A Bayesian Model for Evidence-Based Shared Decision Making

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Background

*"Evidence-based medicine (EBM) requires the integration of the **best research evidence** with our **clinical expertise** and our **patient's unique values and circumstances**"*

Straus SE, Glasziou P, et al. "Evidence-Based Medicine:
How to practice and teach it". 4th ed. Churchill Livingstone/Elsevier; 2011

- Evidence for decision making – often based on research data alone
- In practice, other factors are considered → often relying on clinical intuition & heuristics, in an inconsistent manner → heterogeneous comparison

→ Subjectivity & Bias

Elstein AS, Schwartz A. BMJ;2002;324(March):729–32.

- Can we model all EBM parameters in a common "language" for true shared decision making?

Bayesian Analysis

- Use of probability for quantifying uncertainty to make inferences

- By using only research data → assuming individual patient shares characteristics of study sample

Bayes Theorem: $p(\theta|\psi) \sim p(\theta).p(\psi|\theta)$

➔ Incorporating prior beliefs along with research evidence

Gelman A et al. Chapman & Hall/CRC Press; 2013

- Concept not new to EBM → Multiple past recommendations / examples
  → But used mainly in diagnostics (e.g diagnostic tools, nomograms)

Bae J. Epidemiol Health. 2014;(1):1–7

Ashby D, Smith a FM. Stat Med. 2000;19:3291–305

➔ Proposed Idea: Use of Bayesian approach to therapeutic / management decision-making

Clinical example

Management decision uncertainty:

- Anterior Cruciate Ligament (ACL) rupture management:

  1. Surgical ACL reconstruction

  or 2. Conservative management

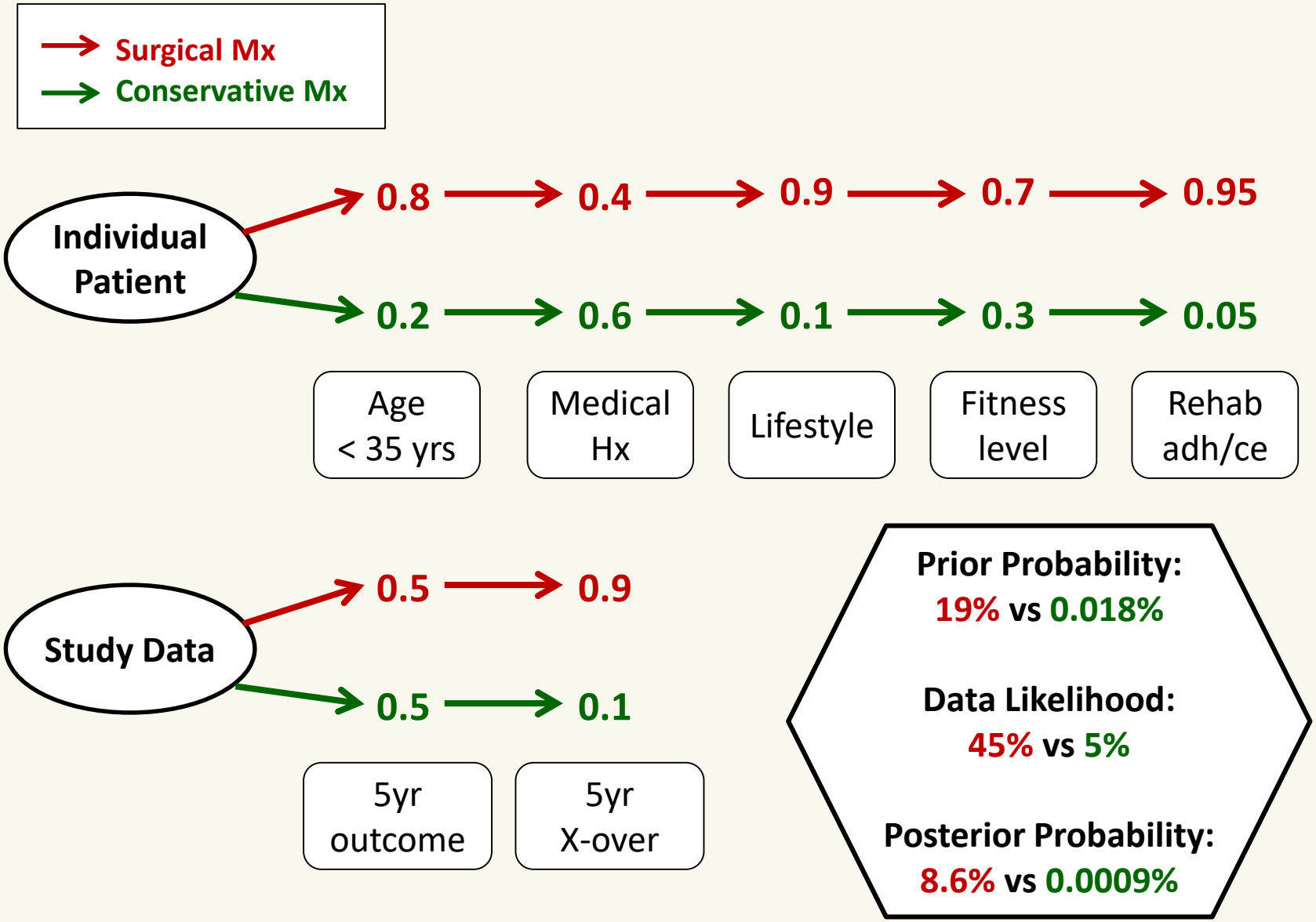
- Research evidence: Cochrane review (1 RCT)

Monk a. P et al. “Surgical versus conservative interventions for treating anterior cruciate ligament injuries” Cochrane Database Syst Rev. 2016

→ No difference between surgical and conservative treatment in patient-reported outcomes at 5 years

- In reality:
  - a specific patient → unique background characteristics, and priorities &
  - a specific treatment team

Probability Modeling



Conclusion

Using a Bayesian approach to treatment decision making

Benefits:

- Bridging the gap between evidence and translation to practice
- Enabling decision making at individual and population level
- Enabling truly shared, patient-centred decision making

Limitations:

- Formalising subjectivity?
- Giving patients a false sense of guarantee?

  → Requires training and shift in perspective

Thank You!

Questions?