Simulation model use to inform colorectal cancer screening delivery: a systematic review

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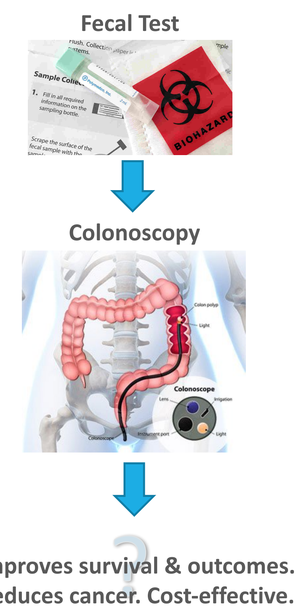
Background

Colorectal cancer (CRC) & screening

- 2nd highest cancer mortality.
- Screening detects cancer earlier & improves outcomes.

- **Optimal** screening population, modality, frequency, & age is difficult to assess:
  - Population specific
  - No feasible RCT



Simulation modeling

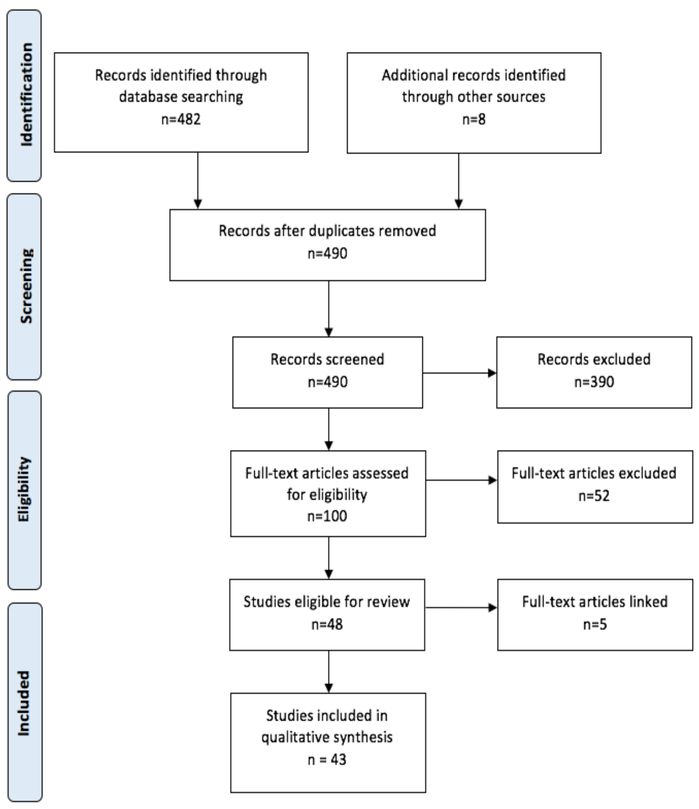
- Representation of a health system.
- Used to assess optimal cancer screening & complex healthcare delivery.
- Analyze scenarios & estimate outcomes to **inform decision-making.**

The validity and impact of simulation models used to inform CRC screening is unknown.

Aim

Assess if simulation modeling informs CRC screening delivery.

Methods



Systematic review of nine academic databases Jan 2008-Mar 2019.

Inclusion Criteria:

- Simulation model incorporating clinical data,
- Target average risk colorectal cancer screening delivery using FIT, FS, FOBT or colonoscopy [†].

[†] FIT(fecal immunohistochemical testing), FS(flexible sigmoidoscopy), FOBT(fecal occult blood test).

Model Validity

- As per international guidelines by ISPOR-SMDM[*], 2012[3].

[*] International Society for Pharamaceconomics &Outcomes Reporting-Soceity of Medical Decision-making

Model informing CRC delivery

- Reported contribution to health system/policy decision.
- Factors for informed decisions [4].

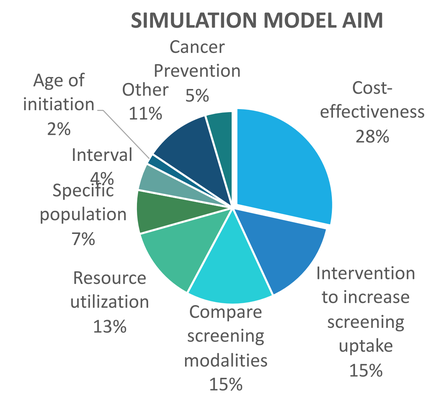
GRADE Evidence to Decision-making Framework Criteria[4]
Priority of problem
Weight of potential benefits and harms
Patient perspective on value
Stakeholder acceptance
Feasibility
Cost-effectiveness
Resource requirements

Results

Model Description

- Developed using published data (86%), registry data (63%), and unpublished data (13%).

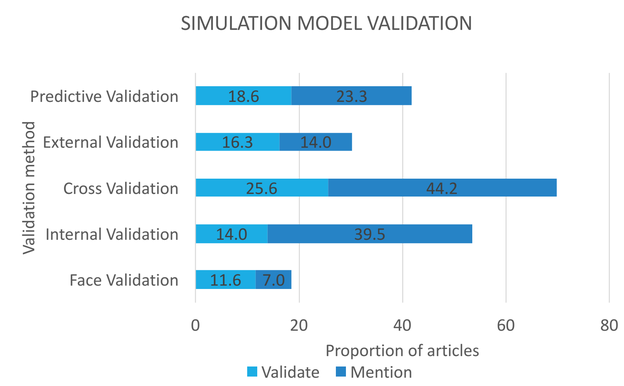
- Majority included a figure of the model (67%) & described model limitations (86%).



Validation

- 54% did not report any model validation.
- Most frequent validation was cross-validation (44%).*
- Only 7% conducted face validation. ✣

*comparing to outputs to similar models
✣confirming accuracy of model with experts (ie clinicians, patients, policymakers).

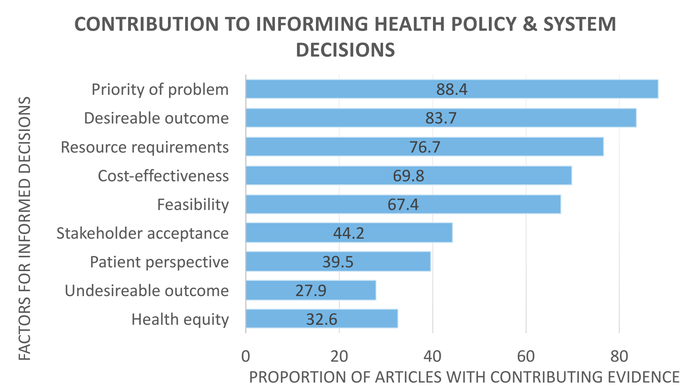


Informing CRC delivery

- 88% aimed to address a specific health policy and systems decision in CRC screening.

- 11% report an impact on that decision.

- 25% involved decision-makers in model development.



Conclusion

Simulation modeling is frequently used to inform specific health system & policy decision in CRC screening.

It has been used to generate evidence for a broad range of factors critical to informed decision-making.

There is need for improved validation and reporting of outcomes to optimize the application & implementation of simulation modeling in healthcare.

NEXT step to develop guidelines for standardized simulation modeling reporting in healthcare.

Acknowledgements & References

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