Clinical Reasoning

Color Index	IMPORTANT	NOTES	GOLD	EXTRA

OBJECTIVES

- Diagnostic Strategies in Clinical Practice
  - Hospital vs family practice
  - Hypothetico-deductive model
- Why Order a test? a diagnostic test?
- Sources of error in the diagnostic process
- Test characteristics: sensitivity, specificity, likelihood ratios.

DONE BY

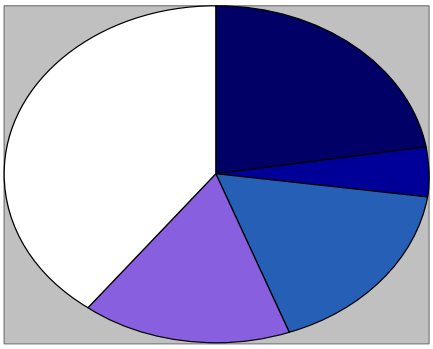
Team Leader	
Members	
Revise	
Sources	Dr's Slides. Fraser's Clinical Method. Norman's research in clinical reasoning.

Introduction

Pattern of illness : hospital vs community

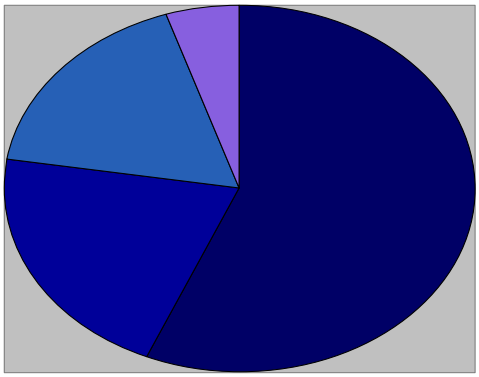
Exp : Contrasting Causes of Chest Pain

General Practice



Cardiac
Neurosis
Alimentary
Respiratory
Musculoskeletal

Hospital



Cardiac
Alimentary
Card & Alim.
Nil found

WHY ?

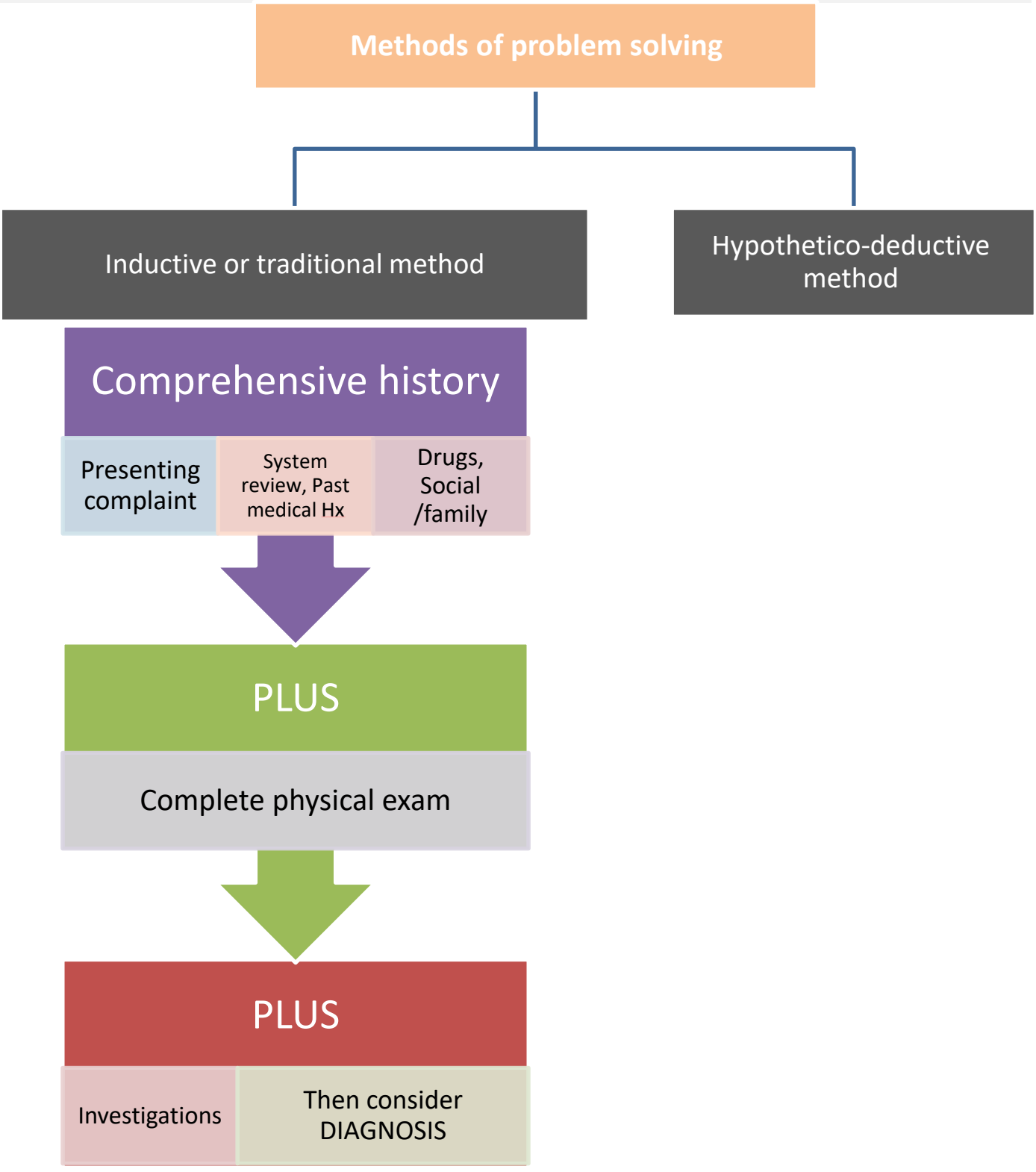
- Undifferentiated & unorganized illness
- No prior assumptions
- Information on which to base a precise diagnosis is lacking- early presentation
- Direct availability of physicians & unpredictable workload
- Doctor-patient relationship-

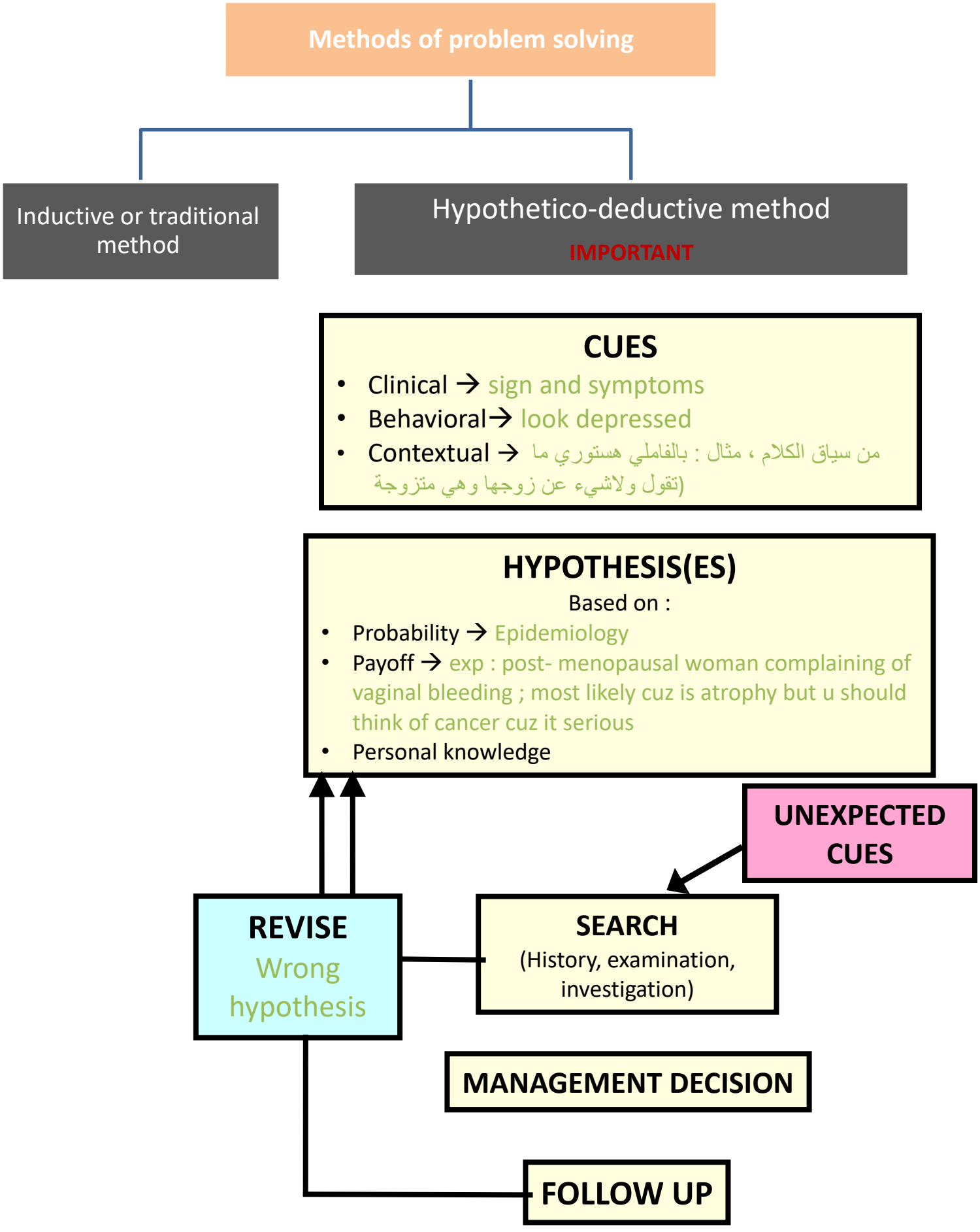
3 Stages of Problem Solving

1. Identify the problem clearly.
2. Generate as many solutions as possible:
   - do not reject a solution at this stage, however preposterous it sounds.
3. Take **STEP**s toward solving the problem:
   c) **S**elect a solution.
   d) **T**ry it out.
   e) **E**valuate what happens.
   f) **P**ersist until you feel better.

Diagnostic Strategies in Clinical Practice

- Pattern recognition (20%)
- Arborization (multiple branching)
- Inductive: Exhaustive exploration of data.
- Hypthetico-deductive (Important)
- Computer-assisted




Methods of problem solving
Inductive or traditional method
Hypothetico-deductive method
IMPORTANT
CUES
Clinical → sign and symptoms
Behavioral→ look depressed
Contextual → من سياق الكلام ، مثال : بالفاملي هستوري ما تقول ولاشيء عن زوجها وهي متزوجة)
HYPOTHESIS(ES)
Based on :
Probability → Epidemiology
Payoff → exp : post- menopausal woman complaining of vaginal bleeding ; most likely cuz is atrophy but u should think of cancer cuz it serious
Personal knowledge
UNEXPECTED CUES
REVISE
Wrong hypothesis
SEARCH
(History, examination, investigation)
MANAGEMENT DECISION
FOLLOW UP

Examples

Case 1 :

A 61-year-old widow presents with a history of 'wetting herself' for the previous 5 days because she 'can't get to the toilet on time'. She had felt 'perfectly well' prior to the onset of her present symptomatology. Her medical records reveal she has no history of significant illness and that she is an infrequent attender.

Cues: widow, witting herself , infrequent attender

Hypothesis : UTI , Incontinence , prolapse, DM , neurologic

Search:

- ask specific question for UTI → dysuria , prolapse → plugging
- incontinence and prolapse is less likely because it's acute
- specific examination → vaginal
- specific investigation → dipstick

Case 2 :

A 32-year-old divorcee with 2 children who has been 'well' until 2 months previously. She presented with:

Presentation 1

Tiredness
Irritability
Weight loss
Dislike of hot weather
Increased sweating
Palpitations
Trembling of hands
Increased appetite

Most likely hypothesis
Hyperthyroidism → go for TFT

Presentation 2

Tiredness
Irritability
Increased sweating
Weight loss
Palpitations
Diminished appetite

Hypothesis
Hyperthyroidism , and Malignancy

Presentation 3

Tiredness
Weight loss
Normal appetite

This is unclear u have to go through inductive method (the old one)

Why order a test?

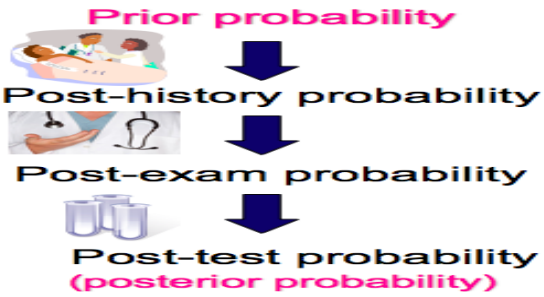
- To rule in or out a diagnosis
- To screen for disease among asymptomatic patients
- To provide prognostic information on patients with established disease
- To monitor ongoing therapy, maximize effectiveness, and minimize side effects.
- To reassure a patient

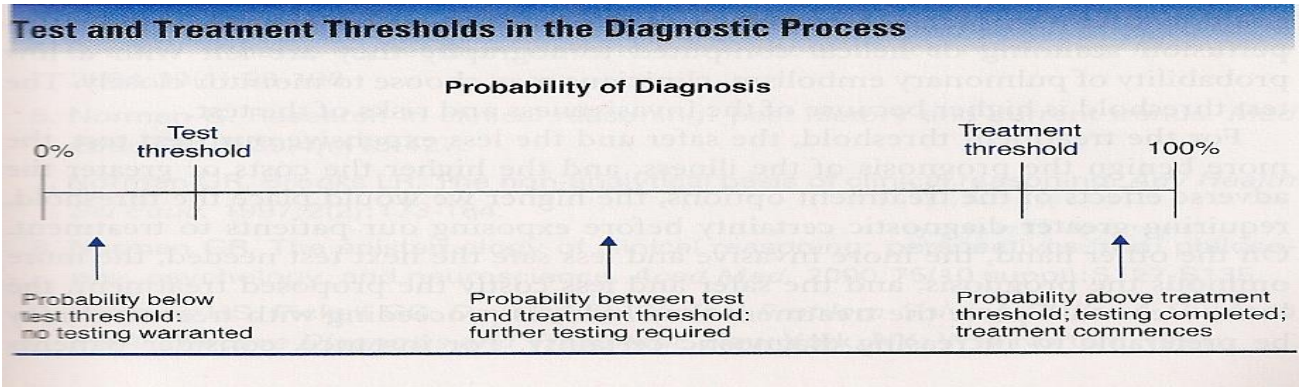
The diagnostic process is probabilistic

Likelihood Ratios from history

LRs from examination

LRs from testing





When order a Diagnostic test?

- When the characteristics of that test give it ***validity*** in the clinical setting.
- When the test result will **change the probability** of the disease leading to a change in clinical strategy.

IMPORTANT SLIDE

- Prevalence = 809/ 2579 =
- Sensitivity = true present / total present= 731/809 =
- Specificity = 270 / 1770 =

Table 3.3 Results of a systematic review of serum ferritin as a diagnostic test for iron deficiency anemia

		Target disorder (iron deficiency anemia)		
		Present	Absent	Totals
Diagnostic test result (serum ferritin)	Positive (<65 mmol/L)	731 a	270 b	1001 a+b
	Negative (≥65 mmol/L)	c 78	d 1500	c+d 1578
	Totals	a+c 809	b+d 1770	a+b+c+d 2579

Data from: Guyatt GH, Oxman AD, Ali M, et al. J Gen Intern Med 1992; 7: 145–53.

If sensitivity was 100% meaning 809 had positive test, would this test help me if positive or negative? It help in negative cause that mean any patient come with –ve result he is truly negative (not ill) → help to rule the disease out → this is **SnNout**

SnNout

A highly sensitive test, if negative,

helps to rule the disease out.

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If Specificity was 100% meaning 1770 had negative test , 0 positive test, would this test help me if positive or negative ? It help in Positive cause that mean any patient come with +ve result he is truly positive (ill) → help to rule the disease in → this is **SpPin**

SpPin

A highly specific test, if positive,

helps to rule the disease in.

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Likelihood ratio

- We take our initial assessment of the likelihood of disease ("pre-test probability"), do a test to help us shift our suspicion one way or the other, and then determine a final assessment of the likelihood of disease ("post-test probability").
- **Likelihood ratios** (LRs) tell us how much we should shift our suspicion for a particular test result.
- The "**positive likelihood ratio" (LR+)** tells us how much to increase the probability of disease if the test is positive, while the **"negative likelihood ratio" (LR-)** tells us how much to decrease it if the test is negative.

Probability of an individual ***with*** *the condition* having a *positive test*

LR+ = ----------

Probability of an individual ***without*** *the condition* having a *positive test*

Probability of an individual ***with*** *the condition* having a negative *test*

LR- = ----------

Probability of an individual ***without*** *the condition* having a *negative test*

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$$LR+ = \frac{\text{Sensitivity}}{\text{1- specificity}}$$

$$LR- = \frac{\text{1- sensitivity}}{\text{Specificity}}$$

Just know that we need sensitivity and specificity to get the likelihood ratios

How helpful is the stress ECG in diagnosing IHD among patients presenting with acute chest pain?

In other way; patient come with chest pain what is the probability that after the ECG I have to take patient directly to treatment and not to investigate him more ?

Sensitivity: 60%

Specificity: 91%

Likelihood ratio: **+ve:** 6.7 **-ve:** 0.4

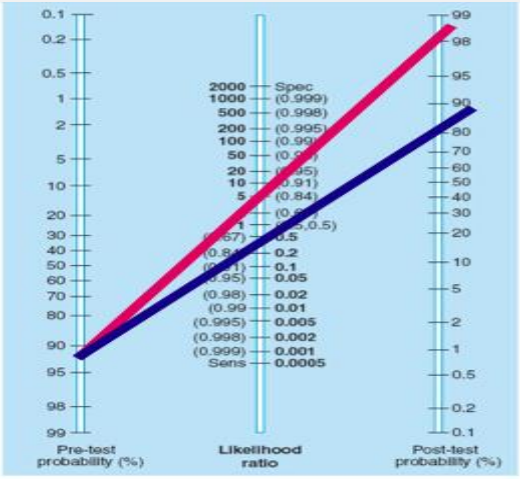
Scenario 1 :

- Middle aged man
- Typical history of angina
- Tight sub-sternal pain
- Increase by exercise
- Decrease by rest within 5 min

Post-test probability of IHD:

+ve: 98% **-ve:** 79%

Probability = 90% (from research or your own decision)



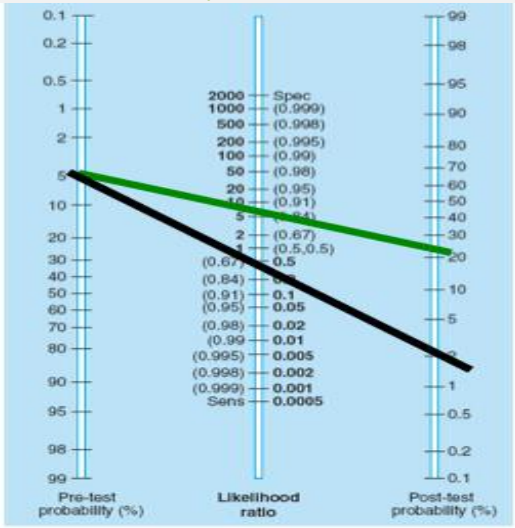
Scenario 2 :

- 40-year-old
- Vague (L) sided chest pain
- Unrelated to exercise
- Increase by moving the

Post-test probability of IHD:

+ve : 28% **-ve :** <2%

Probability = 5% (from research or your own decision)



1- open EBMstatscalc → choose Post-test prob via Sens & spec
2- fill the sensitivity, specificity and the pre-test probability with the given numbers
3- the =ve and –ve values will appears

Interpretation:

My probability will increase to 98% which is higher than 80% (we put it as reference for our self) if the diagnosis was true → I will go to treatment no need for other investigation

Interpretation:

My probability will increase to 28% which is lower than 80% (we put it as reference for our self) if the diagnosis was true → I need to do further investigation .ECG is not enough

LR interpretation

>10	Large & often conclusive increase in the likelihood of disease
5-10	Moderate increase in the likelihood of disease
2-5	Small increase in the likelihood of disease
1-2	Minimal increase in the likelihood of disease
1	No change in the likelihood of disease
0.5-1.0	Minimal decrease in the likelihood of disease
0.2-0.5	Small decrease in the likelihood of disease
0.1-0.2	Moderate decrease in the likelihood of disease
<0.1	Large & often conclusive decrease in likelihood of disease

Strength of a Diagnostic Test

Qualitative Strength	LR+	LR-
Excellent	10	0.1
Very Good	5	0.2
Fair	2	0.5
Useless	1	1

Estimating Pre-Test Probability

Research papers evaluating diagnostic tests

Epidemiological studies and national surveys

Audit data

Clinical experience

(Deena I want to put it as bullet but I couldn't ☺

Urinary Tract Infection

Clinical Symptoms & Diagnosis of UTI

1. Patient population.	Women in child bearing age
2. Intervention.	Symptoms
3. Comparison intervention.	
4. Outcomes.	Probability of UTI
"In women in child bearing age suspected to have UTI, to what extent, would the presence or absence of certain symptoms relate to the probability of UTI?	

Clinical Signs and Symptoms in the Prediction of Urinary Tract Infection

Symptom	LR+	LR-	Symptom	LR+	LR-
Dysuria	1.5	0.48	Vaginal Irritation	0.24	2.7
Frequency	1.8	0.59	Back Pain	1.6	0.83
Hematuria	2.0	0.92	Self-diagnosis	4.0	0
Fever	1.6	0.9	Vaginal Discharge on Physical Examination	0.69	1.1
Flank Pain	1.1	0.84	Cost vertebral Angle Tenderness on PE	1.7	0.86
Lower Abdominal Pain	1.1	0.89	Dipstick Urinalysis	4.2	0.3
Vaginal Discharge	0.34	3.1			

Interpretation:

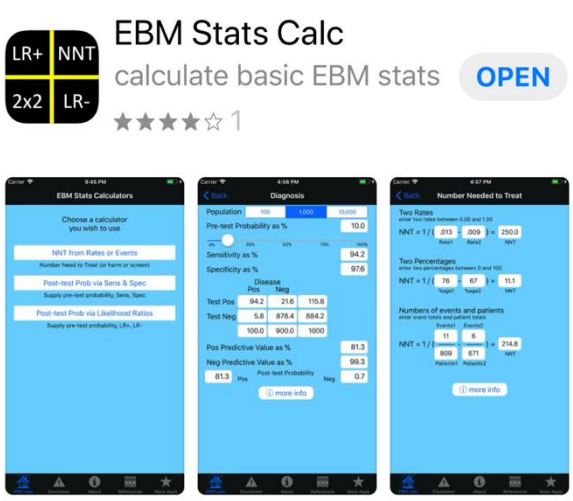
If dysuria, frequency = **Present**

Vaginal discharge and irritation= A**bsent**

=> the diagnosis will be most likely **UTI**

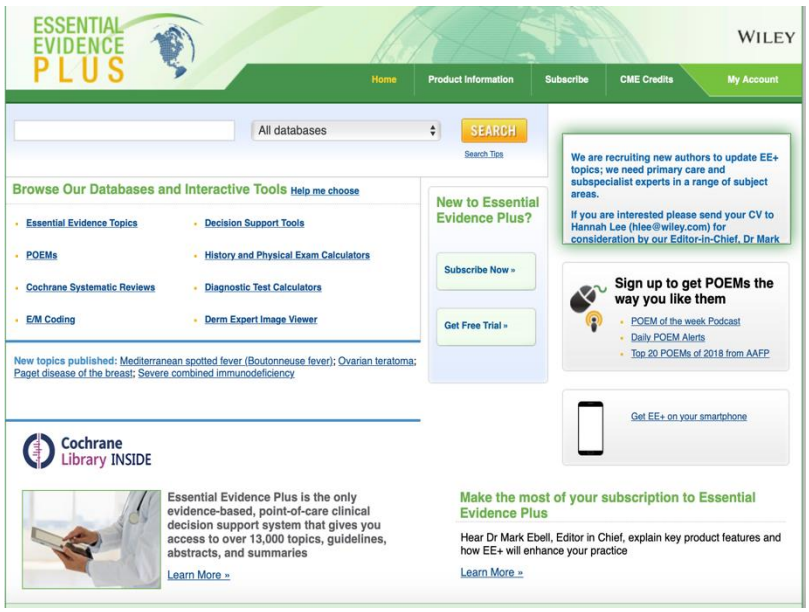
If u can see if the self diagnosis and dipstick test were +ve **the likelihood of the disease increase**

Useful apps and website



To calculate Likelihood ratios

Help is finding diagnostic tools also as calculators



Essential evidence website

Another source for calculators