ITHACA COLLEGE
Department of Exercise and Sport Sciences

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Clinical Reasoning & Research Evidence: How Good Decisions are Really Made

Treatment: Deciding what we should recommend to the patient

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Read not to contradict and confute, nor to believe and take for granted...but to weigh and consider

- Francis Bacon (1561-1626)

We all know that you can prove anything with statistics…

…I recently proved that nobody likes statistics, except a few professors

- Chottiner (1990)

The math of ***Therapy*** using a probabilities approach…

Relative Risk:

Therapy:

Relative Risk (RR): I. Rate of Event in Exposed vs. Unexposed

		Outcome		
		+	−	Totals
Treated	YES	A	B	A + B
	NO	C	D	C + D

Therapy:

Relative CHANCE: Rate of "getting better" in treated group compared to untreated group

		Outcome		
		+	−	Totals
Treated	YES	A	B	A + B
	NO	C	D	C + D

Therapy:

Relative CHANCE: Rate of "getting better" in treated group compared to untreated group

Outcome

Treated	RTP	NO RTP	Totals
	A	B	A + B
	C	D	C + D

Therapy:

Relative CHANCE:

Some people who were treated got better

Outcome

Treated	RTP	NO RTP	Totals
	A	B	A + B
	C	D	C + D

Some people who were not treated got better

Therapy:

Relative CHANCE: Rate of "getting better" in treated group compared to untreated group

Outcome

Treated	RTP	NO RTP	Totals
	A	B	12
	C	D	12

$$\text{Relative Chance of Getting better} = \frac{[A / (A+B)]}{[C / (C+D)]} = \frac{\text{Incidence Rate}_{EXP}}{\text{Incidence Rate}_{UNEXP}}$$

Therapy:

Relative CHANCE: Rate of "getting better" in treated group compared to untreated group

Outcome

Treated	RTP	NO RTP	Totals
	10	2	12
	5	7	12

$$\text{Relative Chance of Getting better} = \frac{[A / (A+B)]}{[C / (C+D)]} = \frac{10/12}{5/12} = 2.0$$

Therapy:

Relative CHANCE: Rate of "getting better" in treated group compared to untreated group

Outcome

Treated	RTP	NO RTP	Totals
	10	2	12
	5	7	12

$$\text{Relative Chance of Getting better} = \frac{[A / (A+B)]}{[C / (C+D)]} = \frac{10/12}{5/12} =$$ **2x the chance of RTP with Magic Pill**

Relative Risk: RELATIVE CHANCE = 2.0

2x rate of RTP with magic pill

Relative Risk: RELATIVE CHANCE = 2.0
2x rate of RTP with magic pill

Relative Risk Increase:

Therapy:

Relative Risk Increase: How much of an increased chance of RTP with MP compared to no MP

Outcome

	RTP	NO RTP	Totals
Treated	10	2	12
	5	7	12

Therapy:

Relative CHANCE IMPROVEMENT: How much of an increased chance of RTP with MP compared to no MP

Outcome

	RTP	NO RTP	Totals
Treated	10	2	12
	5	7	12

Relative Chance of Getting better with MP compared no MP $= \frac{[A / (A+B)] - [C/ (C+D)]}{[A / (A + B)]} = \frac{.83 - .41}{.83} = .50$

Therapy:

Relative CHANCE IMPROVEMENT: How much of an increased chance of RTP with MP compared to no MP

Outcome

	RTP	NO RTP	Totals
Treated	10	2	12
	5	7	12

Relative Chance of Getting better with MP compared no MP $= \frac{[A / (A+B)] - [C/ (C+D)]}{[A / (A + B)]}$ **50% better chance of RTP with MP compared to no MP**

Relative Risk: RELATIVE CHANCE = 2.0
2x rate of RTP with magic pill

Relative Risk Increase: RELATIVE CHANCE IMPROVEMENT = .50
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Absolute Risk Increase:

Therapy:

Absolute Risk Increase: Difference in Chance of getting "better" with Treatment compared to no treatment

Outcome

Treated	RTP	NO RTP	Totals
	10	2	12
	5	7	12

Therapy:

Absolute CHANCE IMPROVEMENT:
Difference in chance of RTP with with MP compared to no MP

Outcome

Treated	RTP	NO RTP	Totals
	10	2	12
	5	7	12

Therapy:

Absolute CHANCE IMPROVEMENT:
Difference in chance of RTP with with MP compared to no MP

Outcome

Treated	RTP	NO RTP	Totals
	10	2	12
	5	7	12

Difference in Chance of Getting better with MP compared no MP = [A / (A +B)] – [C/ (C+D)] = .83 - .41 = .42

Therapy:

Absolute CHANCE IMPROVEMENT:
Difference in chance of RTP with with MP compared to no MP

Outcome

Treated	RTP	NO RTP	Totals
	10	2	12
	5	7	12

Difference in Chance of Getting better with MP compared no MP = [A / (A +B)] – [C/ (C+D)] = 42% Difference in RTP rates between MP & no MP

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2x rate of RTP with magic pill

Relative Risk Increase: RELATIVE CHANCE IMPROVEMENT = .50
50% increased chance of RTP with magic pill compared to no magic pill

Absolute Risk Increase: ABSOLUTE CHANCE IMPROVEMENT = .42
Chance of RTP increases by 42% with magic pill

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Numbers Needed to Treat to Benefit: =

Therapy:

Numbers need to Treat to Benefit (NNTB): How many do we need to intervene on to see 1 person "get better"?

How many resources will be used to get 1 RTP?

$$\text{NNTB} = \frac{1}{\text{Absolute Chance Improvement}}$$

Therapy:

Numbers need to Treat to Benefit (NNTB): How many do we need to intervene on to see 1 person "get better"?

How many resources will be used to get 1 RTP?

$$\text{NNTB} = \frac{1}{\text{Absolute Chance Improvement}} = \frac{1}{.42} = 2.4 \approx 3$$

Therapy:

Numbers need to Treat to Benefit (NNTB): How many do we need to intervene on to see 1 person "get better"?

How many resources will be used to get 1 RTP?

$$\text{NNTB} = \frac{1}{\text{Absolute Chance Improvement}} = \text{If we give 3 people the MP, 1 will RTP}$$

The BEST NNTB: 1 (It takes 1 person taking a MP to Return 1 person to play)

The WORST NNTB: ∞ (It takes an infinite number of MP treatments to Return 1 to play)

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Numbers Needed to Treat to Benefit: = 2.4 ≈ 3
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These are the treatment effects in an ideal situation, without taking the patient into account…

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Numbers Needed to Treat to Benefit: = 2.4.
If we give 3 people the magic pill, 1 will RTP

These are the treatment effects in an ideal situation, without taking the patient into account…
What shifts these probabilities?

Treatment: Deciding what we should Recommend to the Patient

An Evidence-Based Approach

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An Evidence-Based Approach

Novice vs. Expert *on that particular diagnosis*

What do you know about…?

…the **Diagnosis / Injury**

…the **Patient's Population** to which they belong (age, sex, etc.)

…the **Patient** (knowledge, attitude, culture (sporting or ethnic), previous experience with this injury, previous experience with any injury, patient's activities & activity limitations, patient's participation restrictions, etc.

…typical **Rehabilitation Protocols** for that injury

…typical **Prognosis** (Time & Event Outcomes), even after appropriate treatment

Internal Evidence

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Internal Evidence

Where the Internal Evidence is lacking, you must either:
- Ask more questions of your patient
- Go to the External Evidence **(Best Available Research)**

Treatment: Deciding what we should Recommend to the Patient

Critical Appraisal of the Methods
Bias (internal validity)
Generalizability (external validity)

Critical Appraisal of the Results
Results with continuous data: ES & CIs (or similar)
Results with dichotomous events data: Odds, Risk, & CIs (or similar)

Internal Evidence

External Evidence

For the Best Available Evidence & Critical Appraisal of the Methods & Results:

Are the results Meaningful?
- Probability shift that is ***substantial*** (based on research, clinically-oriented and/or patient-oriented results)
- Are the results Valid? Little chance of bias in the way the study was conducted
- Are the results likely to apply to My Patient? Generalizability AND…

PATIENT VALUES

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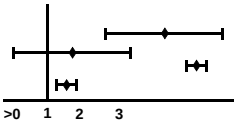
External Evidence



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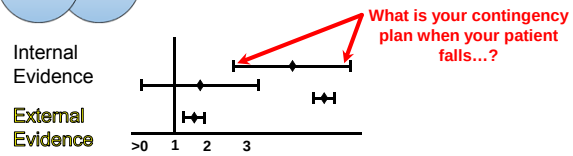

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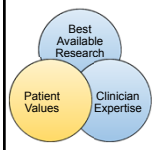

Often described as "What the Patient wants…"
This is OK, but may be a limited view

The Clinician has to consider:

- What is the patient willing to do?
- What is the patient willing to do *properly*?
- What is the patient willing to *continue to do*?

Adherence
Fidelity
Compliance

The answers to these will be filtered through the lens of the items you determined important based on Internal/External evidence

How do the answers to *these* questions SHIFT the probability of successful outcomes based on what the *Clinician Knows (Internal evidence)* or what the *Research Says (External evidence)*?

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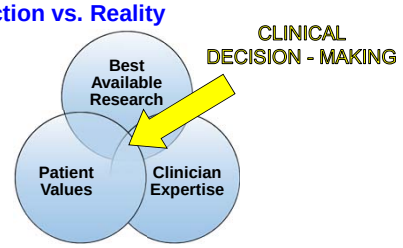
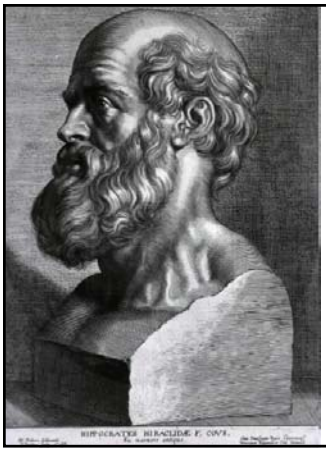
An Evidence-Based Approach

Prediction vs. Reality



Treatment is an ever-shifting paradigm, continual re-examination & re-weighting of what "should" happen & what "could" happen is necessary



It is more important to know what sort of person has a disease than what sort of disease a person has.

-Hippocrates

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