Providing value in the prevention of sternal wound infections following coronary artery bypass graft

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Disclosures

This study was funded by Cardinal Health.

Coreva Scientific is a health-economics and value-based healthcare consultancy that works with a number of medical-device manufacturers.

Xavier University nor its affiliated authors received any compensation for participating in this research project.
Abbreviations

- CABG – Coronary Artery Bypass Graft Surgery
- EU – European Union
- GW – General Ward
- ICU – Intensive Care Unit
- SSI – Surgical Site Infection
- SWI – Sternal Wound Infection
  - DSWI – Deep Sternal Wound Infection
  - SSWI – Superficial Sternal Wound Infection
Sternal wound infections are a serious and costly adverse event

CABG is an established procedure that can greatly improve patient quality of life

SSIs occur in ~1 in 20 CABG patients in the EU
(European centre for disease prevention and control, 2018)

Superficial and deep SWIs increase patient length of hospital stay and readmissions (Jenks et al., 2014)
Research aim

- European data identification
- Quantify SSI/SWI burden
- Assess value-based purchasing
Not all parameters could be represented with local data

- Local data for all investigated parameters was identified for:
  - Austria, Denmark, France, Germany, Italy, the Netherlands, Norway, Portugal, Spain, and the United Kingdom.

- Only partial local data sets could be established for the 20 additional European countries.
Deep and superficial SWI rates following CABG procedures vary

- SWI rates ranged between 2.4–10.4%
- Of which 25–64% were classified as deep SWI

*No deep SWI data available
Model-based approximation of SWI impact on European healthcare systems

- Markov model
- Parameters:
  - CABG procedures/year
  - SWI rates
  - Superficial vs. deep ratio
  - Length of stay
  - Hospital stay to treat SWI
  - Cost of ICU
  - Cost of GW

Example parameters for the UK

- 65.4 million population
- 26/100,000 CABG patients per year
- 1,653 isolated CABG procedures
- 3.0% SWI rate
- 72.56% superficial
- 27.44% deep

Modelled resource expenditure

- Hospital stay
  - 12 hospital days for a CABG procedure
  - +11 days to treat SSWI
  - +23 days to treat DSWI
- Costs
  - 502 € per GW day
  - 1582 € per ICU day
SWIs following CABG have a considerable impact on healthcare budgets

Average cost increase per procedure

Average cost increase per capita

Black border: countries with sufficient data available; borderless: results through extrapolations based on data of other countries
SWIs make up a substantial part of the cost of every CABG procedure

- SWIs represent between 5.2-20.1% of CABG procedure costs
The annual burden in Europe

- €122.5 million overall burden
- €598 per procedure
- >20,000 additional ICU days
- >100,000 additional ward days
Is it realistic? Model validation

- A German costing study (Findeisen et al. 2018), not used in model development, was used to validate the model.

- Findeisen et al. reported that
  - From the payer perspective, an SSI case costs €7,051–8,342 more than a control case.
  - Hospital costs were higher, with a deep-incisional SSI costing an additional €26,331 and organ-space SSIs an additional €59,903.

- Our model, using costs and incidences reported in the paper, estimated an increase of €7,711 for payers.
Value-based purchasing

- Mean cost of an SSI to the healthcare system is €16,423
- A technology preventing one SSI per 100 procedures would save €16,423
- Maximal cost of technology per procedure would be €164

Value-based purchasing is a local decision, the price agreed will vary by country and hospital.
What are the options?

Kles et al, 2015

- A US group reduced their deep SWI rate to 0 (30 months, 590 procedures) following a Six Sigma assessment
- They updated 15 of 42 perioperative processes and saved $600,000
  - Key implementations: disposable ECG leads & wires, antibiotic-coated sutures, silver-impregnated dressings

Lankiewicz et al, 2018

- A single-patient-use ECG cable & lead wire system was shown to reduce SSIs by 18.8% at 30-days post CABG (reaching significance at 90-days post CABG)
References