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# Diagnostic Evidence at the Bedside – Incorporating EBM

## A FACULTY DEVELOPMENT WORKSHOP

Shanu Gupta MD FACP

# Disclosure

*This speaker has nothing to disclose*

# Objectives

1. Discuss what bedside teaching means to you and identify opportunities for teaching EBM at the bedside

2. Apply EBM tools to learner education opportunities
   a. Define likelihood ratio
   b. Use the Fagan nomogram to identify a post-test probability of disease
   c. Apply likelihood ratios to interpret bedside physical exam

3. Commit to implementing EBM tools and resources in your clinical setting

# Board Question

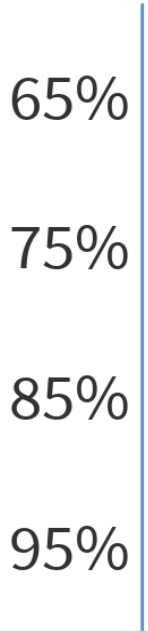
A 62-year-old woman is evaluated for **chest pain, dyspnea and hemoptysis**. The pain is not consistently associated with exertion, nor is it always relieved by rest; it sometimes occurs when she is eating or when she is anxious. She has a 30-pack-year smoking history, but she quit smoking 2 years ago. Medical history is significant for hypertension and hyperlipidemia, for which she takes lisinopril and rosuvastatin, respectively. She has been treated for breast cancer for the last two months.

Physical examination shows tachycardia and unilateral leg swelling.

An electrocardiogram reveals sinus tachycardia.

The patient's pretest probability of acute pulmonary embolus is estimated to be **50%.** CT angiography is performed. This test has a positive likelihood ratio of **10.0** and a negative likelihood ratio of **0.1**. The patient's CTA is **positive**.

# Which of the following best approximates the patient's posttest probability of acute pulmonary embolism?



# Audience

# Who are your learners?

Residents

Medical students

PA/NP students

Faculty

Other

# Where do you do most of your bedside teaching?

Clinic

Emergency room

Inpatient unit

Operating room

Other

# Pair and Share

- What is the skill that you bring to the bedside that learners can learn from?
- What are your barriers to teaching EBM?

# What are your barriers to teaching EBM at the bedside?

I don’t have access to EBM resources

I don’t have time to teach it

I don’t know how to apply EBM

I don’t know how to teach EBM

Teaching EBM is not a priority for me

Research in medicine is terrible anyway

# What resources are you currently using for teaching EBM?

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# Let’s Start…Basics

# Learning Theory

## Cognitive

- learners' ability to process information in a meaningful way

- **Categories:**
  - Knowledge
  - Comprehension
  - Application
  - Analysis
  - Synthesis
  - Evaluation

## Affective

- learners' attitudes and feelings that are a result of the learning process

- **Categories:**
  - Receiving
  - Responding
  - Valuing
  - Organizing
  - Characterizing

## Psychomotor

- learners' ability to use motor skills to learn

- **Categories:**
  - Perception
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  - Mechanism
  - Complex overt response
  - Adaptation
  - Origination

- Knowledge
- Comprehension
- Application
- Analysis
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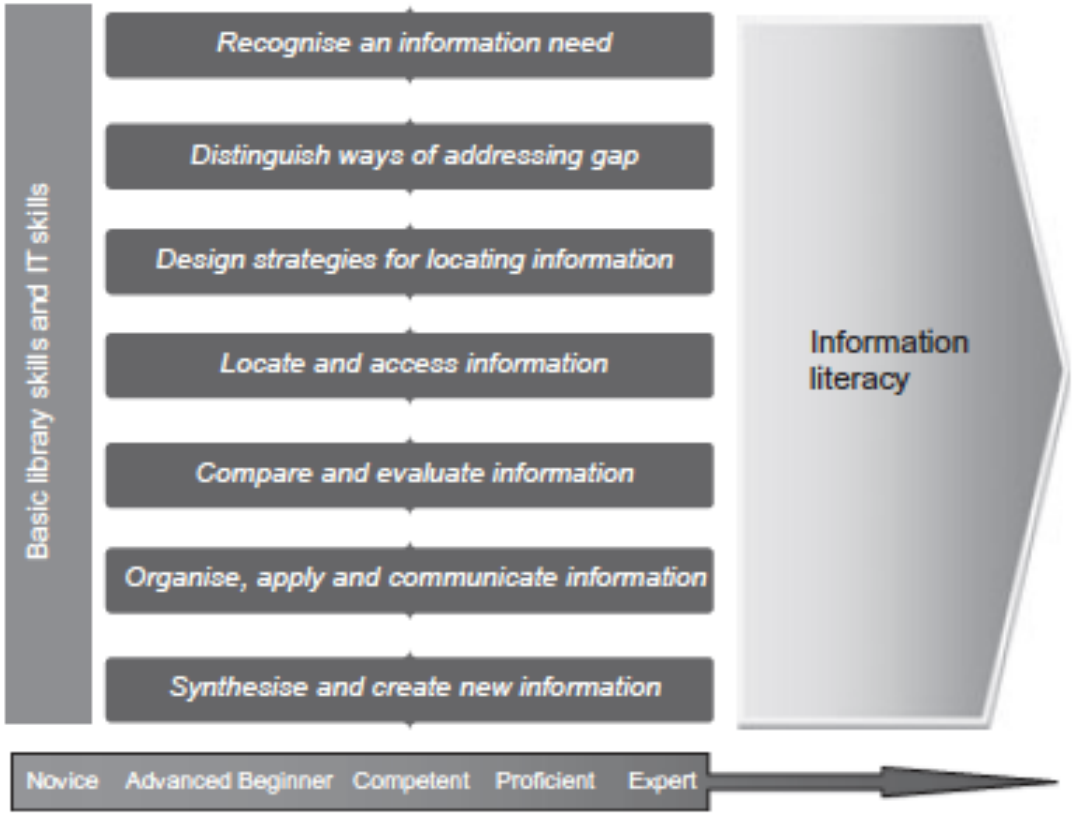
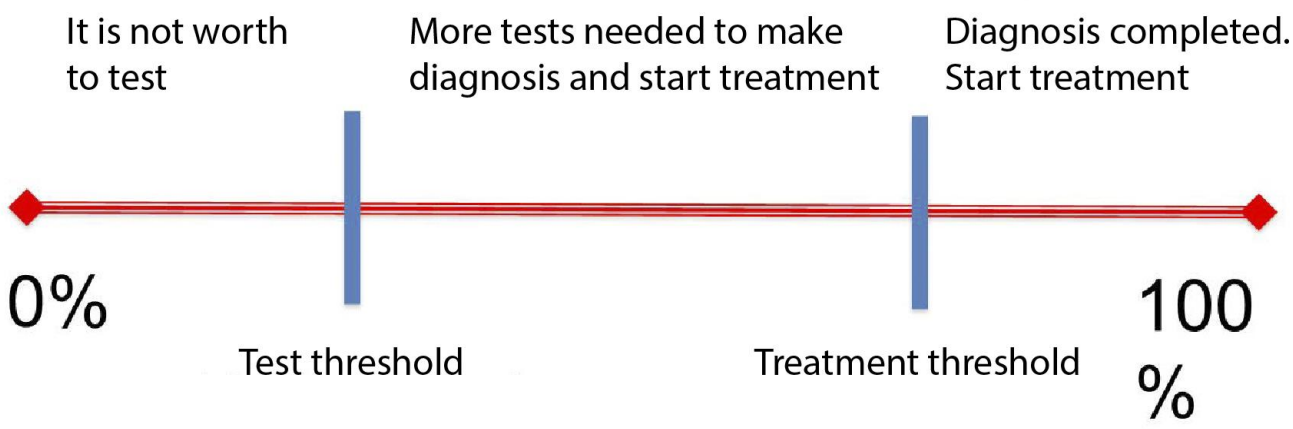
- Evaluation




Fiander, 2011

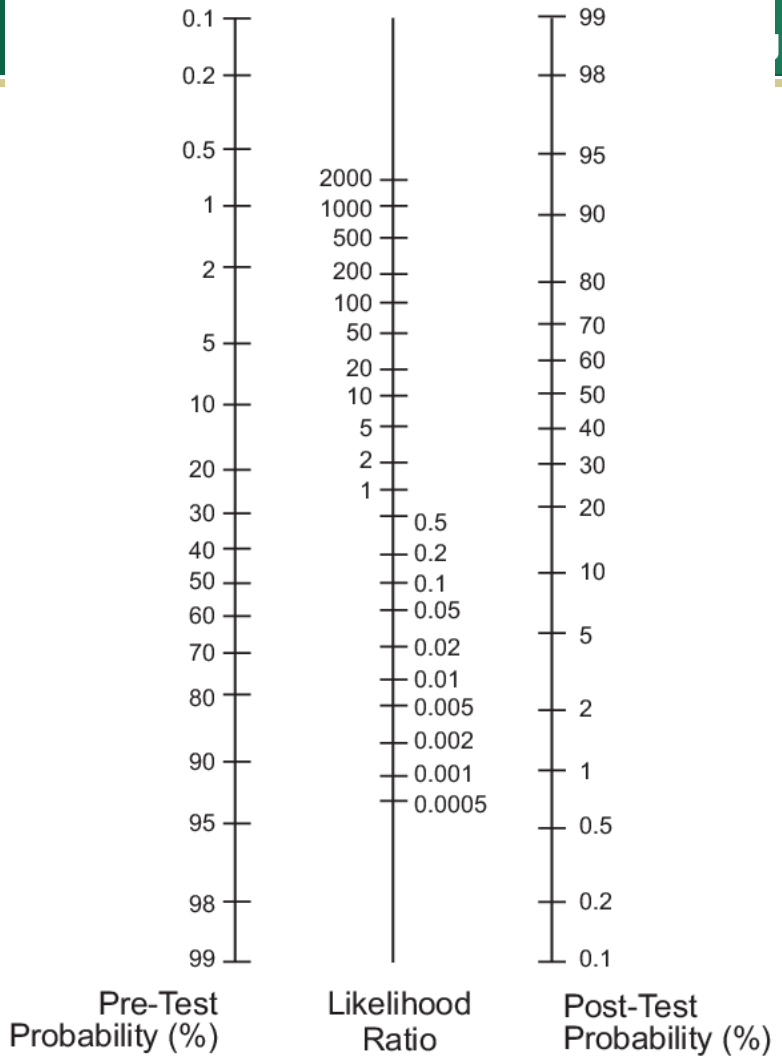



*N Engl J Med* 1980; **302**: 1109–17.

# Likelihood Ratios

| LR Value | 0.1 | 0.2 | 0.5 | 1 | 2 | 5 | 10 |
|---|---|---|---|---|---|---|---|
| Change in probability | | *Decrease* | | *No change* | | *Increase* | |
| | -45% | -30% | -15% | 0 | +15% | +30% | +45% |

McGee 2016


0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
Pre-Test Probability (%)
2000
1000
500
200
100
50
20
10
5
2
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
0.001
0.0005
Likelihood Ratio
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
Post-Test Probability (%)

| Finding | Likelihood ratio if finding | |
|---|---|---|
| | **Present** | **Absent** |
| Inspection | | |
| Bulging flanks | 1.9 | 0.4 |
| Edema | **3.8** | **0.2** |
| Palpation and percussion | | |
| Flank tympany | **0.3** | NS |
| Shifting dullness | 2.3 | 0.4 |
| Fluid wave | **5.0** | 0.5 |

*These data are based on three studies[3–5] of 216 patients presenting with increasing abdominal girth. The diagnostic standard for ascites was ultrasonography. Findings in boldface type have the greatest accuracy (ie, likelihood ratios ≥3 or ≤0.3).*

McGee 2016

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# A CASE

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Mr. J is a 72-year-old man who comes to your office complaining of dizziness.

What are your cannot-miss diagnoses?

# What are your cannot-miss diagnoses?

Stroke

Cardiac arrhythmia

Peripheral neuropathy

Benign positional vertigo

# Is he having a stroke?

**Table 48-3 Comparison of Physician Assessment With That of Emergency Medicine Personnel[a,b]**

| No. of Findings Present | Stroke | Nonstroke Diagnosis | LR (95% CI) |
|---|---|---|---|
| Physician Assessment[c] | | | |
| 3 | 4 | 1 | 14 (1.6-121) |
| 2 | 6 | 5 | 4.2 (1.4-13) |
| 1 | 15 | 10 | 5.2 (2.6-11) |
| 0 | 13 | 117 | 0.39 (0.25-0.61) |
| Emergency Medical Personnel[d] | | | |
| 3 | 20 | 10 | 7.0 (3.3-14) |
| 2 | 22 | 10 | 7.6 (3.7-16) |
| 1 | 49 | 39 | 4.4 (3.0-6.4) |
| 0 | 63 | 476 | 0.46 (0.38-0.56) |

Abbreviations: CI, confidence interval; LR, likelihood ratio.

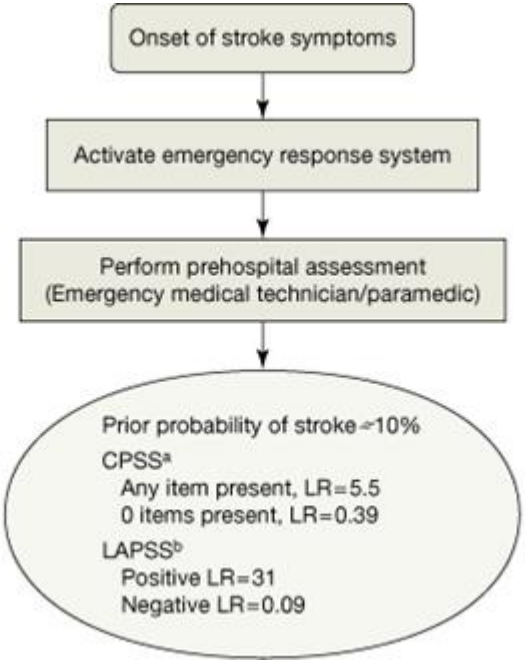
[a]Based on data from Kothari et al.[18]

[b]Collapsing data into a 2 × 2 table yields an LR of ≥1 finding = 5.5; 95% CI, 3.3-9.1.

[c]Data represent unique patients and stratum-specific LR.

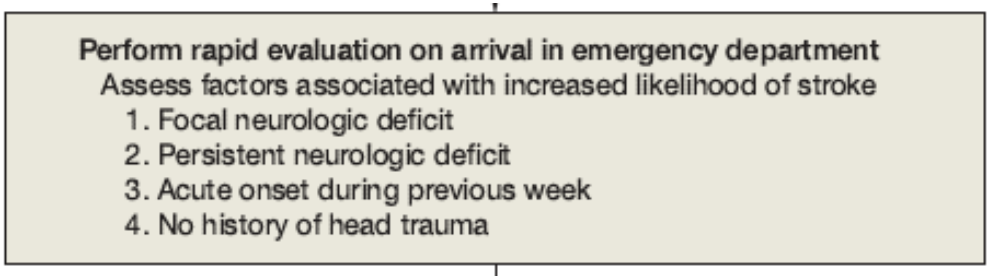
[d]Data represent 4 examinations for each patient.

Keitz, 2009


Onset of stroke symptoms
Activate emergency response system
Perform prehospital assessment
(Emergency medical technician/paramedic)
Prior probability of stroke=10%
CPSS[a]
Any item present, LR=5.5
0 items present, LR=0.39
LAPSS[b]
Positive LR=31
Negative LR=0.09

Keitz, 2009

# Is he having a stroke?

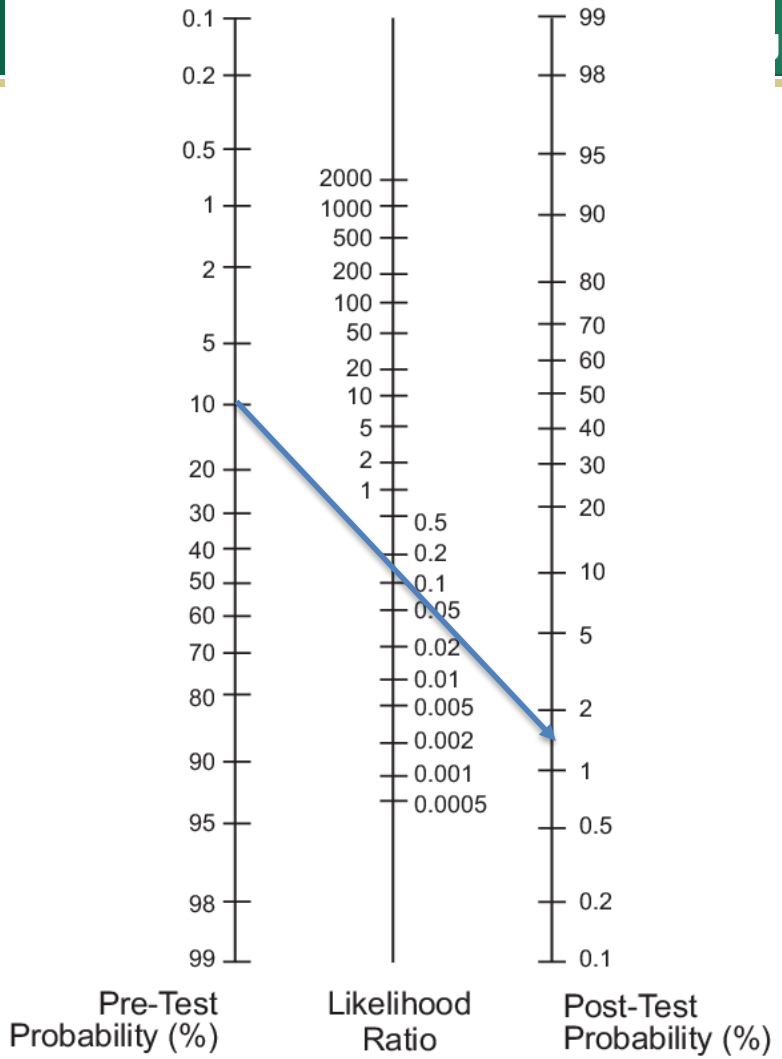



Keitz, 2009

0 Factors

LR = 0.14

Probability of stroke = ?

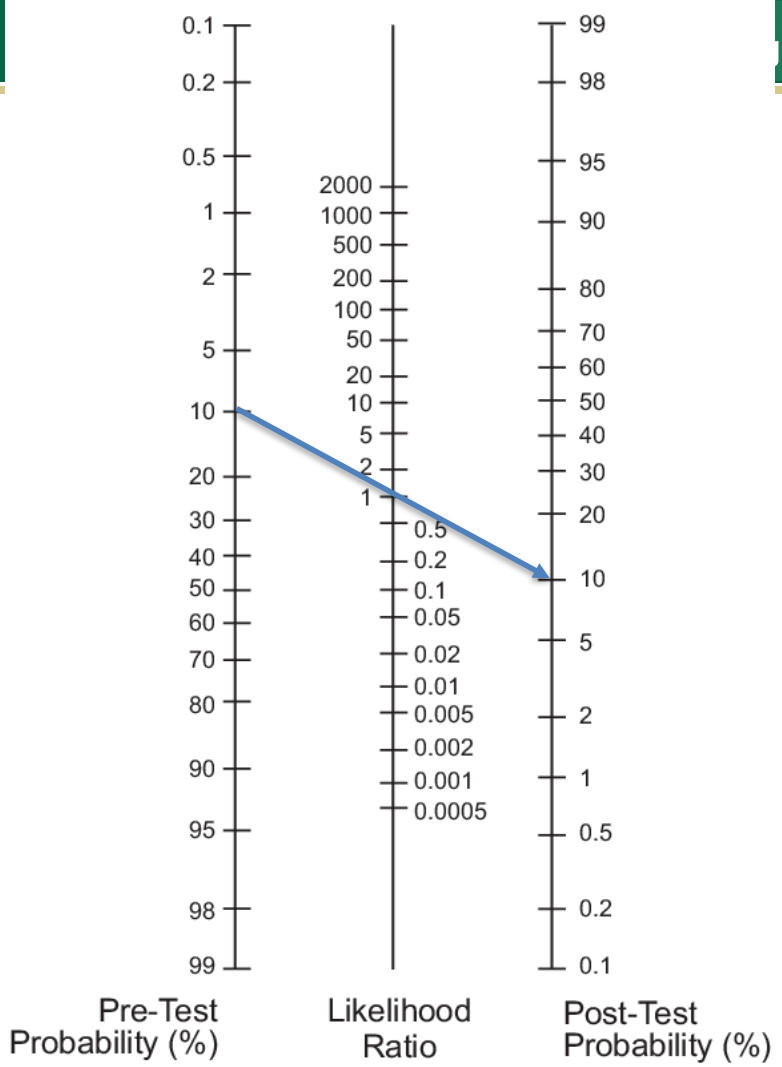



~ 1.5%

1-3 Factors

LR = uncertain

Probability of stroke = ?

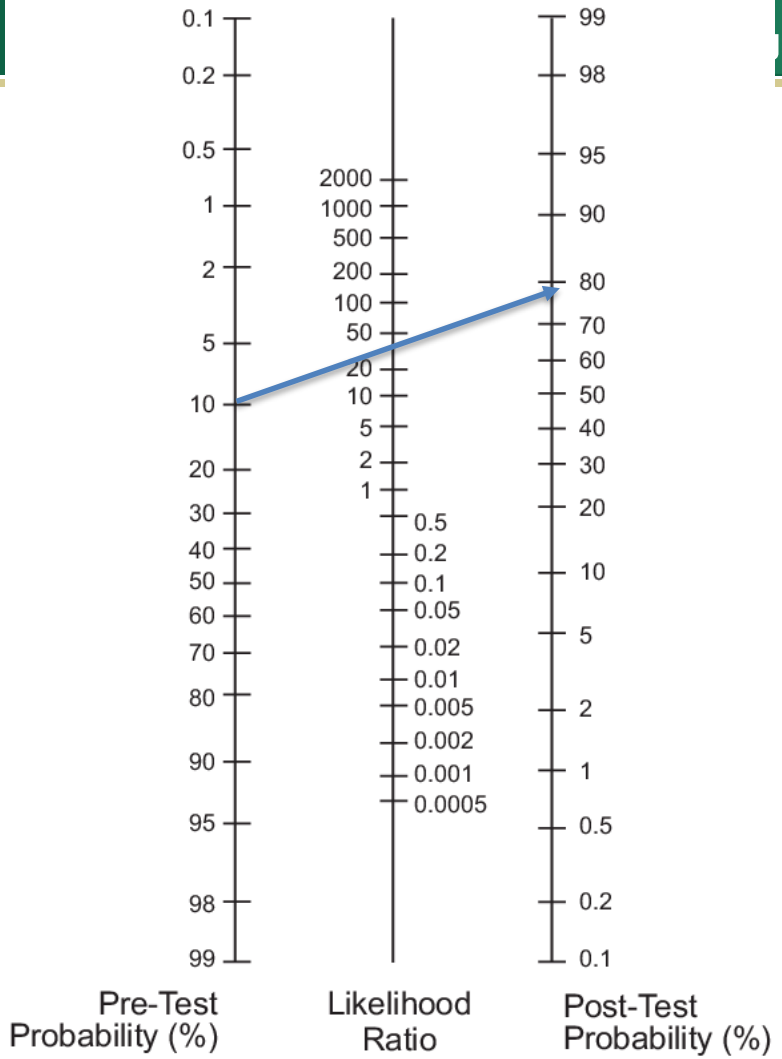



>10%

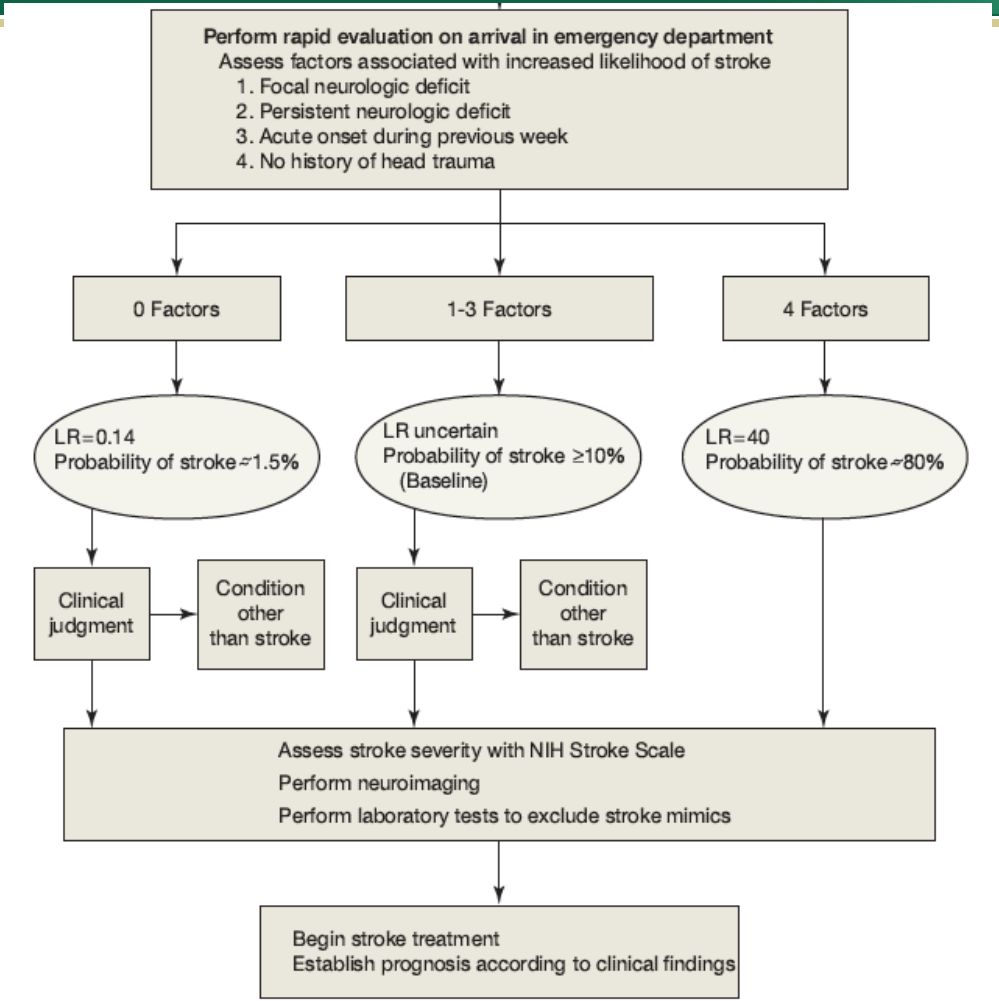
4 Factors

LR = 40

Probability of stroke = ?

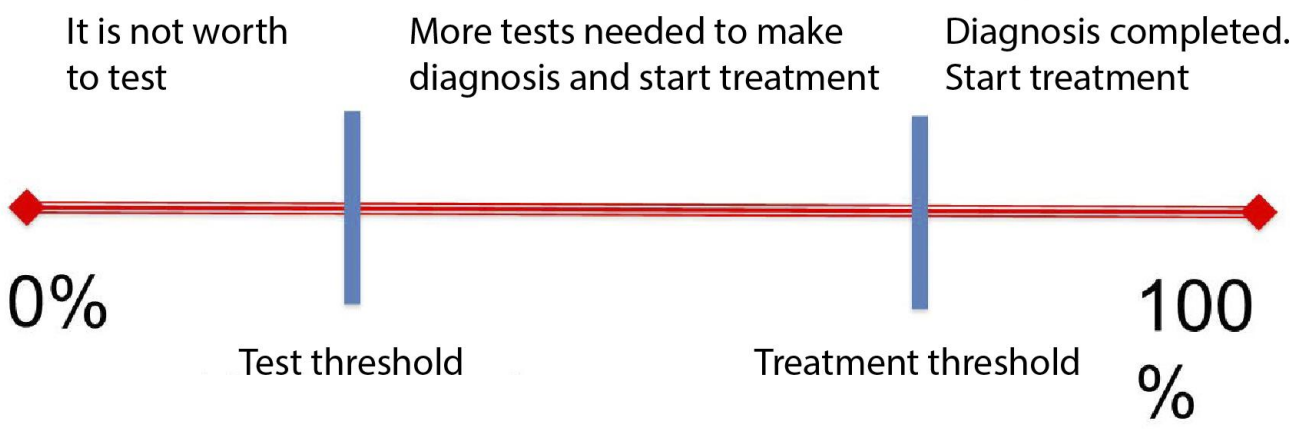



~80%


Perform rapid evaluation on arrival in emergency department
Assess factors associated with increased likelihood of stroke
1. Focal neurologic deficit
2. Persistent neurologic deficit
3. Acute onset during previous week
4. No history of head trauma
0 Factors
1-3 Factors
4 Factors
LR=0.14
Probability of stroke ≈1.5%
LR uncertain
Probability of stroke ≥10%
(Baseline)
LR=40
Probability of stroke ≈80%
Clinical judgment
Condition other than stroke
Clinical judgment
Condition other than stroke
Assess stroke severity with NIH Stroke Scale
Perform neuroimaging
Perform laboratory tests to exclude stroke mimics
Begin stroke treatment
Establish prognosis according to clinical findings

Keitz, 2009

# What happens when you don't have the prevalence?

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# Estimating Pre-Test Probability

- How closely does it fit the illness script?

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  - Analysis
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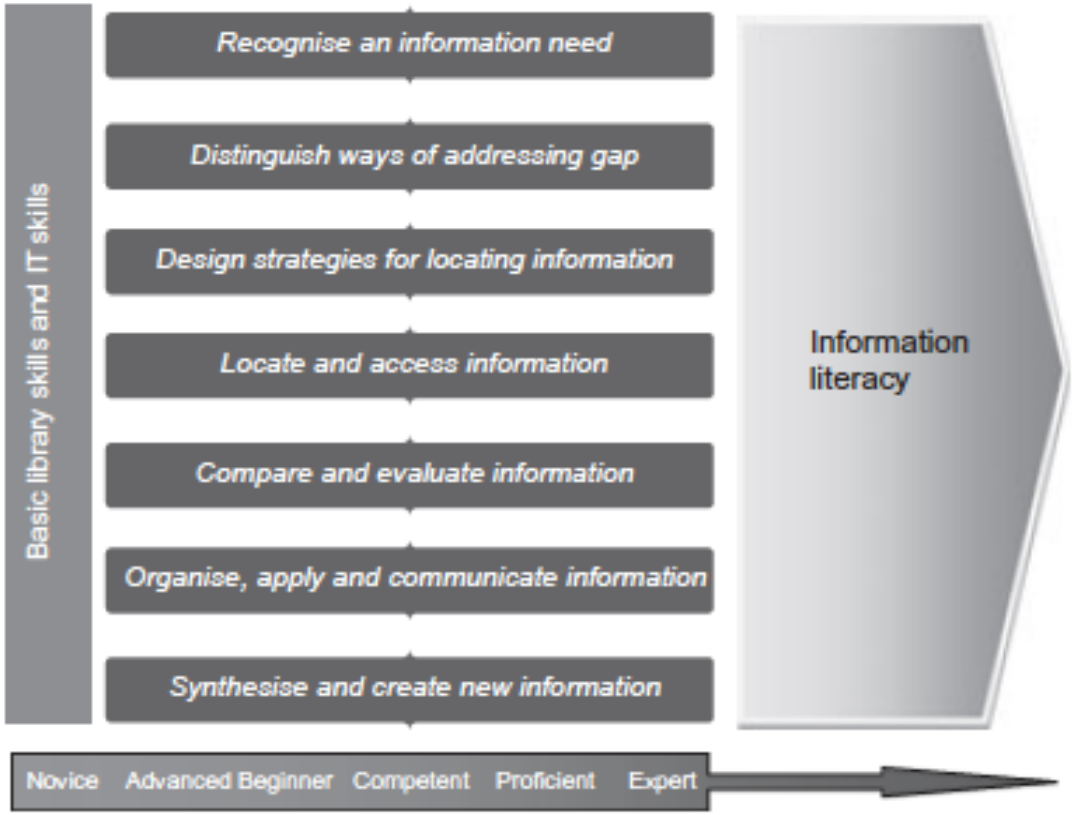

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# Let's Practice

| | |
|---|---|
| 10 mins | Pick a case<br>Identify teaching points |
| 10 mins | Teach your colleague<br>Receive feedback |
| 10 mins | Switch roles:<br>Learn from your colleague!<br>Give feedback |

Use this link to access information on likelihood ratios in your specialty

- http://www.thennt.com/home-lr/
- https://ebm-tools.knowledgetranslation.net/resource/likelihood

# Debrief

- What was your experience?

# Board Question

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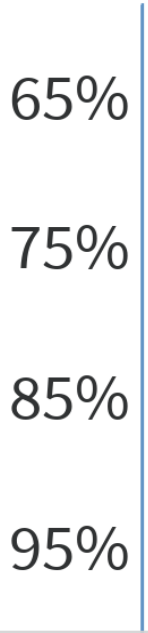

# What is your commitment?

What's one thing you've learned today that you will put into your teaching practice?

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https://bit.ly/ClinicalLearningSeries1

# What's Next?

Please give us your feedback
Shanugupta@usf.edu

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# THANK YOU

shanugupta@usf.edu

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# Bloom's Domains of Learning

(higher order skills are on top)

| Psychomotor | Cognitive | Affective |
|---|---|---|
| • Origination | • Evaluation | • Characterizing |
| • Adaptation | • Synthesis | • Organizing |
| • Complex Overt Response | • Analysis | • Valuing |
| • Mechanism | • Application | • Responding |
| • Guided Response | • Comprehension | • Receiving |
| • Set | • Knowledge | |
| • Perception | | |

Sources: Bloom 1984; Krathwohl, Bloom and Masia 1990; Simpson 1972.

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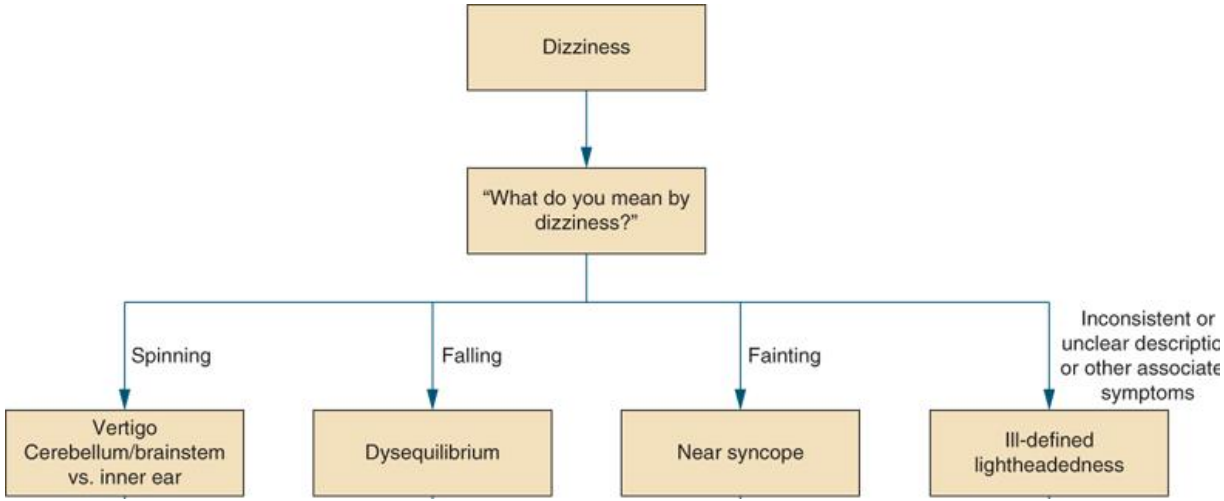

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Mr. J is a 72-year-old man who comes to your office complaining of dizziness.

Cincinnati Prehospital Stroke Scale
0 out of 3

What's a pivotal question?

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Mr. J is a 72-year-old man who comes to your office complaining of dizziness.

Mr. J reports that when he is dizzy, it feels as though the room is spinning. His first episode occurred 3 days ago when he rolled over in bed. The spinning sensation was very intense, causing nausea and vomiting. It lasted less than 1 minute.

What other data do you want to elicit?

# What other data do you want to elicit?

Positional nystagmus

Hx of Vomiting

Finger to nose testing

Romberg (imbalance)

**Table 53-2** Accuracy of Signs and Symptoms for Diagnosing Peripheral Vertigo in an Emergency Department[a]

| | No. of Patients With Peripheral Vertigo (Not an Emergency) | No. of Patients With Other Causes of Dizziness That Might Be an Emergency | Total | Predictive Value, % | Likelihood Ratio |
|---|---|---|---|---|---|
| Positive cluster of signs and symptoms[b] | 23 | 4 | 27 | Positive 85 (23/27) | 7.6 |
| Lack of one or more elements in cluster | 31 | 67 | 98 | Negative 68 (67/98) | 0.6 |
| Total | 54 | 71 | 125 | …[c] | … |

[a]Data from Herr et al.[5]

[b]Positive cluster includes positive results on head-hanging maneuver plus either vertigo or vomiting.

[c]Ellipses indicate not applicable.

**Table 53-3** Accuracy of Signs and Symptoms for Detecting Serious Causes of Dizziness in an Emergency Department[a]

| | No. of Patients With Serious Causes of Dizziness[b] | No. of Patients With Nonserious Causes of Dizziness | Total | Predictive Value, % | Likelihood Ratio |
|---|---|---|---|---|---|
| Absence of vertigo, age >69 y, or neurologic deficit | 33 | 50 | 83 | Positive 40 (33/83) | 1.5 |
| Presence of vertigo, age ≤69 y, and no neurologic deficit | 5 | 37 | 42 | Negative 88 (37/42) | 0.3 |
| Total | 38 | 87 | 125 | . . .[c] | . . . |

[a]Data from Herr et al.[5]

[b]Serious causes of dizziness include medication adverse effects, seizures, stroke, and cardiac arrhythmia.

[c]Ellipses indicate not applicable.

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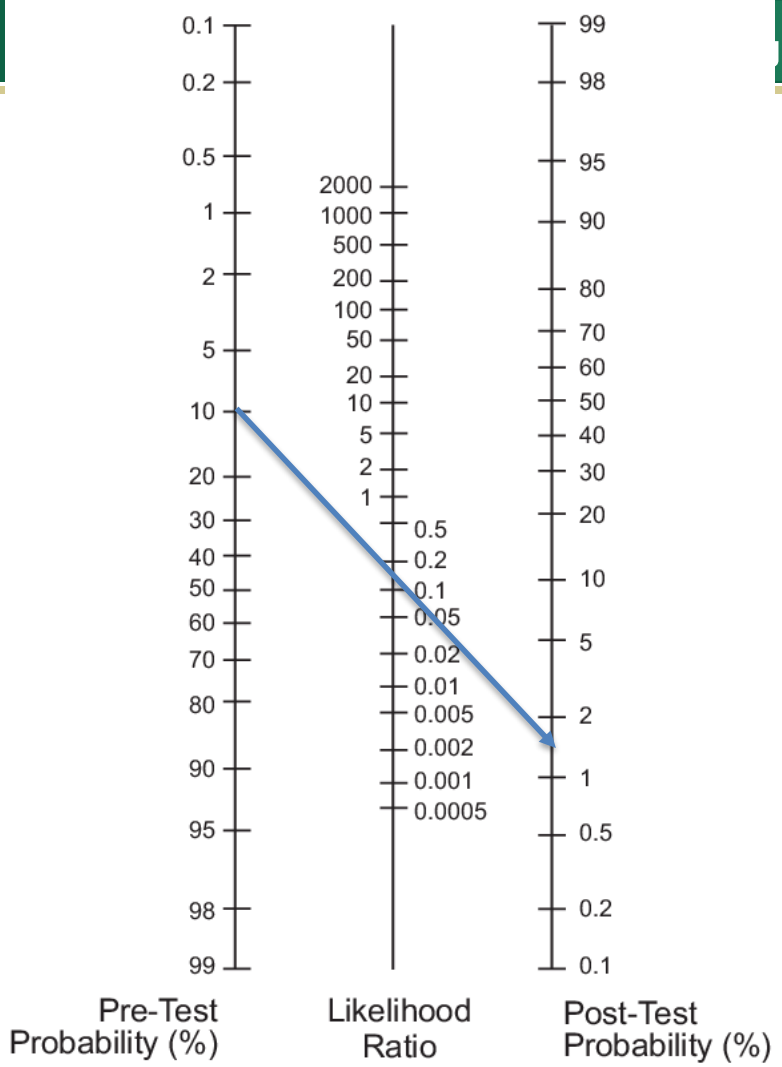
Mr. J reports that when he is dizzy, it feels as though the room is spinning. His first episode occurred 3 days ago when he rolled over in bed. The spinning sensation was very intense, causing nausea and vomiting. It lasted less than 1 minute.

Should you get an MRI?

MRI sens = 88%

LR = 0.14

Probability of stroke = ?




~ 1.5%