Evidence-Informed Trauma Care:
The potential for Evidence Mapping in Clinical Training

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The Global Evidence Mapping Initiative
PUTTING RESEARCH INTO CONTEXT
“Just in Time” learning
The EBM Approach to Education

- Shift focus to current patient problems ("just in time" education)
  - Relevant to YOUR practice
  - Memorable – and behaviour changed!
  - Up to date

- Skills and resources for best current and active

Dave Sackett
Managing Information

- The Airline industry
  - Boeing 777 manuals
    - 24 binders
    - 10 feet shelf space
  - Conversion to CD
    - Reduced search by 60%

- The Health Industry
  - Memorize “the manuals”
  - Exams, audits, etc to check
“It is surely a great criticism of our profession that we have not organised a critical summary, by specialty or subspecialty, of all relevant randomised controlled trials”

-Archie Cochrane
Systematic review

- A review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review.

- Cochrane Collaboration (2005) Glossary of Terms
Clinical Practice Guideline

- Systematically-developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances.

- Institute of Medicine 1990
The 5 steps of EBP

1. Ask an answerable question
2. Find the appropriate evidence
3. Appraise the evidence
4. Apply the evidence to clinical practice
5. Evaluate your practice
Types of clinical questions

- Aetiology or causation
  - What is the risk that this exposure will cause a given disease?

- Diagnosis or assessment
  - What test should I use to investigate this patient’s disease? Accuracy?

- Treatment and prevention
  - Does this treatment improve this condition in patients like this one?

- Prognosis
  - Given the patient demographics, what is the natural history of this condition so I can predict the consequences?

- Economic evaluation
  - What is the cost-effectiveness, cost-benefit of various treatments?
Convert the Question to PICO

**PICO** stands for

- Patient (or **Population** / **Problem**)
- Intervention (or **Indicator**)
- Comparison (or **Control**)
- Outcome
Effective information retrieval

• Ask the right question (i.e. PICO)
• Match the study design to the type of question
• Design an appropriate search strategy
• Use sources of highest yield
What is evidence-based practice?

- Best available evidence
- Clinical expertise, experience, skills, and judgment
- Patient needs, values, and preferences
What type of evidence to look for?

<table>
<thead>
<tr>
<th>Question about...</th>
<th>Best study design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention/Therapy</td>
<td>Randomised controlled trial (or Systematic review of RCTs)</td>
</tr>
<tr>
<td>Diagnosis/Screening</td>
<td>Effect on health outcomes: RCT</td>
</tr>
<tr>
<td></td>
<td>Accuracy: cohort</td>
</tr>
<tr>
<td>Prognosis</td>
<td>Longitudinal cohort</td>
</tr>
<tr>
<td>Aetiology/Risk factors</td>
<td>Randomised controlled trial (if ethical)</td>
</tr>
<tr>
<td></td>
<td>Cohort, case control</td>
</tr>
</tbody>
</table>
How to read a paper

THREE CRITICAL APPRAISAL ISSUES

A. Is the trial valid? (Is this a ‘good study’?)
B. What are the results?
C. How relevant are the results to me?
Applying the evidence: a balance judgment of benefits vs risks/costs

- Magnitude of treatment effect
- Precision of treatment effect
- Risk of target event
- Risk of serious adverse events
- Cost of therapy
- Values
- Generalisability
Organising I: systematic reviews - 20% done for therapy

Reviews and protocols for reviews on
The Cochrane Database of Systematic Reviews
Issue 1/2005

Alderson, 2005
Mapping Research Evidence in Traumatic Brain Injury & Spinal Cord Injury

The Global Evidence Mapping Initiative
PUTTING RESEARCH INTO CONTEXT
in collaboration with

- Melbourne Health
- Southern Health
- The Australasian Cochrane Centre
- The Cochrane Effective Practice & Organization of Care Group
- Centre for Clinical Effectiveness
- Monash University
- The National Institute of Clinical Studies / NH&MRC
- National ICT Australia
Evidence Map or Scoping Review

• ... gather together existing literature in a specific topic area and categorise it to create a coded database of literature. Experts are consulted at several stages and the literature is sourced and evaluated through complex search strategies and the application of rigorous topic-related inclusion criteria, and follows procedures similar to those conducted for systematic reviews. It allows the diversity of studies and the balance between different study types to be examined before deciding how to proceed with developing the evidence base in specific areas.

Bates & Coren, 2007
Evidence Maps

Existing Research
- Evidence-based practice
- Evidence-based policy

Gaps in research evidence
Research Opportunities
- Primary studies
- Systematic reviews
In broad clinical areas maps convey

- what research exists
- where the gaps are
- the strengths and weaknesses of existing research
- its relevance in different patients & contexts
## EBP misconceptions

<table>
<thead>
<tr>
<th>FALLACY</th>
<th>FACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBP is useless when there is no good evidence</td>
<td>EBP means appropriately using the best available evidence to care for patients</td>
</tr>
<tr>
<td>EBP is algorithms that ignore clinical judgment/expertise</td>
<td>Clinical judgment must be used in deciding how to apply the evidence</td>
</tr>
<tr>
<td>EBP is just numbers and statistics</td>
<td>EBP is not numbers in a vacuum - the evidence must be individualised to each patient</td>
</tr>
</tbody>
</table>
Broad stages in mapping

1. Generating & Prioritising Research Questions

2. Searching for & retrieving studies

3. Appraising what the evidence says, and what the gaps are
The many potential outcomes

- Identified Research Questions
- Tabulation of Studies
- Detailed Description of Studies
- Detailed synthesis
Mapping Workshop

- Brainstorm & prioritise decisions & questions
- Professional facilitator & nominal group technique
- Pre-hospital Mapping Workshop - Nov 21st, 2007
  - Metropolitan Ambulance Service
  - Rural Ambulance Victoria
  - Major Trauma Services
  - Regional hospitals
<table>
<thead>
<tr>
<th>Q no.</th>
<th>Question</th>
<th>Criteria 1: Clinical Importance</th>
<th>Criteria 2: Currency / Novelty</th>
<th>Criteria 3: Controversy</th>
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<tbody>
<tr>
<td>1</td>
<td>Effectiveness of intubation</td>
<td>3.55</td>
<td>3.00</td>
<td>3.27</td>
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<td>2</td>
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<td>3</td>
<td>Definition of hypotension</td>
<td>2.73</td>
<td>2.45</td>
<td>2.82</td>
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<td>2.00</td>
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<td>9</td>
<td>Impact of mode of transport (e.g. aeromedical vs. ground ambulance transport)</td>
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<td>10</td>
<td>Effect of spinal immobilisation</td>
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<td>11</td>
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<td>12</td>
<td>Effect of hypoxemia on morbidity and mortality</td>
<td>3.36</td>
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<td>16</td>
<td>Most effective staffing models (e.g. paramedic versus physician based)</td>
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<td>2.45</td>
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Search & Retrieval

Search specialist & Reproducible methods
Massive task of searching multiple databases using complex search strategies, and searching reference lists

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<tr>
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<th>n (citations reviewed)</th>
<th>n (full text reviewed)</th>
<th>n (studies eligible)</th>
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# Searching & retrieval - TBI

<table>
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<tr>
<th>Question</th>
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<td>Definition of hypotension</td>
<td>High</td>
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<td>97*</td>
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<td>High</td>
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<td>58*</td>
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<td>997*</td>
<td>11*</td>
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Citations from the same search strategy ("TBI blood pressure and oxygen saturation")
Citations from the same search strategy ("TBI fluid therapy resuscitation")
Citations from the same search strategy ("TBI Immobilisation")
Citations from the same search strategy ("TBI transport")
Our Database

- Citation details
- Study design & Quality
- Study characteristics
  - patient population
  - context
  - intervention
  - outcome measures
- Results
Challenges in representing the map
Is bed rest ever helpful?
A systematic review of trials*

- 10 trials of bed rest after spinal puncture
  - no change in headache with bed rest
  - Increase in back pain

- Protocols in UK neurology units - 80% still recommend bed rest after LP
  Serpell M, BMJ 1998;316:1709–10

- ...evidence of harm available for 17 years preceding...

*Allen, Glasziou, Del Mar. Lancet, 1999
Appraisal of evidence & gaps

Patient factors

Patient with severe head injury → Prehospital Intubation → Mortality & Functional outcomes

Contextual factors

24 observational studies, 2 reviews – intubation may be associated with harm
1 ongoing RCT (Victoria) – what role of contextual factors i.e. paramedic experience & training
Appraisal of evidence & gaps

Patient with severe head injury \(\rightarrow\) hyperventilation \(\rightarrow\) Mortality & Functional outcomes

Contextual factors

6 observational studies – mild hyperventilation possibly beneficial, more significant hyperventilation possibly harmful
No RCT comparing mild hyperventilation with normal PCO2
Appraisal of evidence & gaps

5 RCTs and 2 cohort studies examining different fluid types, 2 ongoing RCTs – none show benefit of using anything other than normal saline or Hartmanns solution.
Future of Neurotrauma Evidence Maps

- Evidence-based Research
  - Identifying & addressing important research gaps
  - Knowledge generation & knowledge synthesis

- Web-development
  - Interactive “living” updated maps

- Evidence-based Practice & Policy
  - Identifying & addressing important evidence-practice gaps
  - Knowledge Translation

The Global Evidence Mapping Initiative
PUTTING RESEARCH INTO CONTEXT
Many “Leaks” from research & practice

If 80% achieved at each stage then
\[0.8 \times 0.8 \times 0.8 \times 0.8 \times 0.8 \times 0.8 \times 0.8 = 0.21\]
Size of Medical Knowledge

- NLM MetaThesaurus
  - 875,255 concepts
  - 2.14 million concepts
- Diagnosis Pro
  - 9,200 diseases
  - 20,000 abnormalities (symptoms, signs, lab, X-ray,)
  - 3,200 drugs (cf FDAs 18,283 products)

1 per day for 25 years
Rule 31 – Review the World Literature Fortnightly*
**"Kill as Few Patients as Possible"** - Oscar London

![Bar chart showing medical articles per year](chart)

- Biomedical: 5,000? per day
- MEDLINE: 1,500 per day
- Trials: 55 per day
- Diagnostic: Low number
And the information we need is widely scattered

Studies of BNP in MEDLINE
Natriuretic Peptide 10,110
MeSH BNP 2,204
PubMed: Clinical Queries
  broad 799
  narrow 82

Our systematic review
Of BNP accuracy for the Diagnosis of heart failure
20 studies qualified;
Found in 16 journals
“Just in Time” learning: Intern’s information needs

- Setting: 64 residents at 2 New Haven hospitals
- Method: Interviewed after 401 consultations
- Questions
  - Asked 280 questions (2 per 3 patients)
  - Pursued an answer for 80 questions (29%)
  - Not pursued because
    - Lack of time
    - Forgot the question
- Sources of answers
  - Textbooks (31%), articles (21%), consultants (17%)

Green, Am J Med 2000