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**Title**

Using Mimics to Teach about the Diagnostic Process

**Running Title**

Medical Mimics

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## Pullouts:

"While many teaching cases offer key learning points, cases of 'medical mimicry' hold a special place as highly valuable."

"When placed side by side, the key differences between the monarch and viceroy butterfly become clear."

"To be aware of medical mimics is to combat cognitive biases and embrace the fluid nature of the diagnostic process."

### ***Using Mimics to Teach about the Diagnostic Process***

Developing the ability to evaluate a patient and build a differential diagnosis is essential for the education of any medical trainee. It is a process that often begins early in medical school and continues throughout residency training and beyond. Diagnosis is both an art and a skill. As medical research and new technologies have propelled our collective knowledge beyond what

any individual can master, the diagnostic process has grown in complexity. In turn, medical educators must seek creative strategies to teach both cognitive and physical skills in diagnosis.<sup>1</sup>

Case conferences such as “morning report” and “morbidity and mortality” represent a classic forum for medical students and postgraduate trainees to review both common and rarely encountered diseases, as well as to interact and learn from each other. Purposeful selection of cases can serve as excellent opportunities for trainees to simulate the diagnostic process in a safe classroom environment. While many teaching cases offer key learning points, cases of “medical mimicry” hold a special place as highly valuable. Though these challenging cases can push even distinguished diagnosticians out of their comfort zone, they can also be used as vehicles to guide medical trainees through complex diagnostic processes.

There are countless examples of diseases mimicking each other in the medical literature. Medical mimicry is difficult to define exactly, but a guiding principal is that the mimicking disease often presents with many nonspecific symptoms but does share several identifiable characteristics with the model disease, making it difficult for even an experienced clinician to distinguish between the mimic and model on first evaluation.<sup>2</sup> Perhaps the most recognized medical mimic is syphilis, but there are many others, including Lyme disease, multiple sclerosis and systemic lupus erythematosus.<sup>2</sup> In many cases, with further investigation, the clinician will uncover important clinical differences if the correct diagnostic tests are performed. For trainees, medical mimics are challenging because they may be rare diseases that they have never encountered in practice or common diseases that present atypically. Further, medical mimics may potentiate a number of cognitive biases that can lead to misdiagnosis in a complex case, in particular, anchoring, premature closure, and diagnostic momentum.<sup>3</sup> Because of these challenges, medical mimics serve as an excellent teaching tool for trainees to explore both the challenges of the diagnostic process and also strategies to overcome common cognitive pitfalls. To develop the medical mimic case conference, we drew inspiration from a classic example from evolutionary biology: the monarch (model) and viceroy (mimic) butterflies.<sup>4</sup>

While indistinguishable at first glance, when placed side by side, the key differences between the monarch and viceroy butterfly become clear (Figure 1). The viceroy has a notable black line

on the hindwing that is absent in the monarch. They also tend to have a smaller wingspan than monarchs. In a study with human observers and images of mimicking insects, the participants were able to better distinguish between mimics over time by focusing on specific distinguishing traits (e.g. size or shape).<sup>5</sup> When specific differences were identified, those lessons carried over into testing when all traits were present. We believe mimicking diseases can be better distinguished by comparing them side by side and focusing on key distinguishing clinical features. This exercise has the potential to help medical trainees make the diagnosis in complex cases (Figure 2).

We presented a case of a middle-aged gentleman with progressive weakness and sensory loss of his lower extremities. The initial diagnostic studies, including electromyography and nerve conduction studies, supported the diagnosis of chronic idiopathic demyelinating polyneuropathy (CIDP). Despite appropriate therapy, the patient's condition worsened. Eventually, after multiple diagnostic tests during several hospital admissions, he was found to have a bony lesion in his hip, prompting the evaluation of a vascular endothelial growth factor (VEGF) level and the correct diagnosis of polyneuropathy, organomegaly, endocrinopathy, monoclonal protein, skin changes (POEMS) syndrome. The case highlighted a prolonged course of treatment with no response (a warning sign for medical mimicry) and the specific characteristics of POEMS syndrome, which were framed against the alternate diagnosis. Side by side, the distinguishing features of the mimic and model disease emerged more clearly than when presented alone.

A consequence of introducing students and trainees to the concept of mimicry is the simple recognition that mimics exist not just in nature but in the healthcare environment, as well. To be aware of medical mimics is to combat cognitive biases and embrace the fluid nature of the diagnostic process. These are valuable skills that will help trainees find clues amongst the growing lists of signs, symptoms, and tests that will point to what truly ails their patients.

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Photo 1.



Fritillary butterfly on Arizona trail

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This photo was taken by author Ettleson, who provides permission for its use to the Clinical Teacher staff for publication.

Author

Figure 1.



The monarch and viceroy butterflies side by side

Permissions:

Monarch: Kenneth Dwain Harrelson

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[https://commons.wikimedia.org/wiki/File:Monarch\\_In\\_May.jpg](https://commons.wikimedia.org/wiki/File:Monarch_In_May.jpg)

Viceroy: Benny Mazur

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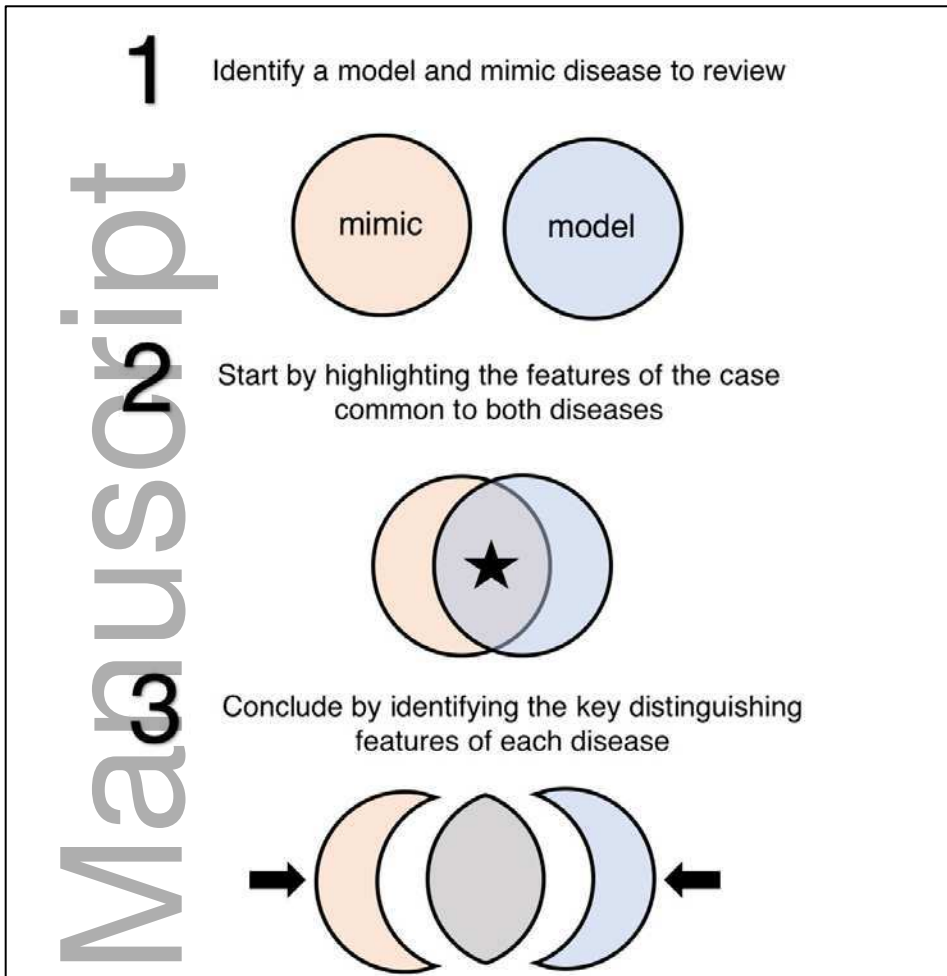
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Changes:

The background of each image was removed using Microsoft Powerpoint and the dividing line and text were added below each image to clearly delineate the two butterflies.

Figure 2.

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Three steps to creating a medical mimic case conference.





Monarch Butterfly

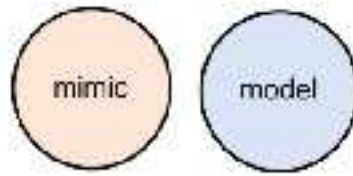


Viceroy Butterfly

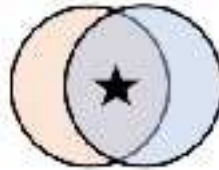
tct\_13039\_f1.jpg

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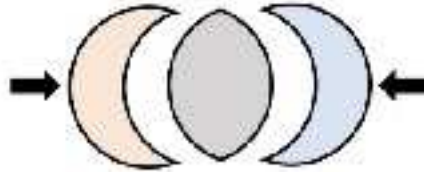
**1** Identify a model and mimic disease to review



**2** Start by highlighting the features of the case common to both diseases



**3** Conclude by identifying the key distinguishing features of each disease



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