Presenting Complex Information Effectively for Clinical Decision Making

Design an interface for a computer-based breast cancer treatment choice decision aid

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Reading


Decision Making

- Context
- Decision Making
- Evaluation
- Decision Aids
“Healthcare systems should make all information flow freely so that anyone involved in the system, including patients and families, can make the most informed choices and know at any time whatever facts may be relevant to a patient’s decision making.”

*Institute of Medicine, 2001*
Breast Cancer

In 2005-2009, around 85% of women in England survived their breast cancer for five years or more.  
*Cancer Research UK, 2011*

50,000+ new diagnoses in the UK each year.  
*National Cancer Intelligence Network, 2011*

11,556 women and 77 men in the UK died from breast cancer in 2010.  
*Cancer Research UK, 2011*
Breast Cancer

• Diagnosis
  – Signs/symptoms, Physical examination
  – Imaging; mammogram, magnetic resonance imaging (MRI), ultrasound, ductogram
  – Biopsy; fine needle aspiration (FNA), needle core, surgical excisional/incisional

• Types
  – Early; ductal carcinoma-in-situ (DCIS), lobular carcinoma-in-situ (LCIS)
  – Invasive; lobular or ductal
  – Rare; inflammatory, Paget’s disease, ++
Breast Cancer Treatment

• Surgery
  – Breast conserving, mastectomy, lymph node assessment
• Chemotherapy
  – Systemic cytotoxic drugs
• Radiotherapy
  – High energy x-rays
• Hormone therapy
  – Oestrogen positive cells (ER+)
• Targeted therapy
  – Target specific processes within the cells that cause cancer to grow e.g. Herceptin
Decision Making in Healthcare

- Previous experience
- Personal health beliefs
- Clinician's opinion
- Positive effects of treatment
- Negative effects of treatment
- Disease characteristics
- Social norms
- Family

Patient decision making
Decision Making

- Cognitive dissonance (Festinger, 1957)
- Ambiguity effect (Ellsberg, 1961)
- Risk preference (Tversky & Kahneman, 1981)
- Regret theory (Bell, 1982)
- Choice supportive bias (Mather, Shafir & Johnson, 2000)
- Confirmation bias (Snyder & Cantor, 1979)
- Information bias (Baron, Beattie & Hershey, 1988)
- Bounded rationality (Savage, 1954)
Decision Aids in Healthcare

• Applications
  – To take up screening; e.g., prostate cancer screening
  – Promoting disease prevention; e.g., coronary heart disease prevention
  – Regarding diagnosis; e.g., malaria
  – For treatment choices; e.g., adjuvant breast cancer therapies

• Aims
  – Facilitate shared decision making
  – Facilitate informed consent
  – Reduce cognitive load
Decision Aids

- Comparing choices increases confidence (Musweiler & Posten, 2012)
Aim

• To design an interface for a breast cancer treatment decision aid
• Review literature
Effectiveness Measures

- Treatment undergone
- Whether a treatment decision is made
- Satisfaction with decision
- Condition-specific health status
- Satisfaction with care
- Satisfaction with healthcare encounter
- Time taken to make decision
- Agreement between clinician and patient

- Total costs
- Intervention costs
- Knowledge
- Perceptions
- Optimism
- Decisional conflict
- Level of control
- Adherence to decision
- Strength of intention
- Treatment intention
Decision Aid Development & Evaluation

**Stage 1**
- Back-end testing
  - Validity of underlying maths or computing
  - Quality & accuracy of information

**Stage 2**
- Interface design
  - User-centred design
  - Iterative prototype testing

**Stage 3**
- Pre-release validation
  - Cognitive processes
  - Clarity of info
  - Usability & acceptability

**Stage 4**
- Trials and pilots
  - Decision process
  - Behavioural intentions
  - Behaviour
  - Implementation case studies

**Stage 5**
- Post-implementation
  - Return on investment
  - Long term effects, e.g., patient/clinician satisfaction, time savings, cost savings
Evaluation Elements

EE4: Achievement of aims

EE3: Information clarity

EE2: User experience

EE1: Information accuracy
## Putting it all Together

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<tr>
<th>Development Stage</th>
<th>Evaluation Element</th>
<th>Possible Outcome Measure</th>
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<tbody>
<tr>
<td><strong>1. Back-end testing</strong></td>
<td>1. Information accuracy</td>
<td>IPDAS guide Software Eng metrics</td>
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<td>2. Interface design</td>
<td>2. User experience</td>
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<td>4. Achievement of aims</td>
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<td>6. Behaviour</td>
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Take home message

• To effectively evaluate a decision aid:
  – First ask “What is the aim of the decision aid?”
  – Use the framework to guide the choice of outcome measure

• Future work
  – Presentation format
  – Representing uncertainty
  – Decision stability

Thank you