Remote Learning in the Time of COVID-19

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Introduction
With the spread of SARS-CoV-2 in the U.S., medical schools across the nation have taken measures to protect the health and safety of their students. Notably, most schools have elected to suspend clinical experiences for medical students as the pandemic evolves. Many schools have demonstrated creativity and adaptability by developing online, non-clinical electives for their students to engage in. Here, we provide an easily implemented opportunity for remote clinical learning in the time of COVID-19 in the Emergency Department.

Remote Learning Process
This process affords students the opportunity to practice history taking, differential diagnosis, clinical reasoning, and patient management skills from a remote setting (Figure 1). A student will be assigned to a resident or attending and will be available by cell-phone, tablet, or other communication device when that physician is working. The resident or attending will contact the student prior to the shift and set a time period when a patient will be identified for the student to interview. Ideally, the student will also have remote access to the electronic medical record for chart review. Low volume or fast-track shifts likely will be most amenable to this scheme.

During the session, the student performs iterative differential diagnosis formulation, as described in other medical education schemes.1 The Clinical Reasoning and Differential Diagnosis Sheet (Figure 2) is a helpful tool to guide clinical reasoning. Figure 3 demonstrates a completed version based on a remote learning case regarding a 45-year-old healthy male presenting with 2 weeks of lower back pain with bilateral sciatica after an episode of heavy lifting and with a recent history of rollover motor vehicle collision.

At the end of the remote session, the physician and student should review concepts learned during the session and provide feedback. Assessment and teaching of clinical reasoning can be integrated into the case presentation through clinician verbalization of their own thought process.2

**Figure 1.** Remote Learning Instructions.

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Conclusion
As the pandemic continues to evolve, identifying and implementing opportunities to provide some form of clinical continuity and education for medical school learners will be of high value. This simple scheme provides for real-world case practice from a remote setting in the current (and likely recurrent) event that learners are not permitted in the direct clinical environment. In a time demanding adaptability and creativity, we believe this process offers a reasonable model of clinical learning and a valuable engagement for learners.

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Clinical Reasoning and Differential Diagnosis Worksheet

Directions
1. Write down the top 3-5 diagnoses starting with the most likely diagnosis
2. List findings that support this hypothesis
3. List findings that oppose this hypothesis
4. List findings that would be expected if the hypothesis-at-hand were true but which were not encountered in the case
5. Return to your differential list, and reorder the alternative hypotheses if the first hypothesis proved to be incorrect

| Diagnosis       | Findings supporting | Findings opposing | Findings that would be expected but not seen |
|-----------------|---------------------|-------------------|--------------------------------------------|
| Diagnosis 1:    |                     |                   |                                            |
| Diagnosis 2:    |                     |                   |                                            |
| Diagnosis 3:    |                     |                   |                                            |
| Diagnosis 4:    |                     |                   |                                            |
| Diagnosis 5:    |                     |                   |                                            |

Ask faculty for feedback (i.e., strengths, areas for improvement)

What is one concept you learned?
What might you do differently next time?

Figure 2. Clinical Reasoning and Differential Diagnosis Worksheet. Adapted from Mamede et al.³
| Diagnosis          | Findings supporting                                           | Findings opposing                        | Findings that would be expected but not seen                     |
|--------------------|--------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------|
| **Diagnosis 1:**   |                                                             |                                          |                                                                 |
| Disc herniation    | - History of trauma                                         |                                          | - Report of possible paresthesia in saddle region               |
|                    | - Pain worse with physical activity and sitting down        |                                          | - Bilateral symptoms less common                                |
|                    | - Sciatica; straight and cross-leg tests positive bilaterally|                                          |                                                                 |
|                    |                                                             |                                          | - Expected findings were observed                               |
| **Diagnosis 2:**   |                                                             |                                          |                                                                 |
| Fracture           | - History of trauma                                         |                                          | - Lack of point tenderness                                      |
|                    | - Pain worse with physical activity                         |                                          | - Point tenderness over spinous process                         |
|                    |                                                             |                                          | - History of steroid use                                        |
| **Diagnosis 3:**   |                                                             |                                          |                                                                 |
| Cauda Equina       | - Lower back pain and bilateral lower extremity sciatica    | - Normal neuro exam                       | - Bowel/bladder incontinence or retention                      |
|                    | - Report of possible paresthesia in saddle region           |                                          | - Saddle anesthesia                                             |
|                    |                                                             |                                          | - Lower extremity weakness                                      |
| **Diagnosis 4:**   |                                                             |                                          |                                                                 |
| Epidural Abscess   | - Lower back pain and bilateral lower extremity sciatica    | - Afebrile                                | - Fever, point tenderness                                       |
|                    |                                                             |                                          | - History of intravenous drug abuse, diabetes, signs of distal infection, or immunocompromise |
| **Diagnosis 5:**   |                                                             |                                          |                                                                 |
| Aortic Dissection  | - Age                                                       | - Normal neuro exam                       | - History of hypertension, connective tissue disease            |
|                    | - History of trauma                                         |                                          | - Pulse, blood pressure differences in extremities              |
|                    |                                                             |                                          |                                                                 |

*Ask faculty for feedback (i.e., strengths, areas for improvement) – focused on “serious” causes of back pain which are important to rule out; work on also identifying more of the most common causes.*

**What is one concept you learned?** These patients benefit from early multi-modal pain control including an NSAID, acetaminophen, and a muscle relaxant.

**What might you do differently next time?** I need to remember to ask for/perform a full lower extremity neuro exam for these patients including reflexes and thorough sensory exam.

**Figure 3.** Example of a completed Clinical Reasoning and Differential Diagnosis Worksheet.