

# Physicians' Test Ordering Tendencies : The Non- EBM influences

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Rochester**



# Background

- **Assumption: Increase instruction in EBM since 1992**

**Decrease practitioner variability.  
Optimize patient care**



# Clinical Decision Making

Observation



Hypothesis generation

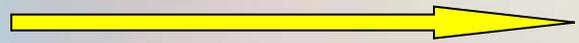
(Heuristics, biases and pre-test probability)



Hypothesis refinement



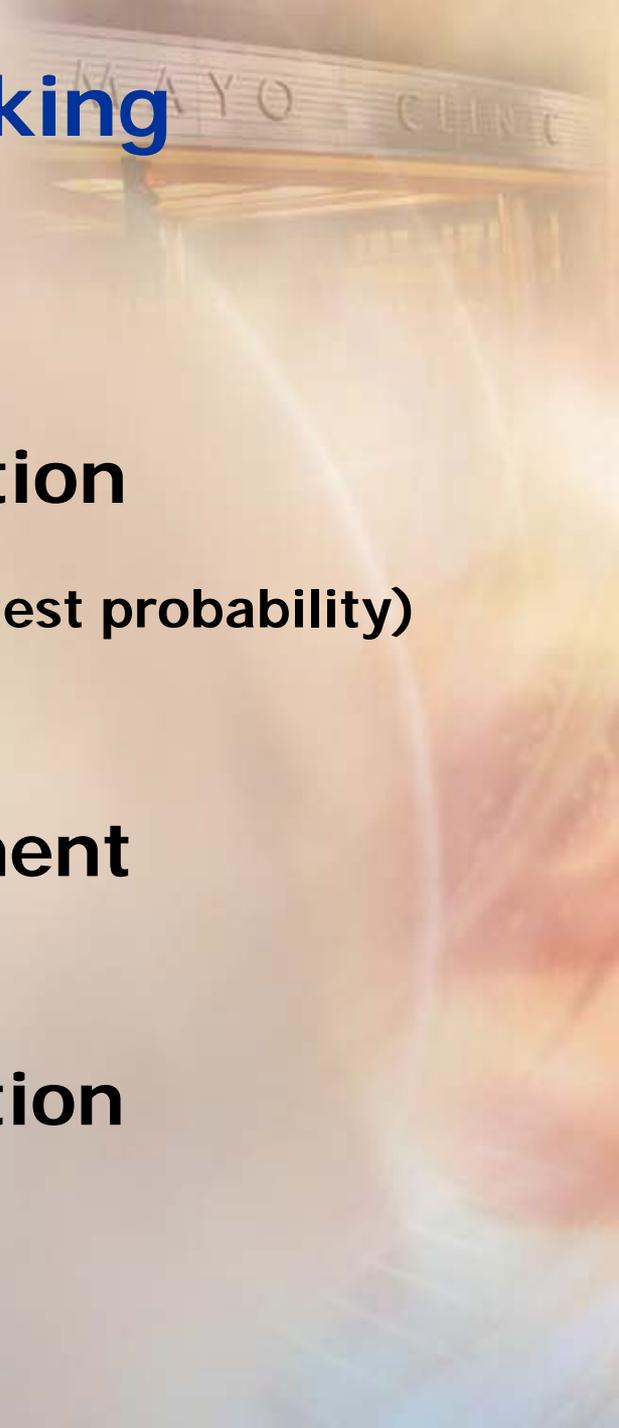
Test



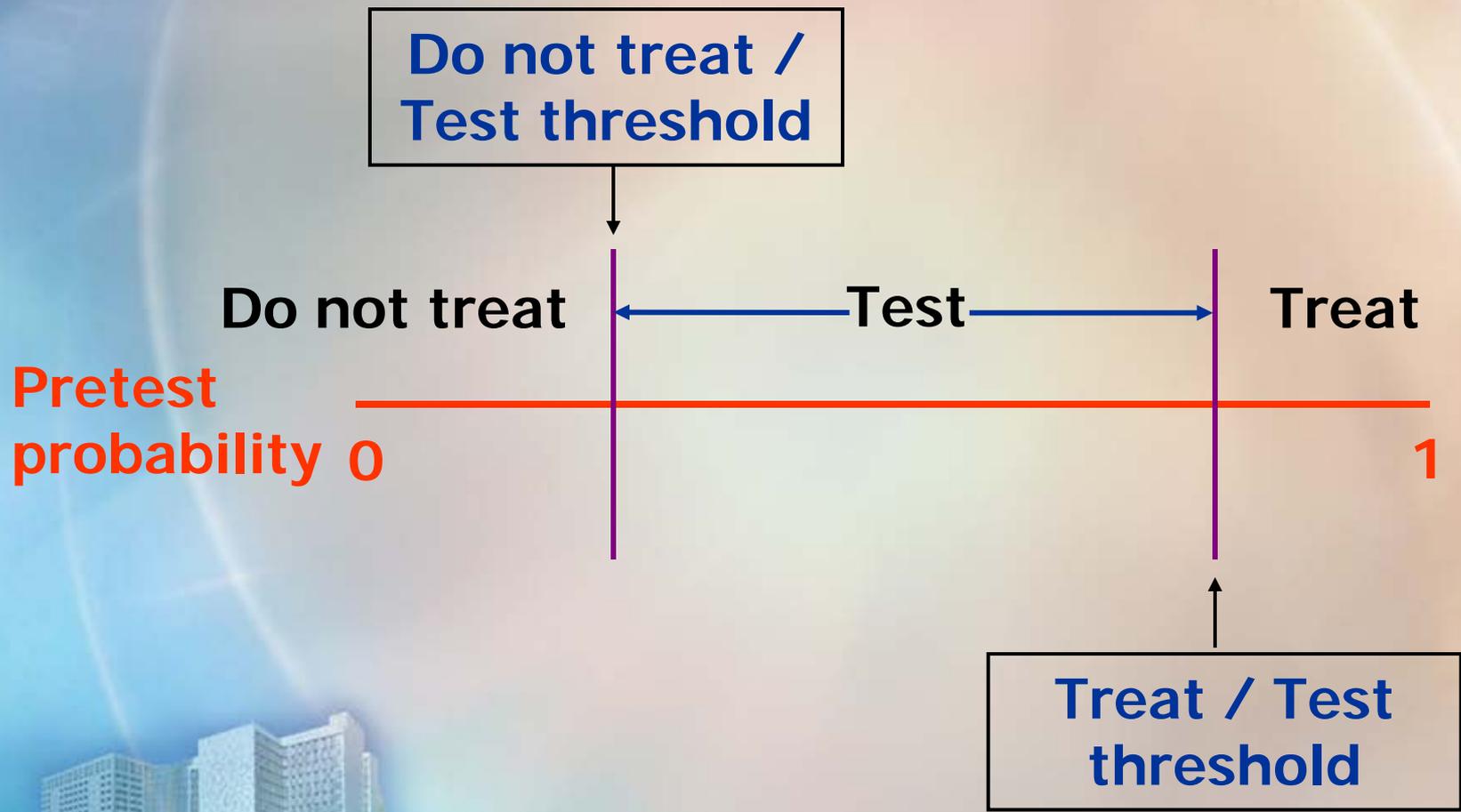
Diagnostic verification



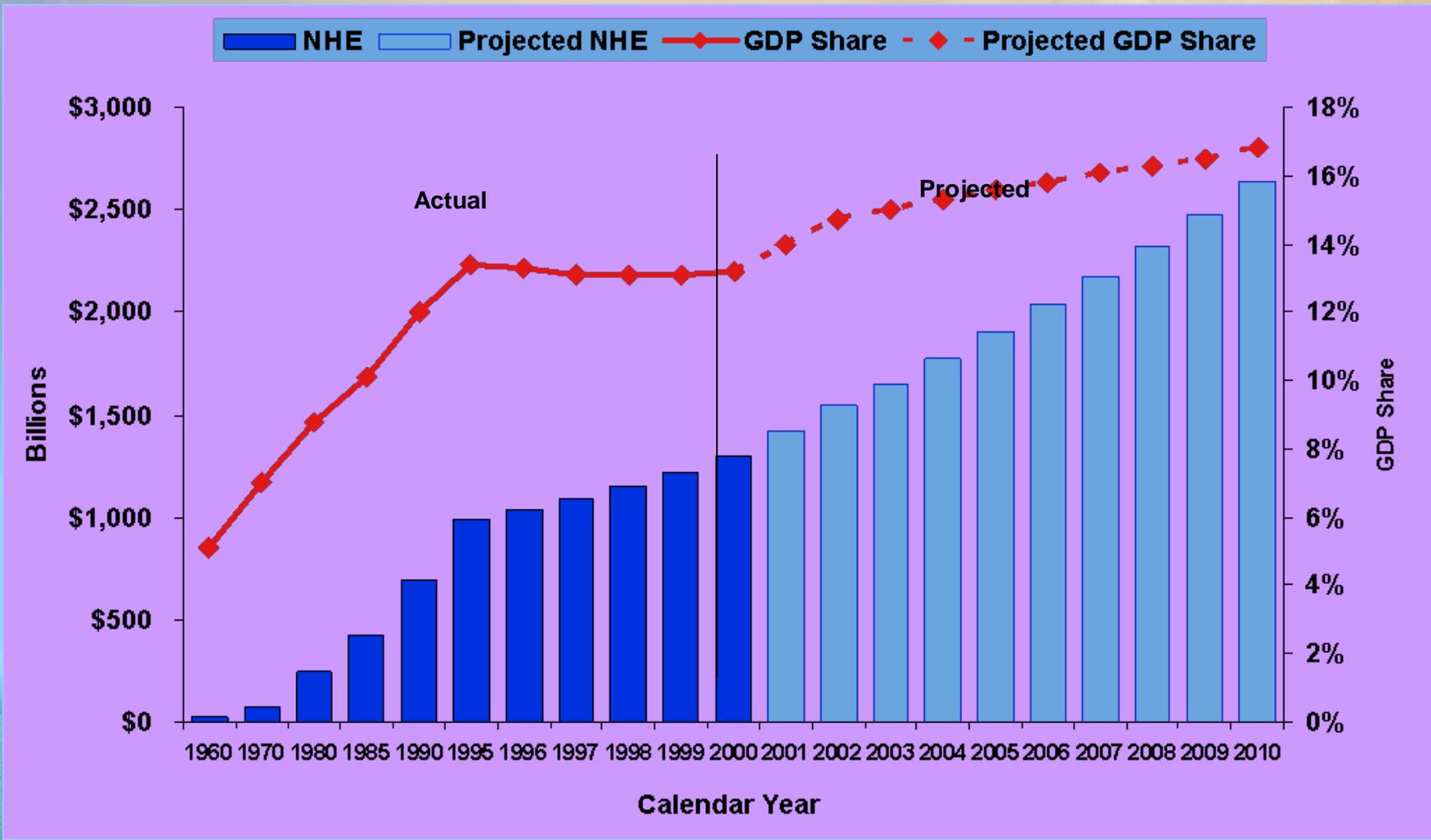
Treatment



# Clinical Decision Making



# National Health Expenditure (1960-2010)



Source: CMS, Office of the Actuary, National Health Statistics Group

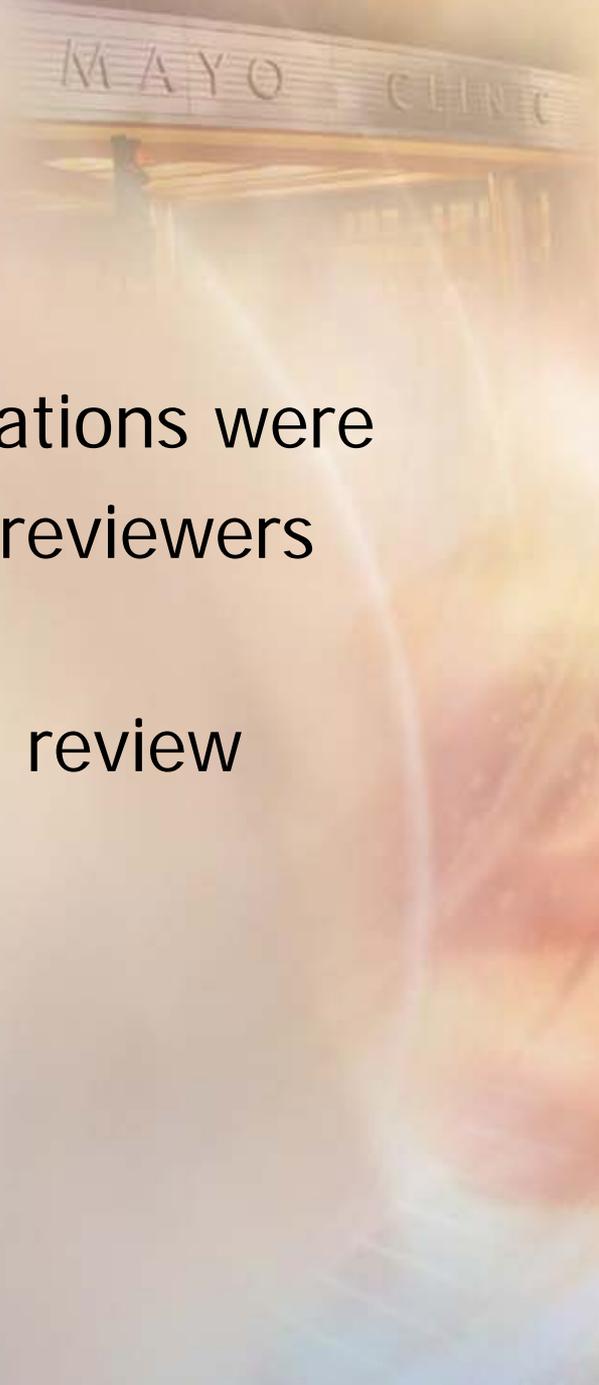
# Study Aim

- **To understand the non-EBM determinants of test ordering**



# Methods

- Study design, quality, and limitations were independently abstracted by 2 reviewers
- Exclusions: letters to the editor, review articles and editorials



# Methods

## Databases searched:

- **Medline 1988-2004**
- **Embase 1988-2004**
- **PsychInfo 1984-2004**
- **Web of Science 1993-2004**
- **Educational websites**
- **Hand searching of Bibliography from key articles**

# Methods

## Search terms:

### In MEDLINE and Embase

"laboratory techniques and procedures"

(also used diagnostic tests, laboratories, hospital/utilization) AND

Physician's practice patterns

(also used unnecessary procedures, guideline adherence, and attitude of health personnel)

### Specifically in EMBASE

"Diagnostic test or laboratory test" AND

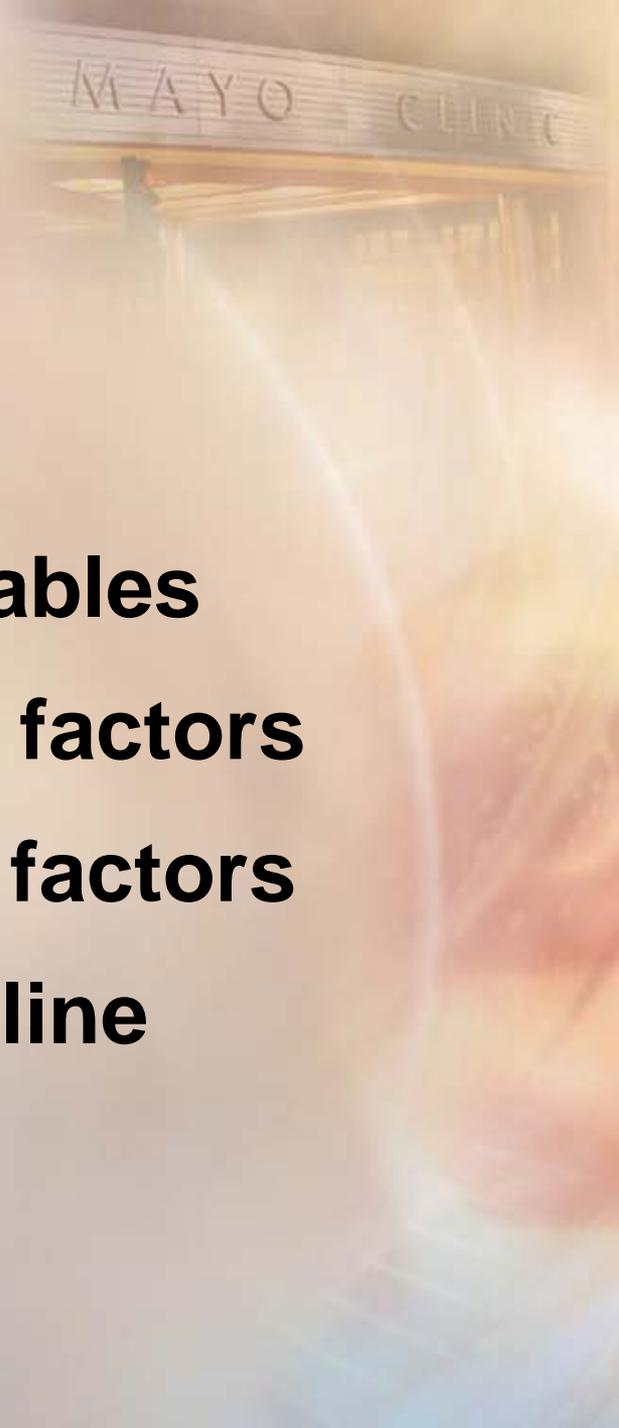
(Professional practice, primary medical care, medical decision making)

### In WOS

Test order\$ or diagnostic test\$ or laboratory test\$ AND  
order\$ or behavior\$

# RESULTS

- **253 articles reviewed**
- **92 met inclusion criteria**
- **59 articles- Physician variables**
- **24 studies- Patient related factors**
- **6 studies- Disease related factors**
- **17 studies- Effect of guideline**





# Physician Variables

# Physician Variables

**Specialization**

**Location**

**Age / Gender**

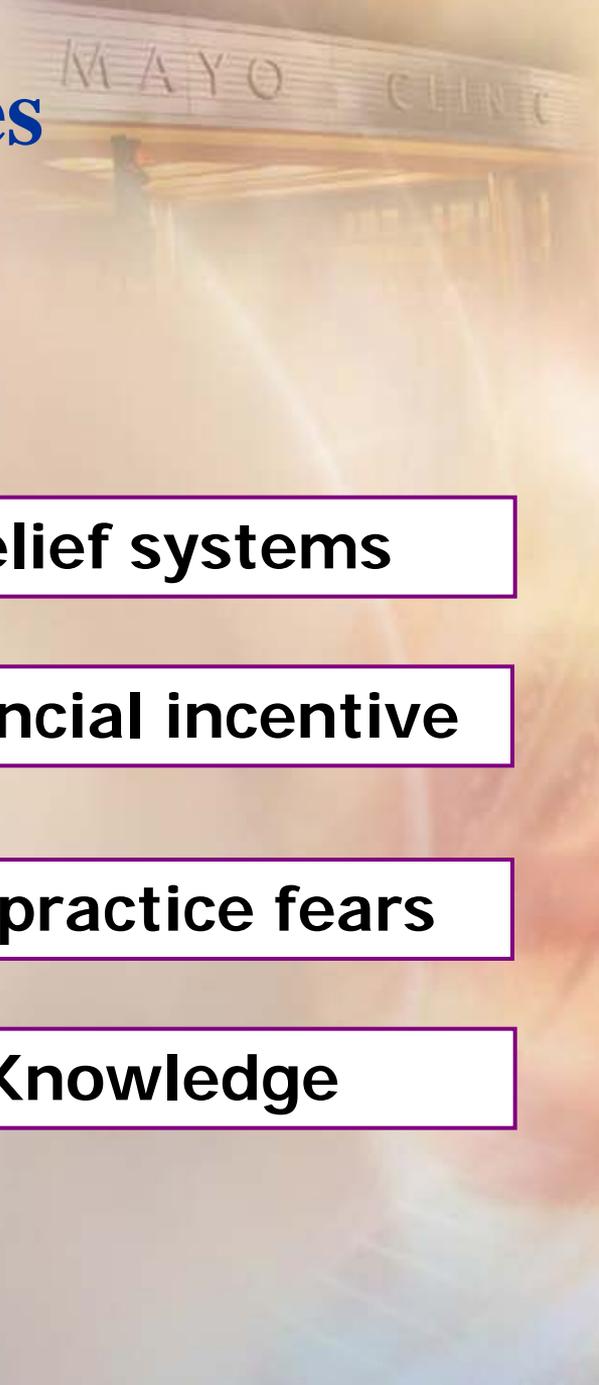
**Practice setting**

**Belief systems**

**Financial incentive**

**Malpractice fears**

**Knowledge**



# Physician Variables : Specialization

## Specialists ordered more tests compared to PCPs

- **Acute LBP (1580 patients): Radiography was ordered by orthopedic surgeons in 70% compared to PCPs in 41%**

(Carey et al; Arch Int. Med; 1996)

- **Office visits (1.12 billion): Cardiologists ordered exercise stress tests, 3.7 (95% CI, 2.7-5.1) more commonly in office visits compared to Primary care physicians (after adjustment for clinical and non-clinical variables)**

(Cohen et al Am Heart J, 1999)

# Physician Variables : Age & Gender

- **Routine tests for surgical consultations: Older primary care physicians ordered more routine ECGs and routine labs** (Stafford, R.S. et al. Arch Intern Med, 2001. 161(19): 2351-5; Kristiansen, I.S. et al. Fam Pract, 1992. 9(1): p. 22-7)
- **USPSTF guidelines adherence: Younger family physicians adhered more to guidelines compared to older colleagues** (Stange, K.C., et al., J Fam Pract, 1994. 38(3): p. 231-7)
- **Referrals to specialists: Female physicians more commonly referred patients to specialists** (Franks, P., et al., J Gen Intern Med, 2000. 15(3):163-8)

# Physician Variables : Practice setting

- **Solo practitioners v group practices: Solo practitioners ordered more imaging tests and less preventive screening** (Carey, T.S., et al. *Ann Intern Med*, 1996. 125(10): p. 807-14; Stange, K.C., et al. *J Fam Pract*, 1994. 38(3): 231-7)
- **Hospital based v non-hospital based physicians: Hospital based physicians ordered more tests** (Stafford, R.S. et al. *Arch Intern Med*, 2001. 161(19): p. 2351-5; Bushnell, C., et al. *Neurology*, 2001. 56(5): p. 624-7)
- **Academic v Non-academic setting: Academic physicians had a lower threshold for test ordering** (Winkenwerder W, et al. *JGIM* 1993;8(7):369-73)

# Physician Variables : Belief systems

- **Belief in usefulness of screening:**
- \* **If physicians doubted the efficacy or usefulness of a screening modality, they didn't offer it to their patients**  
(Turner, B., et al., J Gen Intern Med, 2003. 18(5): 357-63; Taylor, V.M., et al. Cancer Detect Prev, 1994. 18(6): p. 455-62).
- \* **If physicians believed that the screening test improved QOL and survival, the test was ordered more frequently** (Hicks, R.J., et al. Arch Fam Med, 1995. 4(4): p. 317-22)
- **Belief in therapeutic value of a test: Personal belief that a normal test provides reassurance and psychological satisfaction led to more test ordering**
- (Little P, et al. Family Practice 1998;15(3):264-65)



# Physician Variables : Financial incentive

- **ECG and EEG: Physicians billing for ECG or EEG readings ordered them more often**  
(Birbeck, G.L., et al., Neurology, 2004. 62(1): p. 119-21; Stafford, R.S., et al. Arch Intern Med, 2001. 161(19): p. 2351-5)
- **Imaging studies: Physicians owning an interest in an imaging facility or equipment ordered imaging tests more often**  
(Carey, T.S., et al. Ann Intern Med, 1996. 125(10): p. 807-14)
- **Source of payment: Physicians ordered more tests if pay source was private insurance compared to Medicare**  
(Cohen, M.C., et al. Am Heart J, 1999. 138(6 Pt 1): p. 1019-24).

# Physician Variables: Fear of litigation

- **Overestimation of malpractice risks: Physicians overestimated the risk of being sued by 3 fold**
- **Percentage of tests ordered to prevent lawsuits: Family practitioners reported that 27% of the tests ordered were to prevent a law suit**
- **Effect on practice patterns: Fear of litigation resulted in increased specialty referrals**

(Lawthers, A.G., et al., *J Health Polit Policy Law*, 1992. 17(3): p. 463-82).

(Van Boven K, et al. *Journal of Family Practice* 1997;44(5):468-72).

(Franks, P., et al., *Why do physicians vary so widely in their referral rates?* *J Gen Intern Med*, 2000. 15(3): p. 163-8).

# Physician Variables: Knowledge and Experience

- **Deficiency in Physician Knowledge base led to:**

- \* **Inappropriate test ordering for Lyme disease**

(Eppes, S.C., et al. Clin Pediatr (Phila), 1994. 33(3): p. 130-4)

- \* **Poor follow up of positive Hepatitis C screening**

(Woodall, D.W., et al. J Fam Pract, 1994. 39(3): p. 257-61)

- **Good knowledge base led to:**

- \* **Appropriate genetic testing for germ line mutations**

(Wideroff, L., et al., Cancer Epidemiol Biomarkers Prev, 2003. 12(4): p. 295-303).

- **Effect of experience on test ordering: The effect was variable.**

(Scholer SJ, et al. Archives of Pediatrics & Adolescent Medicine 1996;150(11):1154-9).



# Patient Variables

# Patient Variables

**Age**

**Gender**

**Race**

**Insurance coverage**

**Expectation**

**Anxiety**



# Patient variables: Age, Gender, Race

- AGE: Older patients got more:
  - 'Routine' ECGs
  - 'Baseline' screening tests in normal state of health
  - Tests for preoperative evaluation.
- GENDER: Men were more likely to get:
  - Routine ECGs, ETTs, and colorectal cancer screening
- RACE: Caucasians got more:
  - CT/MRI for low back pain evaluation
  - ETTs

# Patient variables: Insurance Status

- Privately insured patients compared to others had more:
  - \* Routine lab testing
  - \* Screening tests and
  - \* Special testing



# **Patient variables:** **Expectations, inquiry, anxiety**

- **Patients expectations and inquiry: generated more baseline screening tests, even without an actual medical indication**
- **Anxious patients: More likely to get tested particularly for atypical symptoms**



# Other variables with Increased test ordering

<p><b>Day of the week</b> (Cheng et al. Laboratory Hematology 2003;9(4):207-13)</p>	<p><b>More tests ordered on Mondays and Fridays than other days</b></p>
<p><b>Seasonal variation</b> (McGillivray DL, et al. American Journal of Diseases of Children 1993;147(8):870-74 )</p>	<p><b>More tests ordered from July-Nov compared to Mar-Jun</b></p>
<p><b>Use of local practice guidelines</b> (Wang et al. Archives of Internal Medicine 2002;162(16):1885-90)</p>	<p><b>Use of local practice guidelines led to decreased test ordering</b></p>
<p><b>Easy availability of lab test on the laboratory order form</b> (Zaat et al. Medical Care 1992;30(3):189-98)</p>	<p><b>More tests ordered; test ordering frequency decreased with alteration in the form</b></p>
<p><b>Advertisement</b> (Wideroff et al. Cancer Epidemiol Biomarkers Prev, 2003. 12(4): p. 295-303)</p>	<p><b>Genetic studies of germ line mutations ordered more after media attention</b></p>

# Conclusions

- **Several non-EBM variables affect physician test ordering.**
- **Some of these variables can be modified by targeted education, legislative actions and other interventions.**
- **Excess test ordering significantly contributes towards health care costs.**



# Thank you!

