

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

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# Background

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

**Decrease practitioner variability.  
Optimize patient care**



# Clinical Decision Making

**Observation**



**Hypothesis generation**

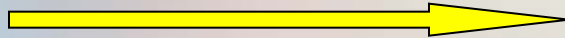
(Heuristics, biases and pre-test probability)



**Hypothesis refinement**



**Test**



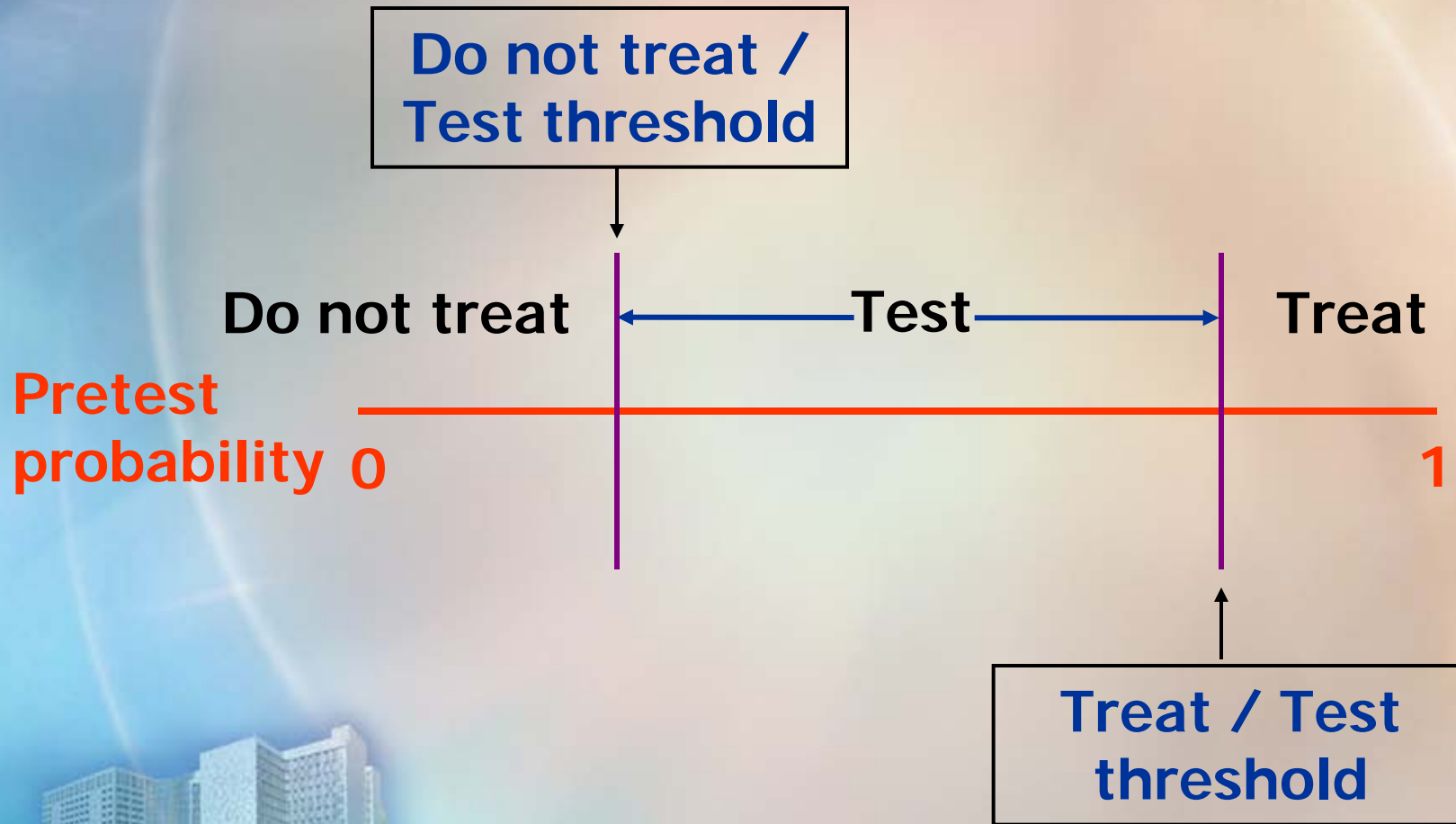
**Diagnostic verification**



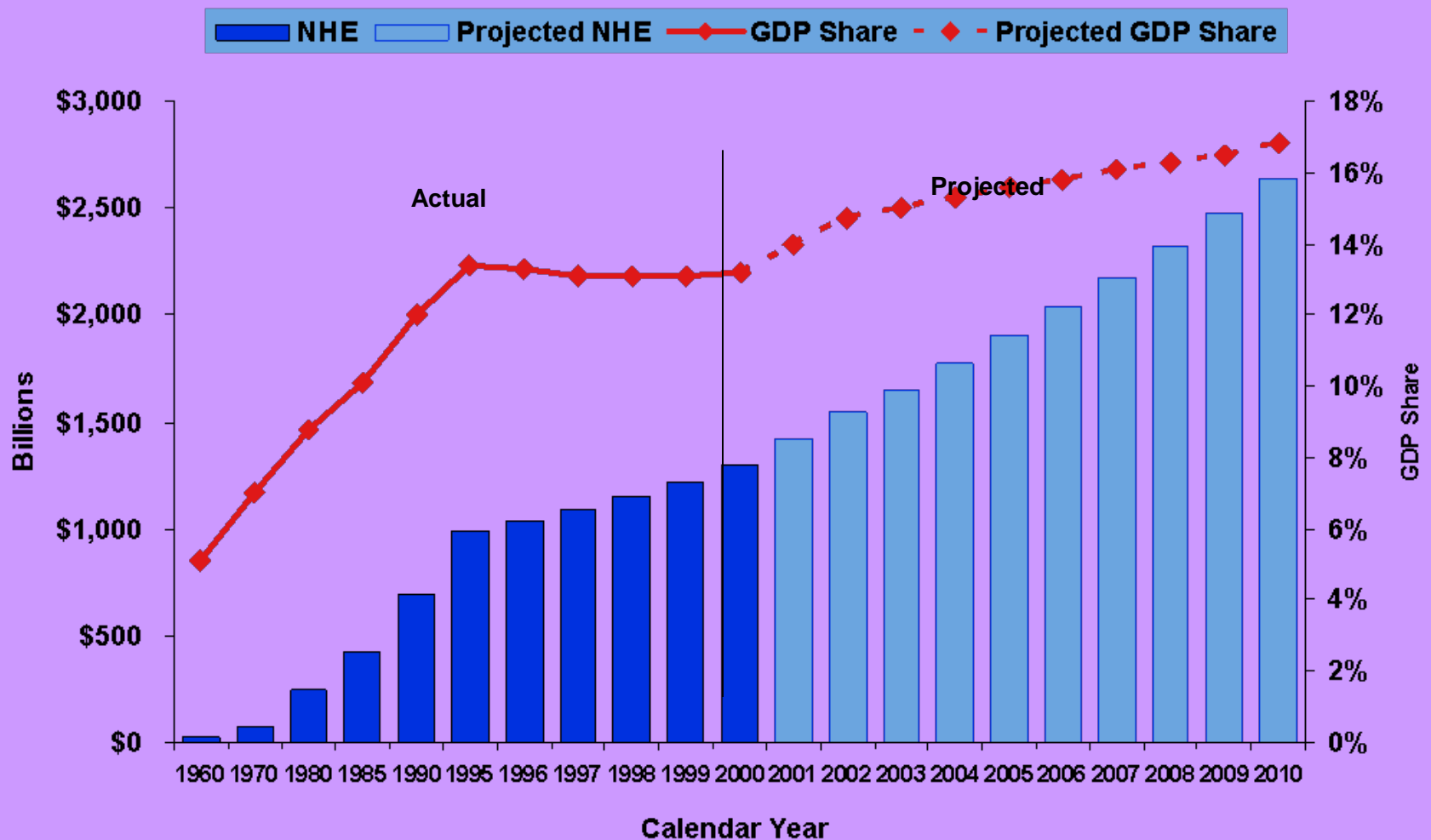
**Treatment**



# Clinical Decision Making



# National Health Expenditure (1960-2010)



# 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 law-suits:** 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

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



# 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!

