THE COST OF STERNAL WOUND INFECTIONS AND THE BENEFIT OF IMPLEMENTING ADDITIONAL PATIENT SAFETY PRACTICES: A HEALTHCARE MODEL STUDY IN AUSTRALIA

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Background

- Sternal wound infections (SWI) are severe and costly adverse events of coronary artery bypass graft surgery (CABG), often leading to increased length of stay and/or readmissions
- Australian governments have committed to payment penalties for hospitals in the case of hospital-acquired infections and avoidable readmissions [1]
  - This includes SWIs within 30 days of CABG
- Easy to implement safety practices, such as single-patient use electrocardiogram (spECG) cable and lead systems, can help to prevent SWIs [2]

Aim

- To quantify the costs of CABG-related SWIs in Australia and the cost-benefit of implementing spECG cable and lead systems

Methodology

- An integrative literature review identified Australian data on SWI following CABG, including incidence rates, length of stay, and costs
- The 30-day SWI incidence was 3.6%, of which 36.1% were deep SWIs (DSWI),[3] similar to international values (Fig.1A)
- The data were used to develop a 1-year Markov model with the following parameters (Fig.1B):
  - Population mean age: 68 years, 25% female, 33% obese
  - In-hospital ECG monitoring for ≤6 days
  - Additional length of stay (LoS) due to SWI/DSWI: 7.5/16 days [4,5]
  - Outpatient SWI resulted in outpatient care or readmission
  - Impact of spECG odds ratio: 0.74 (CI:0.63–0.88) [2]
- The patient pathway modelled is displayed in Fig.2
- Cost in 2017 AUD from tariffs and literature and only considers costs incurred by the hospital administration
- Uncertainty in outcomes was assessed by probabilistic sensitivity analysis and reported as the 95% credible interval (95% CrI)
- Inputs can be altered to tailor outcomes to a specific local setting

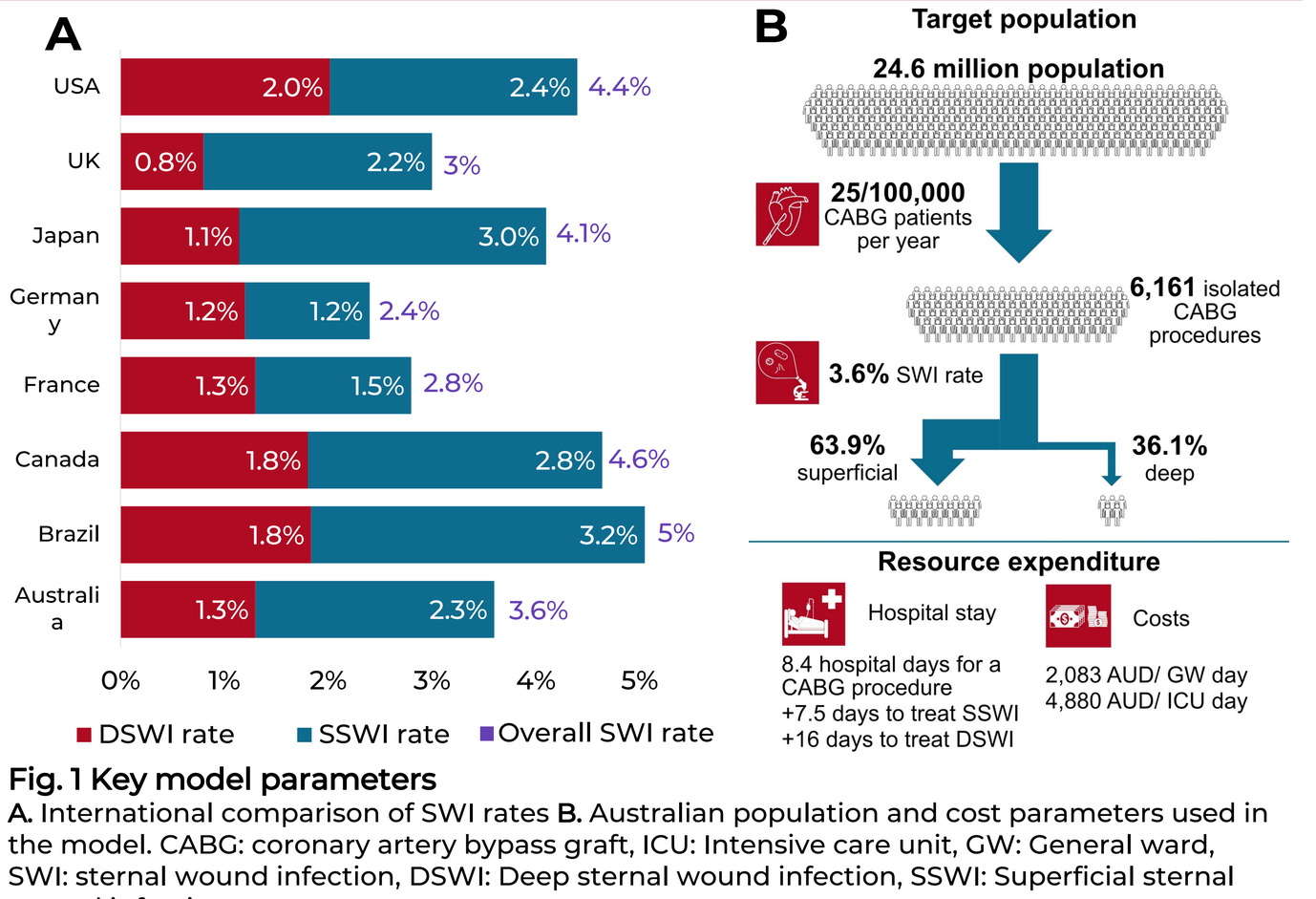

Fig. 1 Key model parameters

A. International comparison of SWI rates **B.** Australian population and cost parameters used in the model. CABG: coronary artery bypass graft, ICU: Intensive care unit, GW: General ward, SWI: sternal wound infection, DSWI: Deep sternal wound infection, SSWI: Superficial sternal wound infection

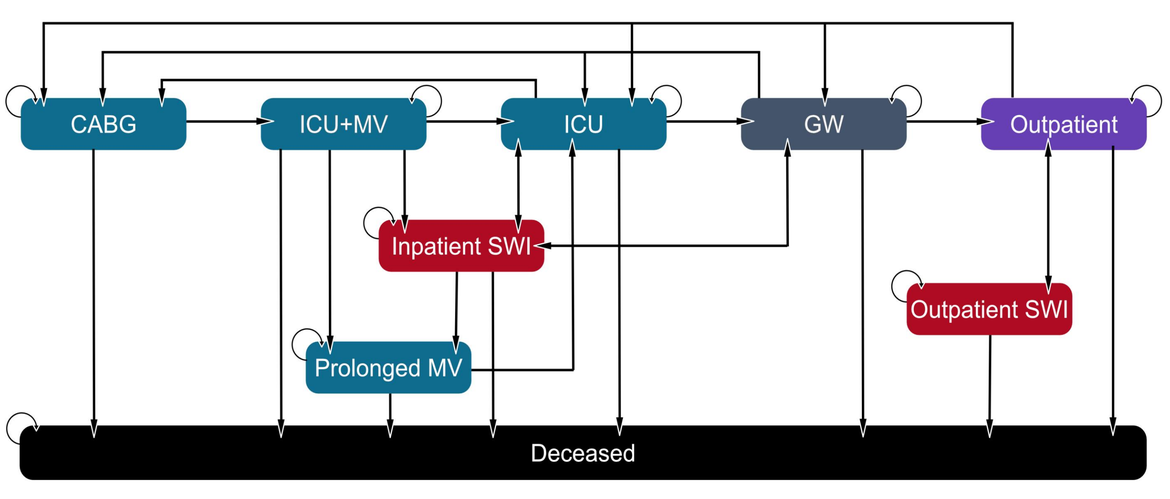

Fig. 2 Markov model flow

After each cycle patients either remain in their current state or transition in another state as indicated by the arrows. Each transition occurs based on a individual probability. CABG: coronary artery bypass graft, ICU: Intensive care unit, MV: Mechanical ventilation, GW: General ward, SWI: sternal wound infection

Conclusion

- The model accurately represents Australian government data
- CABG related SWIs were estimated to incur substantial costs, adding almost A$1,000 to the cost of care of every CABG patient
- Implementing spECG to stop cross contamination could help to reduce the burden and improve patient outcomes

Results

- The model estimated patient LoS for the current standard of care at 8.7 (95% CrI 6.8-10.9) days with a total cost of A$36,703 (95% CrI A$ 31,215 - A$43,068)
- SWIs added A$998 to the mean cost of care per patient
- With 6,161 CABG separations , the annual burden of CABG related SWIs in Australia was estimated at A$6.15 million (95% CrI A$4.2 - A$9,9 million)
- SWI costs are comprised of 247 additional ICU days, 1,362 general ward days, and 128 readmissions of which 28 occurred within 30 days of CABG and 38 within 30 days of discharge
- Implementing spECG was estimated to save (Fig.3):
  - A$1,6 million (95% CrI A$788,000 - A$3.2 million)
  - 71 ICU days (95% CrI 33-161)
  - 389 general ward days (95% CrI 187-948)
  - 33 readmissions (95% CrI 17-57).
- With respect to hospital funding, spECG would likely result in:
  - 31 fewer hospital-acquired SWIs
  - 10 fewer readmissions within 30-days of discharge
- A single hospital performing 200 CABG procedures a year was estimated to save over A$53,000. The mean cost saving per patient was A$265, representing a 25-fold return on investment

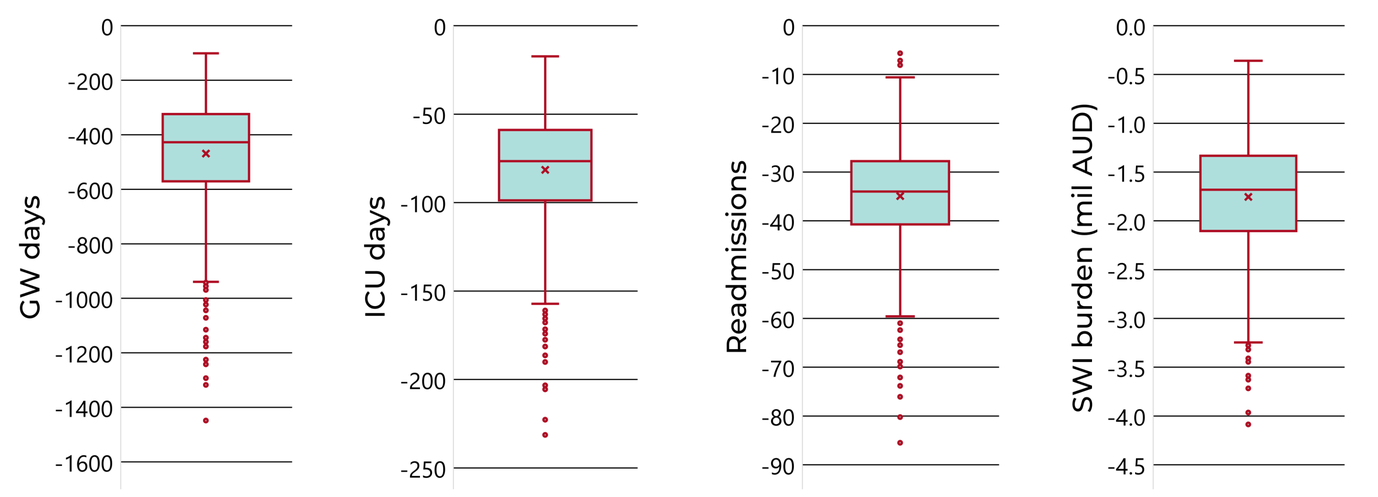

Fig. 3 Savings based on the implementation of spECG cable and lead system

Box and whisker chart showing the median and interquartile range (IQR, central box), the mean (cross x). Each whisker extends 1.5x the IQR, points beyond this are considered outliers. ICU: Intensive care unit, GW: General ward, SWI: sternal wound infection.

Discussion

- Modelled results closely align with government figures [6] which where not used in the creation of this model (Fig.4)
- A group in the USA reduced their DSWI to zero (over 30 months and 590 procedures) after implementation of a Six Sigma assessment, in which they updated 15 of 42 perioperative processes and saved USD 600,000 compared with previous practice [7]
  - Key implementations were: Use of spECG, antibiotic-coated sutures, silver-impregnated dressings

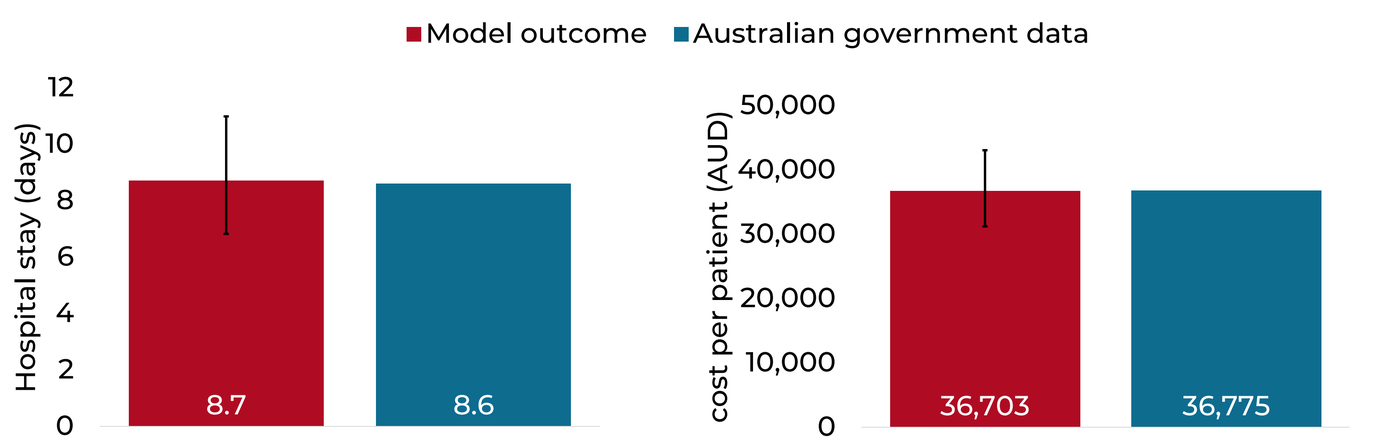

Fig. 4 Model validation

Model median values closely align with data from the Australian government. Differences are A$72 and 0.1 hospital days respectively, Error bars represent 95% credible interval

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