Diagnosis** | Claim: <br><br> Evidence: <br><br> Reasoning: |

**DISCUSS:** The idea is that even though med students learn about rare diseases, they should not always assume it's something less likely (statistically) than the obvious diagnosis. It is good to be prudent and rule out the dangerous/ urgent (even though rare) diseases, but not always practical when the cost vastly outweighs the likelihood. A good example of this is brain tumors and headaches. Occasionally patients will come in and ask for/demand a brain scan (MRI) for a headache they have had. In some cases this is the right call, but in most cases it is not. And the cost of this diagnostic test (both in money and in actual possibility for unnecessary and potentially harmful intervention) usually outweighs the infinitesimal chance it is a tumor.

**NEW INFO:** The differential diagnosis is the main portion of the Assessment process/ documentation in the SOAP note. If students have already tried out this process in prior cases (from previous modules) ask them what was challenging or difficult about this step?

**NEW INFO:** This is not necessarily the "gold standard" method of how a DD is done in practice, but it is a good approximation. In fact, many health practitioners have so much experience that they will conduct many of these steps in their head. But for students who have VERY limited medical knowledge and no experience, it is important to be more systematic.

**READ**

## 8 Ways to Help Your Health Care Professional

Read the article "8 Ways to Help Your Doctor Make the Right Diagnosis." In the table below, summarize why this tip will help lead increase a patient's chances of getting the right diagnosis.

| Way to Help | Why it may help lead to the right diagnosis |
|---|---|
| Plan for your appointment with specialists | |
| Write down each symptom | |
| Know your medical history | |
| Bring in your medications | |
| Describe your symptoms, but don't conclude | |
| Be specific about your symptoms | |
| Ask your health practitioner what to expect | |
| Question, question, question | |

**DISCUSS**

## How Do Patients Stack Up?

1. Which one of the tips do you think the average patient is **most likely** already doing when visiting a clinical health professional?

2. Which tip is the average patient **least likely** to be already doing?

**READ:** The article can be found as a PDF file in the lesson resources folder. Make a class set of copies for students to read during this part of the lesson.

## Which Disease?

**THINK**

Many illnesses can seem to be something else, confusing patients and sometimes even doctors. Often, delays in diagnosis result in more complications or even death. In the table below, write down the distinguishing features of each illness. Use credible sources online (ex: WebMD, CDC, NIH, MayoClinic) to find this information.

| Disease | Evidence (symptoms or tests) to help diagnose… |
|---------|------------------------------------------------|
| Heart Attack **VS.** Heartburn | |
| Influenza **VS.** Gastroenteritis ("stomach flu") | |

## Do You Know Your DD?

**ASSESS**

1. What is a differential diagnosis?

2. How does a clinical healthcare provider conduct a differential diagnosis?

## DD the Disease!

**HOME WORK**

Choose **any** disease, syndrome, condition, or illness you are interested in. Research the disease carefully so you know the symptoms, tests used to diagnose, and other illnesses that may be similar. On a separate sheet of paper, answer the following:

1) Describe the illness including it's symptoms and tests to diagnose
2) List at least 3 (or more) diseases that would be most likely to appear on a differential diagnosis list, in order or priority from most urgent or dangerous to least urgent or dangerous.
3) For each differential diagnosis option, write at least one way you could "rule it out" based on a symptom or, more preferably, a test.

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**THINK:**

Heart attack vs. Heartburn: http://www.mayoclinic.org/diseases-conditions/heartburn-gerd/in-depth/heartburn-gerd/art-20046483

Influenza vs. Gastroenteritis: http://www.webmd.com/cold-and-flu/flu-guide/stomach-flu-not-influenza

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**HOMEWORK:** The purpose of this homework assignment is to get students to continue practicing the differential diagnosis thinking process with an illness they are interested in.