Evidence-Based Informatics

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Goal and activities for session

- Answer the question, how do we adapt evidence-based medicine (EBM) techniques to practice evidence-based clinical informatics?
- Activities
  - 9:00 – Fellow-led review of EBM
  - 9:15 – Discussion of adapting EBM process to evidence-based informatics
  - 9:30 – Small-group of asking and answering question requiring finding and applying evidence
  - 10:00 – Presentations back to group

What are the major steps in EBM?

- (Answers from fellows)

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What are the major steps in EBM?

- Phrasing a clinical question that is pertinent and answerable
  - Background vs. foreground
  - Question category
- Identifying evidence to address the question
  - Best evidence for question category
- Critically appraising the evidence
- Determining if the evidence applies to the patient

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How do we adapt steps of EBM to evidence-based informatics?

- (Answers from fellows)

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How do we adapt steps of EBM to evidence-based informatics?

- Phrasing a clinical question that is pertinent and answerable
- Identifying evidence to address the question
- Critically appraising the evidence
- Determining if the evidence applies to the patient

- Consider: Wyatt, JC (2016). Evidence-based health informatics and the scientific development of the field. *Studies in Health Technology and Informatics*. 222: 14-24.

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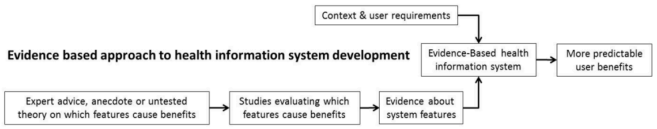
Phrasing the question (Wyatt, 2016)



Stakeholder	Benefit
Patient	Safer, more effective health information systems; faster, more efficient care
Clinician / health professional	Systems that are easier to learn and use, fit better with clinical workflows, are safe and effective, with no surprises. Lower professional liability premiums as a result.
System developers	A clear set of guidelines for use in system development
Funders of clinical information systems e.g. health insurers	Systems that cost less and have predictable benefits
Tax payers, the public	Systems that cost less and have predictable and optimised benefits
Professional indemnity organisations	More reliable, effective health systems, so fewer legal claims against health professionals
System purchasers	A clear set of criteria to use during system procurement
People working in health informatics	Clarity about what to teach students Clarity about what works, when consulted about this A strong core of knowledge to inform future development of the profession
Regulatory organisations e.g. Medicine & Healthcare products Regulatory Agency (MHRA, UK), Food and Drug Administration (FDA, US)	An evidence base of tested principles against which to check new health information technologies
Clinical guideline developers	Good evidence on which to base their recommendations to use - or avoid - clinical information systems

Identifying and appraising the evidence (Wyatt, 2016)

Level	Type of evidence to support "What works?" questions
1a	Systematic reviews of well-designed impact studies designed to directly test a relevant design principle, with low heterogeneity
1b	Systematic reviews indirectly comparing well-designed impact studies that evaluate systems that demonstrate or lack a relevant design principle, with low heterogeneity
2	An individual randomised controlled study comparing the impact on real decisions or actions of a system designed according to a design principle or theory vs. a system not designed according to that principle
3a	Study comparing the safety or accuracy of a system based on the design principle against one not based on that principle, using real patient data
3b	Laboratory studies of simulated decisions or actions in response to a system based on the design principle vs. one not based on the principle, using real or simulated patient data
4	Untested theories or expert advice about what works in system design Anecdotes and case studies ("It worked for me")

Study type	Motive for carrying out study	Typical questions
1. Formative evaluation	How to improve an information system?	Is it accurate? Is it safe? Will people use it? How to improve it?
2. Summative evaluation	Can the finished system solve a specific problem?	Does this system work? How much does it cost? Will people use it?
3. Defensive evaluation	Was the funders' money spent well without making the situation worse?	Has anything improved since the system was implemented?
4. Self-interested evaluation	Can this study help the evaluator build their own CV?	Will this study have an impact on my colleagues?
5. Principle-based evaluation	Can this generic principle contribute to system design and EBHI?	Does this general design principle make systems more usable, effective, safer, less expensive, or more maintainable?

Applying the evidence (Wyatt, 2016)

Question	Type of study	Results	Source	Evidence grade (see Table 2) & comments
How to improve data quality?	Systematic review of 12 (mostly before-after) studies of various strategies in UK primary care	Most strategies appeared to have a positive effect, but study quality poor	Brouwer et.al. 2006 [2]	Evidence grade 1a. But systematic review was limited by poor study designs.
Does the use of psychological theory make a difference in behaviour change websites?	Systematic review and meta regression of 85 RCTs of theory based websites for health behaviour change	Use of theory to design website or recruit participants improved effectiveness by about one third of a standard deviation	Webb et.al. 2010 [10]	Evidence grade 1b. Use of theory may be confounded with better quality website design.
How much of a difference does tailoring and targeting make to text message impact?	Systematic review and meta regression of 19 RCTs of tailored SMS interventions for health behaviour change	Use of tailoring and targeting improves intervention effectiveness by 0.44 of a standard deviation	Head et.al. 2013 [11]	Evidence grade 1b. Use of tailoring may be confounded with better quality text design.
How to improve diagnostic accuracy?	RCT of a checklist	A well designed disease specific checklist improves accuracy by 10%	Adams et.al. 1986 [12]	Evidence grade 2. May reflect limited accuracy of junior doctors.
Can Fogg's principles of Persuasive computing improve websites for health-related decisions?	Online RCT of two websites to encourage 900 students to join NHS organ donation register	No – no difference (38% in both groups)	Nind et.al. 2009 [13]	Evidence grade 2. May only generalise to significant decisions such as organ donation.
Which kind of user interface speeds up data entry?	Experiment with 15 clinicians each entering 63 medical findings from 3 simulated cases using alternative prototype pen based user interfaces	Paged interface 5 seconds faster than scrolling. Complete list of codes 4 seconds faster than patient-specific list. Fixed position on screen 2 seconds faster than variable position.	Poon et.al. 1996 [14]	Evidence grade 3b. Limited to pen-based interfaces?

Group exercise at tables

- Break into groups of 2 or more, one person with Internet access
- Activities (modulo time constraints)
  - Ask an answerable question
  - Find some evidence
  - Appraise the evidence found
  - Does the evidence answer question and apply in your setting?
- (For some) Type one slide and present to group