

# What is KT research ?



- Studying the determinants of knowledge use and effective methods of promoting the uptake of knowledge
- Implement evidence with evidence



# Translating Research into Clinical Practice

- Passive educational activities such as CME:
  - Setting: conference room or home PC
  - Methods: educational
  - Outcomes: based on CME credits
    - poor at changing physician behavior

Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D, Sibbald G, Straus S, Rappolt S, Wowk M, et al. The case for knowledge translation: shortening the journey from evidence to effect. *BMJ* 2003. 327(7405):33-35.



# Translating Research into Clinical Practice

- Knowledge Translation:
  - Setting: clinical practice environment
  - Methods: clinical pathways or clinical decision support (CDS) tools
  - Outcomes: patient-important outcomes or physician behavior

Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D, Sibbald G, Straus S, Rappolt S, Wowk M, et al. The case for knowledge translation: shortening the journey from evidence to effect. *BMJ* 2003. 327(7405):33-35.

# Two Examples of KT Research



- Focus on Health Outcomes
  - Diagnostic evaluation of PE
    - Rationale
    - Development of EBM guideline
    - Implementation (KT strategy)
    - Pragmatic observational study
- Focus on Changing Behavior
  - Mobile computer
    - Access to CDS tools
    - Physician satisfaction/efficiency

# Rationale for Development of PE Diagnostic Guideline



- Confusion regarding the appropriate use of D-dimer in the diagnosis of PE
- Large evidence base - but not consistently applied in clinical practice
  - *Translation of best evidence not occurring!*



# Pragmatic Study Design

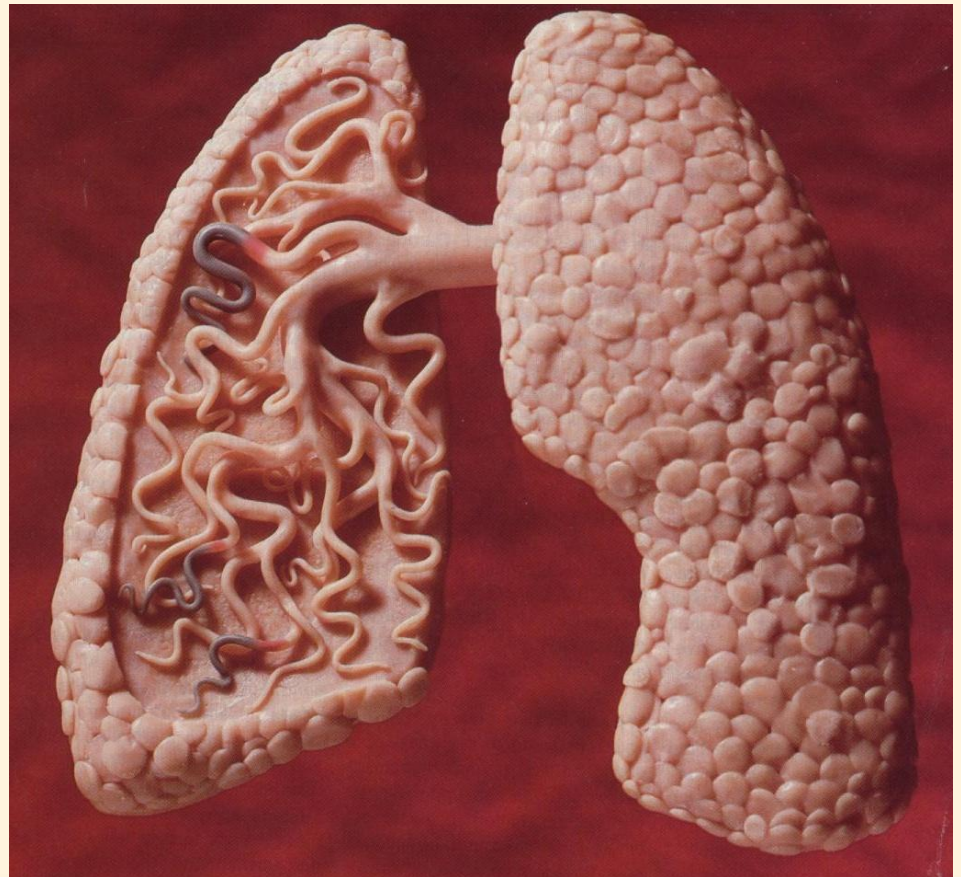
- Aim to test whether an intervention is likely to be effective in normal clinical practice
- Conducted on broader (more diverse) groups of subjects
- Researchers have less control on delivery of intervention

Schwartz D & Lellouch J (1967). *Journal of Chronic Diseases*



# Clinical Focus:

- Pretest probability estimation
- D-dimer testing



# Evidence Base: *D-dimer AND PE*



- MEDLINE Clinical Queries:
  - Diagnosis 454 hits
  - Systematic Reviews: 29 hits
- ACPJC
  - 20 hits – 2 directly relevant
- AHRQ Guideline Clearinghouse([www.guideline.gov](http://www.guideline.gov))
  - Clinical guidelines: 10 hits
    - ACEP Guideline #1 on list
  - AHRQ Evidence Based Practice
    - 1 Evidence Report directly relevant

# ACEP and AHRQ Reports



- Comprehensive
- Evidenced-based
- Difficult to implement into clinical practice

1. Clinical policy: Critical issues in the evaluation and management of adult patients presenting with suspected pulmonary embolism. *Ann Emerg Med* 2003. 41(2):257-270.
2. AHRQ Evidence Report/Technology Assessment No. 68, Diagnosis and Treatment of Deep Venous Thrombosis and Pulmonary Embolism. 1/2003.

# Pretest Probability Important



- Based on gestalt
- Based on prediction rule:
  - Wells
  - Wicki
  - Charlotte
- Advantages and disadvantages with each approach
  - Focus on common elements

# Modified Charlotte Rule Using 4 Strongest Predictors :



- Unexplained hypoxia
- Hemoptysis
- Unilateral leg swelling
- Recent surgery

# D-dimer



- Screening test
- Multiple small studies with conflicting results and conclusions
- Ideal for meta-analysis

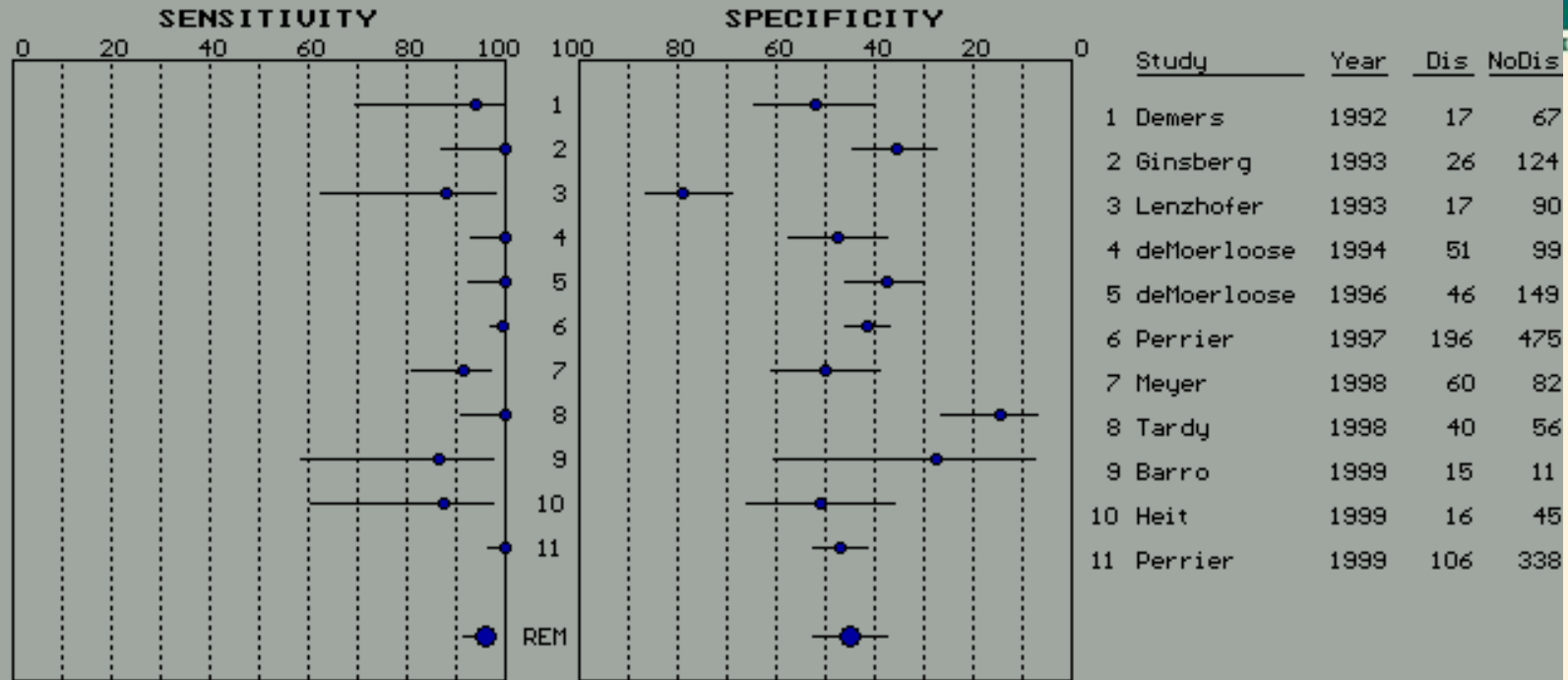
Brown MD, Rowe BH, Reeves MJ, Bermingham JM, and Goldhaber SZ. The accuracy of the enzyme-linked immunosorbent assay D-dimer test in the diagnosis of pulmonary embolism: a meta-analysis. *Annals of Emergency Medicine* 2002. 40(2):133-44.

# ELISA



Sensitivity/Specificity Plot

BLIND.MT1



Options: 1 2 3 4 5 A D G H L M P S

# Results:



- Sensitivity 95%
- Specificity 45%



# ACP Journal Club

- LR positive: 1.7
- LR negative: 0.1

Number of studies	Sensitivity (95% CI)	Specificity (CI)	+LR	LR
11	95% (90 to 98)	45% (38 to 52)	1.73	0.11
9	94% (88 to 97)	45% (36 to 55)	1.71	0.13

\*Diagnostic terms defined in Glossary; LRs calculated using the pooled summary estimates of sensitivity and specificity reported by the author.

ACPJC Vol 138, Jan/Feb 2003

# Subgroup Analysis for ELISA:



<u>Study Group</u>	<u>% Sensitivity</u>	<u>% Specificity</u>
Age > 70	100	<u>14</u>
Duration > 4 days	<u>73</u>	33

# A Simple Plan



- Guideline for when to order D-dimer
  - start with clinical gestalt
  - account for conditions that increase pretest probability into moderate range
  - account for conditions that result in poor D-dimer test characteristics



## D-dimer not recommended:

- Unexplained hypoxia
- Hemoptysis
- Unilateral leg swelling
- Recent surgery
- Pregnant
- Age  $\geq$  70 years
- Duration symptoms  $\geq$  4 days

Decision Support

IDENTIFIED ORDER:

D-DimerVidas (D-Dimer r/o Pulmonary Embolism)

Reference

D-DimerVidas (D-Dimer r/o Pulmonary Embolism)

Search

CarePlan information

Chart guide

Nurse preparation

Patient education

Policy and procedures

Scheduling information

Test most often ordered in the ED. If ordered outside the ED, may **only be ordered** by a Pulmonologist.  
9/19/01

**D-Dimer Vidas testing is NOT recommended if any one of the following is present:**

- ...unexplained hypoxia (pulse ox <95%)
- ...unilateral leg swelling
- ...recent surgery (within last 4 weeks)
- ...hemoptysis
- ...pregnancy
- ...age  $\geq 70$  years
- ...duration of symptoms  $\geq 4$  days

OK

# Two Examples of KT Research



- Focus on Health Outcomes
  - Diagnostic evaluation of PE
    - Rationale
    - Development of EBM guideline
    - Implementation (KT strategy)
    - Pragmatic observational study
- Focus on Changing Behavior
  - Mobile computer
    - Access to CDS tools
    - Physician satisfaction/efficiency

# Overview of previous systematic reviews of professional behaviour change strategies



<b>Generally ineffective</b>	<b>Mixed effects</b>	<b>Generally effective</b>
Dissemination of printed educational materials	Audit and feedback	Reminders
Didactic educational session	Local opinion leaders	Educational outreach
		Multifaceted interventions

Bero et al (1998). *BMJ*  
 Grimshaw et al (2002). *Medical Care*

# Multifaceted approach for Implementation:



- Local opinion leader
  - Consensus building key
- Reminders at the point of care
  - Guideline on pop-up screen
- Educational Outreach
  - Via lecture, e-mail, business meetings



# Following Implementation of PE Guideline:

- 1207 patients suspected of PE
- Primary Outcome: Missed PE
  - 3 month F/U identified 1 miss
  - NPV 99.9% (95% CI: 99.5-100%)
  - Appears “safe”

Brown MD, Vance SJ, and Kline JA. An Emergency Department Guideline for the Diagnosis of Pulmonary Embolism: An Outcome Study. *Acad Emerg Med* 2005. 12(1):20-25.



## Several Limitations:

- Inadequate funding for experimental design
  - i.e. cluster RCT, before and after analysis (comparison to similar setting without intervention)
- Did not have accurate measures for physician compliance
- Did not include a true CDS tool:
  - where physician patient data entry is required
  - where software directs diagnostic approach based on individual level data



# Two Examples of KT Research

- Focus on Health Outcomes
  - Diagnostic evaluation of PE
    - Rationale
    - Development of EBM guideline
    - Implementation (KT strategy)
    - Pragmatic observational study
- Focus on Changing Behavior
  - Mobile computer
    - Access to CDS tools
    - Physician satisfaction/efficiency

# Wireless Mobile Computing



- RCT design in the ED:
  - Wireless vs.
  - Desktop
- Physician behavior outcomes:
  - Utilization rates of electronic CDS tools and clinical guidelines
  - End-of-shift physician questionnaire

Bullard MJ, Meurer DP, Colman I, Holroyd BR, and Rowe BH. Supporting Clinical Practice at the Bedside Using Wireless Technology. *Acad Emerg Med* 2004. 11(11):1186-1192.



# Results Based on 100 shifts:

- Utilization of electronic resources:
  - Increased use of intranet-based clinical practice guidelines (3.6 vs. 2.0 uses/shift)
- Physician survey using 7 point Likert scale:
  - Increased use of CDS tools (4.1 vs. 3.5)
  - Rated as less efficient (3.1 vs. 4.3)

# Translating Research into Clinical Practice



- Knowledge Translation:
  - Setting: clinical practice environment
  - Methods: clinical pathways or clinical decision support (CDS) tools
  - Outcomes: patient-important outcomes or physician behavior

Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D, Sibbald G, Straus S, Rappolt S, Wowk M, et al. The case for knowledge translation: shortening the journey from evidence to effect. *BMJ* 2003. 327(7405):33-35.



# AHRQ Guideline Clearinghouse

- [www.guideline.gov](http://www.guideline.gov)
- Must include aids for Knowledge Translation “Implementation Tools”:
  - Chart Documentation/Checklists/Forms
  - Clinical Algorithm
  - Personal Digital Assistant (PDA) Downloads
  - Pocket Guide/Reference Cards
  - Toolkits

# Conclusion



- It's about people
- Understand why something failed
- Bridging the gap
- Implement evidence with evidence
- KT research