

Research 101 Michael Prats, MD S@PratsEM

SAENA RLS RESEARCH LEARNING SERIES

COI

Butterfly Network

Medmastery

Gulfcoast Ultrasound Institute





Research

Where? Which? How?



Literature Search

EMBASE

Indexed Databases











Types of Studies



Created by Dan Kim 🔰 @dan kim



Types of Studies





Observational Studies

Cross Sectional

Distribution of variables in a specific sample

Cohort

Identifying a group and following over time

Case Control

Starts with outcome of interest, compares those with to those without





Trials

Adding an intervention





Clinical Trials

Control Blinding Randomization



Eliminate Confounders



Statistics





Variables

Dependent – expected to change based on another variable

Independent – not expected to change





Variables



		Actual Value		
		Positive Disease	Negative Disease	
Teet	Positive Test	True Positive	False Positive	
Test	Negative Test	False Negative	True Negative	

Sensitivity =	TP/(TP	+ FN)
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Specificity = TN/(TN + FP)

		Actual Value	
		Positive Disease	Negative Disease
Teot	Positive Test	True Positive	False Positive
Test	Negative Test	False Negative	True Negative

Sensitivity Specificity



Specificity = TN/(TN + FP)

PPV = TP/(TP + FP)

NPV = TN/(TN + FN)

		Actual		
		Positive Disease	Negative Disease	
Taat	Positive Test	True Positive	False Positive	PPV
Test	Negative Test	False Negative	True Negative	NPV

Sensitivity Specificity

Predictive Values

- Tied to the disease **prevalence**
- When prevalence is very high \rightarrow high PPV. When low \rightarrow high NPV

Sensitivity and Specificity are <u>test centered</u>

• Tell you whether the **test** will be positive given that the patient has or does not have disease



Likelihood Ratios are disease centered

• Tell you the likelihood of disease given a positive or negative test



Number Needed to Treat (NNT)

• NNT = 1/ARR

ARR = Absolute Risk Reduction = Control Event Rate (CER) – Experimental Event Rate (EER)

ARR = FN/(FN + TN) - TP/(TP + FP)

NNH = 1/Attributable Risk





Number Needed to Treat (NNT)

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ARR = Absolute Risk Reduction = Control Event Rate (CER) – Experimental Event Rate (EER)

ARR = FN/(FN + TN) - TP/(TP + FP)

NNH = 1/Attributable Risk

You have 20 people playing the lottery. Chat \rightarrow 1/10 lose Bird-cebo \rightarrow 5/10 lose

ARR = 0.5 - 0.1 = 0.4 NNT = 1/0.4 = 2.5

For every 2.5 people you give a chat, you avoid 1 losing the lottery



	Value	Actua			Equation	Test
	Nagativa	Docitivo			TP/(TP + FN)	Sensitivity
	Disease	Disease	Dis		TN/(TN + FP)	Specificity
					TN/(TN + FN)	NPV
	False	True	Desitive Test	Test	TP/(TP + FP)	PPV
PPV	Positive	Positive	Positive lest		sens / (100 –	+LR
	Truo	Falso	Nogotivo		spec)	
NPV	Negative	Negative	Test		(100 – sens) / spec	-LR
ty	Specificit	Sensitivity			1/ARR	NNT

P Values

Null hypothesis = no difference between groups

P value is the probability that you get the result observed assuming the null hypothesis is true

Low p values mean that there is a very low chance that the result could have occurred if there was no difference between the groups → a true difference is therefore likely

P value of 0.05 is used commonly but is somewhat arbitrary



Summary of Main Points

- 1. Observational studies (cross sectional, cohort, case control) do not have an intervention
- 2. Control, blinding, and randomization eliminate confounders
- 3. Categorical variables can be ordinal (order implied) or nominal (no order)
- 4. Sensitivity cares about positive disease \rightarrow TP/(TP + FN)
- 5. Specificity cares about negative disease $\rightarrow TN/(TN + FP)$





Thank You

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