Critique and Use of the Scientific Evidence – Sharpening Skills
Russ Olmstead, St. Joseph Mercy Health System, Michigan
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Hosted by Jim Gauthier
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Sponsored by
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Agenda
• List at least one bibliographic search engine to identify evidence related to the practice of infection prevention and control.
• Describe concepts used in critical appraisal of scientific evidence.
• List elements used to score quality and strength of peer reviewed studies.
• List at least one strategy involved in application of evidence to prevent infection.

Disclosures, R. Olmsted
– Speakers’ Bureau: Advanced Sterilization Products, Ethicon Inc., Sage Products

Building the Case for Connection Between Scientific Evidence & the Infection Preventionist


Practice Standard: Research
• Participates; evaluates; and/or applies relevant research findings to infection prevention, control, and epidemiology practice
• Critically evaluates published research and incorporates appropriate findings

Building the Business Case for Scientific Evidence & the Infection Preventionist


Domain: Infection Prevention & Control
• The IP must be able to critically evaluate research and apply the findings to their practice setting

Domain: Performance Improvement & Implementation Science
– Uses literature review as an essential tool
– Interprets and applies meta-analyses; interprets research findings, identifies study limitations and bias

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Research & Implementation Science are elements within the new IP Competency Model published by APIC; Murphy DM, et al. Am J Infect Control 2012 (May);40:296-303

Finding the Evidence: Bibliographic Search Engines: tool at your fingertips -

PubMed® - U.S. National Library of Medicine’s (NLM) bibliographic search system.
It is available free on the Internet at http://pubmed.gov
- Searchable database system contains:
  > 21.6 million records from 5,052 publications
covering biomedicine and health, 1950 to the present
Uses Medical Subject Headings (MeSH) to create an index of published studies,
example: the term “nosocomial” maps to the MeSH heading “cross Infection.” For more details visit: http://www.nlm.nih.gov/mesh/meshhome.html

What’s Available from PubMed? Simple Search
1. Identify the key concepts for your search.
2. Enter the terms (or key concepts) in the search box.
3. Suggestions will display as you type your search terms.
4. Click here to run this search in PubMed.

Example:
1. Type the term, “cross infection Clostridium difficile” into the search window
2. Click the search button
3. Result = 1,221 retrievable abstracts (when provided) sorted by date of publication (default setting that is modifiable)

What’s Available from PubMed? continued
- Advanced search capabilities
- Abstracts: email, clipboard, export to citation management software, etc.
- Full text articles – based on permissions from publisher and/or author
- Additional functions: related citations matcher, Link Out, Clinical Queries
- Tutorial
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Other Bibliographic Search Engines

• Cumulative Index to Nursing and Allied Health Literature (CINAHL) – hosted by EBSCO
  – www.ebscohost.com/cinahl
• EBSCO Publishing
  – www.ebscohost.com
• OVID
  – Wolters Kluwer Publishing
  – www.ovid.com

Hierarchy of Scientific Evidence: rank order of quality of findings

Evidence-Based Practice; step-wise approach

• "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research." (Sackett D, 1996)

  • Assess and identify the problem
  • Develop a question that is in need of an answer
  • Locate the scientific evidence that pertains, e.g. search the literature
  • Appraise the evidence
  • Apply the evidence
  • Evaluate the efficacy/impact of intervention implement based on the evidence

Sharpening Your Skills: Locating, Assessing and Grading the Evidence

Step 1. Formulate your question.

The reason for a bibliographic Index + search engine:
800,000 manuscripts published each year

Appraising the Evidence: HICPAC Guidelines Method

• Healthcare Infection Control Practices Advisory Committee (HICPAC), CDC
  – New methodology begun with catheter-assoc. UTI prevention Guideline
  – Starting point: I've got a question…
  – Targeted systematic reviews of the literature using:
    • "grading of recommendations assessment, development, and evaluation (GRADE) system

GRADE System & Development of Evidence-Based Recommendations, CDC; Umscheid CA 2010

Table 1. Formulating recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Strength of Recommendation</th>
<th>Quality of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong (A)</td>
<td>Strong evidence for benefit or harm</td>
<td>Very high</td>
</tr>
<tr>
<td>Moderate (B)</td>
<td>Moderate evidence for benefit or harm</td>
<td>High</td>
</tr>
<tr>
<td>Weak (C)</td>
<td>Weak evidence for benefit or harm</td>
<td>Moderate</td>
</tr>
<tr>
<td>Forbid (C)</td>
<td>Evidence for harm</td>
<td>Low</td>
</tr>
</tbody>
</table>

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Application of GRADE by HICPAC:


- Question 2: What are the best methods to identify an outbreak of norovirus gastroenteritis in a healthcare setting?
  - Search found: moderate quality evidence from a single diagnostic study - use of the Kaplan criteria to detect outbreaks of norovirus gastroenteritis. (119)
  - Recommendation 2.A.1 In the absence of clinical laboratory diagnostics or in the case of delay in obtaining laboratory results, use Kaplan’s clinical and epidemiologic criteria to identify a norovirus gastroenteritis outbreak. (Category IA)
  - Citations:

How Good is the Quality & Quantity of Evidence?

Preventability of Healthcare associated infections

- Results of literature search and assessment:
  - 4,847 potentially relevant articles identified
  - 434 articles were retrieved / 64 ultimately met the inclusion criteria
  - Only 15 were part of the final analysis
  - Reasons for elimination of studies from the pool of 64:
    - Low quality score using GRADE system (31)
    - > 10 years old (7)
    - Only reported processes – no outcome data (5)
    - Study performed outside the U.S. (11)
- Study Conclusions of Preventability? Class assignment - put search terms below in PubMed search window:
  - umschid ca cost cross infection 2011

Resource on Review and Assessment of the Evidence:

Scicluna EA, IJIC 2012; vol. 8 (no.4)

What are these results telling me?

Elizabeth Anne Scicluna
Infection Control Unit, Mater Dei Hospital, Malta, Malta

- Good review of the following key elements that a smart consumer of evidence needs: case definition, bias/confounding, sample size & power, Meta analysis

Applications of the Evidence:

Are Infection Preventionists Using the Evidence?

Model of Diffusion of Innovation: Rogers EM, 1962

1847

How long after Semmelweis’ work did it take for alcohol-based handrub to be used in U.S. hospitals?

Are Prevention Practices Making it to the Bedside? Case Study using CAUTI. Krein SL, 2010

Rate of CAUTI can be reduced by half with use of catheter reminder or stop order.

Is there any new evidence on efficacy of antimicrobial urinary catheters?
- Class assignment #2:
  1. Go to PubMed
  2. Type in the following terms in the search window:
     - “antimicrobial urinary catheters 2012”
     - Take a look at the study you find near the top of the search results
     - My dog ate my internet browser is not acceptable for completion  ;-) 

Implementation Science: A Definition
- Implementation Science (IS) is the scientific study of methods to promote the systematic uptake of clinical research findings and other evidence-based practices into routine practice, and hence to improve the quality (effectiveness, reliability, safety, appropriateness, equity, efficiency) of health care. It includes the study of influences on healthcare professional and organisational behaviour.’

Implementation Science Across the Career Development of an Infection Preventionist

Novice
- Performs literature searches & reviews
- Use HAI surv. Findings to identify needs
- Begin to understand performance improvement (PI) & IS tools and techniques

Proficient
- Can critically analyze and assess research findings; identify limitations and bias
- Apply IS & PI in special projects and daily work. Presents poster session at national IP meeting

Advanced
- Performs and publishes systematic reviews of the literature using GRADE system
- Active research program and publishes studies
- Coordinates multi-facility PI collaboratives

Moving Evidence from the Journals to the Bedside
- All 4 of the following found correlation between IP with CIC* and implementation of evidence-based prevention strategies:
  - *certification in infection prevention & control
Translational Research: Moving Science to Action

- Definition: Translational research/evaluation involves moving knowledge and discovery gained from the basic and epidemiologic sciences to its application in clinical and community settings.

Translational Research: Another model for moving evidence forward

- $T_0$: characterized by the discovery of opportunities and approaches to health problems through technologic advances, surveillance, outbreak investigation, and epidemiologic studies.
- $T_1$: seeks to move discovery into first application of candidate interventions in healthcare settings and patient populations.
- $T_2$: assesses the value of the candidate interventions leading to the development of evidence-based guidelines.
- $T_3$: attempts to move evidence-based guidelines into health practice, through delivery, dissemination, and diffusion research. aka Implementation Science
- $T_4$: seeks to evaluate the "real world" health outcomes of population health practice


Future Prevention Successes Depend on Investment in Each Phase of the Research Process; J. Jernigan - CDC

Keys for the Elimination of Healthcare-associated Infections

- Collect data and disseminate results
- Full adherence to best practices
- Recognize excellence
- Identify and respond to emerging threats
- Improve science for prevention through research

- "Sustained elimination of HAIs can be based on this public health model of conduct action and evidence. Elimination will require the implementation of evidence-based practices, the alignment of financial incentives, the closing of knowledge gaps, and the acceleration of information to bases progress and to enable responses to emerging threats.


CLABSI Prevention at Middlemore Hospital, NZ. Seddon ME, et al. NZMJ 2011;124:9-21

- CLABSI rate decreased from 6.6 to 0.9/1,000 central line days
- Median days between CLABSI events increased from 30 to > 100

Antimicrobial Stewardship & The IP

- Trautner BW, et al Implementation Science 2011, 6:41
- A hospital-site controlled intervention using audit and feedback to implement guidelines concerning inappropriate treatment of catheter-associated asymptomatic bacteriuria (ABU)

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The efficacy of outcome data in preventing HAIs?

- Impact of surgeon-specific feedback on surgical site infection (SSI) rates in Thailand.
- Observational, before-after trial in 7 Thai hospitals providing surgeon-specific SSI rates & standardized infection ratios (SIR).
- Results: Feedback of performance data had no impact on incidence of SSI.

Improving Awareness and Use of the Literature

- Well-recognized strategy used by clinicians to critique and keep up to date with relevant literature
- Example: methods used…
  - Is the study design clearly identified? Is it appropriate?
  - How representative is the sample?

Conceptual Model for Implementation Science

- Saint S, et al.
  ICHE 2010

Thank You…Any questions?

Additional Resources & Readings:

Centre for Evidence-Based Medicine (Oxford University)
http://www.cebm.net/

Centre for Evidence-Based Medicine (Toronto)
http://ktclearinghouse.ca/cebm/practise/

Dartmouth Biomedical Libraries, U.S. -
http://www.dartmouth.edu/~biomed/resources.html#ebm_resources.shtml#ebm_info

Evidence-Based Nursing Journal:
http://ebn.bmj.com/

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