Knowledge Translation
Research in EM

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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

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

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)
  - 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


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

### Sensitivity/Specificity Plot

#### Study Details

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Dis</th>
<th>NoDis</th>
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</thead>
<tbody>
<tr>
<td>Demers</td>
<td>1992</td>
<td>17</td>
<td>67</td>
</tr>
<tr>
<td>Ginsberg</td>
<td>1993</td>
<td>26</td>
<td>124</td>
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<td>Barro</td>
<td>1999</td>
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<tr>
<td>Perrier</td>
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<td>106</td>
<td>338</td>
</tr>
</tbody>
</table>

#### Diagram Details

- **Sensitivity** vs. **Specificity** plot.
- Data points for each study are marked with dots.
- Study numbers range from 1 to 11.
- REM is marked at the bottom.
Results:

- Sensitivity 95%
- Specificity 45%
ACP Journal Club

- LR positive: 1.7
- LR negative: 0.1

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Sensitivity (95% CI)</th>
<th>Specificity (CI)</th>
<th>+LR</th>
<th>LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>95% (90 to 98)</td>
<td>45% (38 to 52)</td>
<td>1.73</td>
<td>0.11</td>
</tr>
<tr>
<td>9</td>
<td>94% (88 to 97)</td>
<td>45% (36 to 55)</td>
<td>1.71</td>
<td>0.13</td>
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</tbody>
</table>

*Diagnostic terms defined in Glossary; LRs calculated using the pooled summary estimates of sensitivity and specificity reported by the author.
Subgroup Analysis for ELISA:

<table>
<thead>
<tr>
<th>Study Group</th>
<th>% Sensitivity</th>
<th>% Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt; 70</td>
<td>100</td>
<td>14</td>
</tr>
<tr>
<td>Duration &gt; 4 days</td>
<td>73</td>
<td>33</td>
</tr>
</tbody>
</table>
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 ≥ 70 years
- Duration symptoms ≥ 4 days
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 ≥ 70 years
...duration of symptoms ≥ 4 days
Two Examples of KT Research

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● Focus on Changing Behavior
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### Overview of previous systematic reviews of professional behaviour change strategies

<table>
<thead>
<tr>
<th>Generally ineffective</th>
<th>Mixed effects</th>
<th>Generally effective</th>
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</thead>
<tbody>
<tr>
<td>Dissemination of printed educational materials</td>
<td>Audit and feedback</td>
<td>Reminders</td>
</tr>
<tr>
<td>Didactic educational session</td>
<td>Local opinion leaders</td>
<td>Educational outreach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multifaceted interventions</td>
</tr>
</tbody>
</table>

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”

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
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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

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)
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AHRQ Guideline Clearinghouse

- 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