After determining that a diagnostic test accuracy study design is methodologically sound/valid we then assess its results. Many students and residents want to jump to the results and ignore the critical appraisal step. It's important to teach them that a biased study will likely give biased results.

We need to determine what the results are and if they are important. How important the results are is a matter of judgment and will not be discussed further. The results of diagnostic test accuracy studies are most commonly sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and likelihood ratios (LRs). There are a few other outcomes like area under the ROC curve and diagnostic odds ratios that we won't discuss further.

**Teaching note:** most of the calculations that are discussed in this module never need to be made clinically as the authors of the studies will report them. Thus, it's more important to teach how to interpret them and use them. Clinicians do need to know how to calculate posttest probability using the results of a diagnostic test accuracy study but this is done using posttest probability calculators available on the web and in various apps (see the end of the lecture notes for more about this). Unfortunately few clinicians do this as they assume all positive tests mean disease and all negative tests mean absence of disease. Hopefully after this module you will teach them this isn’t the case.

Try to answer these questions as you work through this module:

- What effect does changing the cutoff for a positive test have on its test characteristics?
How do likelihood ratios differ from sensitivity and specificity?

How does prevalence (or pretest probability) impact the calculation of predictive value (post-test probability)?

**Diagnostic Test Characteristics: Sensitivity, Specificity & Likelihood Ratios**

- **Lecture notes:** read pages 1-3 of these lecture notes to get an overview of how to calculate and interpret sensitivity, specificity, and likelihood ratios.

- **Videos:** watch these videos for an overview of how to calculate and interpret sensitivity, specificity, and likelihood ratios.
  - How to calculate sensitivity (3:51)
  - How to calculate specificity (3:27)
  - The tradeoff between sensitivity and specificity (12:35)
  - What are likelihood ratios and how are they used (10:10)
  - How to calculate a positive likelihood ratio (2:51)
  - How to calculate a negative likelihood ratio (2:45)

- **Readings:** read these for an overview of how to calculate and interpret sensitivity, specificity, and likelihood ratios.
  - Users’ Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice, 3rd ed: Chapter 18 Diagnostic Tests
  - Fletcher Chapter 8, pages 108-117, 122-125
  - Test Properties 1: Sensitivity, Specificity, and Predictive Values
  - Test Properties 2: Likelihood Ratios (just read the LR section)
  - Tips for Teachers of Evidence-based Medicine: Making Sense of Diagnostic Test Results Using Likelihood Ratios
Diagnostic Test Characteristics: Post-test Probability

- **Lecture notes:** read pages 3-5 of these [lecture notes](#) to get an overview of how to calculate and interpret post-test probability.

- **Videos:** watch these videos for an overview of how to calculate and interpret post-test probability.
  - [How to calculate positive predictive value](#) (3:34)
  - [How to calculate negative predictive value](#) (4:23)
  - [Predictive Value Estimates From Studies Can Be Misleading](#) (9:44)

- **Readings:** read these for an overview of how to calculate and interpret post-test probability.
  - Users’ Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice, 3rd ed: **Chapter 18 Diagnostic Tests**
  - Fletcher Chapter 8, pages 117-122
  - [Positive and Negative Predictive Value](#)
  - EXTRA READING in case you were wondering how to estimate pretest probability: [Tips for Teachers of Evidence-based Medicine: Clinical Prediction Rules (CPRs) and Estimating Pretest Probability](#)

Problem set: work through these problems to practice making these calculations. I have organized them to get progressively more difficult to make the calculations. Feel free to use these with your students.

- [Problem set](#)
- [Problem set with solutions](#)

Prognostic Study Outcomes

- **Lecture notes:** read pages 5-8 of these [lecture notes](#) to get an overview of the outcomes of prognostic studies.
• **Videos:** watch this video for an overview of how to interpret hazard ratios and survival curves.
  
  • [Interpreting hazard ratios](#) (5:00)- also discusses how to interpret a survival curve

• **Readings:** read these for an overview of prognostic studies and how to interpret survival curves.
  
  • [Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice, 3rd ed:](#) *Chapter 20 Prognosis*
  
  • Fletcher chapter 7 (through to case series on page 101)
  
  • [Survival Curves: The Basics]
  
  • [A practical guideline to understanding Kaplan-Meier curves](#) (a little more advanced than the [basics article](#))