July 13, 2021

Agenda

- *Why Pre-Test Probability Matters*
- Case Discussions
- Open Discussion

		TRUTH	
		+	-
TEST	+		
	-		

		TRUTH	
		+	-
TEST	+	True Positive	
	-		

		TRUTH	
		+	-
TEST	+	True Positive	
	-		True Negative

		TRUTH	
		+	-
TEST	+	True Positive	
	-	False Negative	True Negative

		TRUTH	
		+	-
TEST	+	True Positive	False Positive
	-	False Negative	True Negative

		TRUTH	
		+	-
TEST	+	A	C
	-	B	D

Sensitivity

Probability that a test will be POSITIVE if the patient is truly POSITIVE

True positives/All real positives

or

A/A+B

		TRUTH	
		+	-
TEST	+	A	C
	-	B	D

Specificity

Probability that a test will be NEGATIVE if the patient is truly NEGATIVE

True Negatives/All real Negatives
Or

D/D+C

		TRUTH	
		+	-
TEST	+	A	C
	-	B	D

Positive Predictive Value

Probability that a patient with a POSITIVE test is truly POSITIVE

A/A+C

		TRUTH	
		+	-
TEST	+	A	C
	-	B	D

Negative Predictive Value

Probability that a patient with a NEGATIVE test is truly NEGATIVE

D/D+B

		TRUTH	
		+	-
TEST	+	A	C
	-	B	D

But what's that about pre-test

- Sensitivity and Specificity are all about the test characteristics

- But PPV and NPV depend on the test characteristics and the population prevalence!

An Example

POSITIVE PREGNANCY TEST in a cisgender MAN

Cisgender man presents to the ED with abdominal pain and the ED abdominal pain order-set is initiated. The patient's pregnancy test comes back POSITIVE. How do I interpret this?

Population prevalence: 0%

The test must be a FALSE POSITIVE

		TRUTH	
		+	-
TEST	+	0	X
	-		

An (COVID) Example

Probability that a patient with a POSITIVE test is truly POSITIVE

ce: 15%

		TRUTH	
		+	-
TEST	+	144	3
	-	6	847

PPV = A/A+C = 144/(144+3)

PPV = 98%

An (COVID) Example

SARS-CoV-2 Test
Sensitivity 96%
Specificity 99.6%

1000 people tested
Population prevalence: 3%

		TRUTH	
		+	-
TEST	+	29	4
	-	1	966

PPV = A/A+C = 29/(29+4)
PPV = 88%

FINAL EXAM

PPV of 88% (Sens 96%, Spec 99.6%, Prevalence 3%)

You do 1 million tests and 32,680 come back positive. How many of those were false positives?

		TRUTH	
		+	-
TEST	+	A	C
	-		

32,680

0.88= A/32,680

A = 28,758

C = 3,922

~4K False Positives

PPV = A/A+C

Take Aways

- All this to say, no test is perfect
- Population prevalence matters
- The lower pre-test probability, the more FALSE POSITIVES you will see
- This is a big problem for SARS-CoV-2 testing, especially asymptomatic
- This is a HUGE simplification - there are several other factors that influence pre-test probability too (symptoms, risk factors, etc.)