COST-UTILITY ANALYSIS OF TICAGRELOR REMOVAL BY CYTOSORB® IN PATIENTS REQUIRING EMERGENT OR URGENT CARDIAC SURGERY IN THE UK

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Objectives

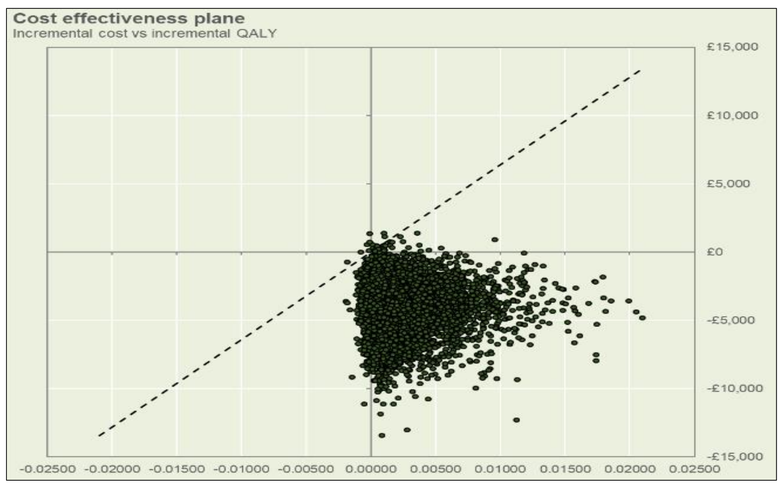
Acute coronary syndrome patients on dual antiplatelet therapy needing emergent or urgent cardiac surgery are at risk of major bleeding, which can impair post-operative outcomes (1). CytoSorb®, a blood purification, adsorbent polymer technology, has been demonstrated to remove ticagrelor from blood during on-pump cardiac surgery (2). This study assessed the cost-utility of intraoperative removal of ticagrelor using CytoSorb versus usual care among patients requiring emergent or urgent cardiac surgery in the UK.

Methods

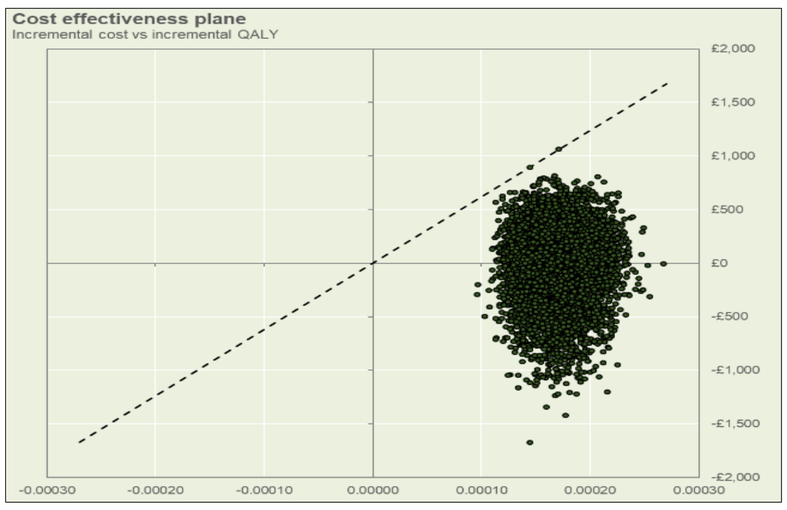
A *de novo* decision analytic model, based on current treatment pathways, was developed to estimate the short- and long-term costs and outcomes. Clinical results from the CytoSorb study (2), other randomized clinical trials, and national standard sources were used to inform the model (3-5). Costs were estimated from the National Health Service (NHS) and Personal Social Services perspective. Deterministic and probabilistic sensitivity analyses (PSA) explored the uncertainty surrounding the input parameters.

Results

In emergent cardiac surgery, intraoperative removal of ticagrelor using CytoSorb was less costly (£12,933 versus £16,874) and more effective (0.06201 versus 0.06091 quality-adjusted life years) than cardiac surgery without physiologic clearance of ticagrelor over a 30-days' time horizon. For urgent cardiac surgery, use of CytoSorb was less costly than any of the three comparators; delaying surgery for natural washout without adjunctive therapy, adjunctive therapy with short-acting antiplatelet agents, or adjunctive therapy with low molecular-weight heparin (£12,935 versus £12,959, £13,200, £13,030 respectively). Results from the PSA showed that CytoSorb has a high probability of being cost saving (99% in emergent cardiac surgery and 53%-77% in urgent cardiac surgery, depending on the comparators). Cost savings derive from fewer transfusions of blood products and re-thoracotomies, and shorter stay in hospital/intensive care unit in the cohort one (emergent cardiac surgery) and shorter length of stay in hospital in the cohort 2 (emergent cardiac surgery). For cohort 1 results from the Tornado diagram showed that ±25% changes on the following inputs had the biggest impacts (±9.4% - ±44.3%) on the estimated total cost savings; total operation time, average LoS (day) in hospital and ICU, cost of operating theatre and ICU and cost of re-thoracotomy. Whereas for cohort 2 the input parameters with the highest impact on the estimated cost saving were average number of hospital bed days while waiting for physiologic clearance of ticagrelor and cost of CytoSorb device implementation and percentage of patient who will not be discharged home while waiting for physiologic clearance of ticagrelor.



2a) Emergent cardiac surgery



2b) Urgent cardiac surgery

Figure 2 Cost-effectiveness scatter plot (£20,000 WTP threshold & 30-days' time horizon)

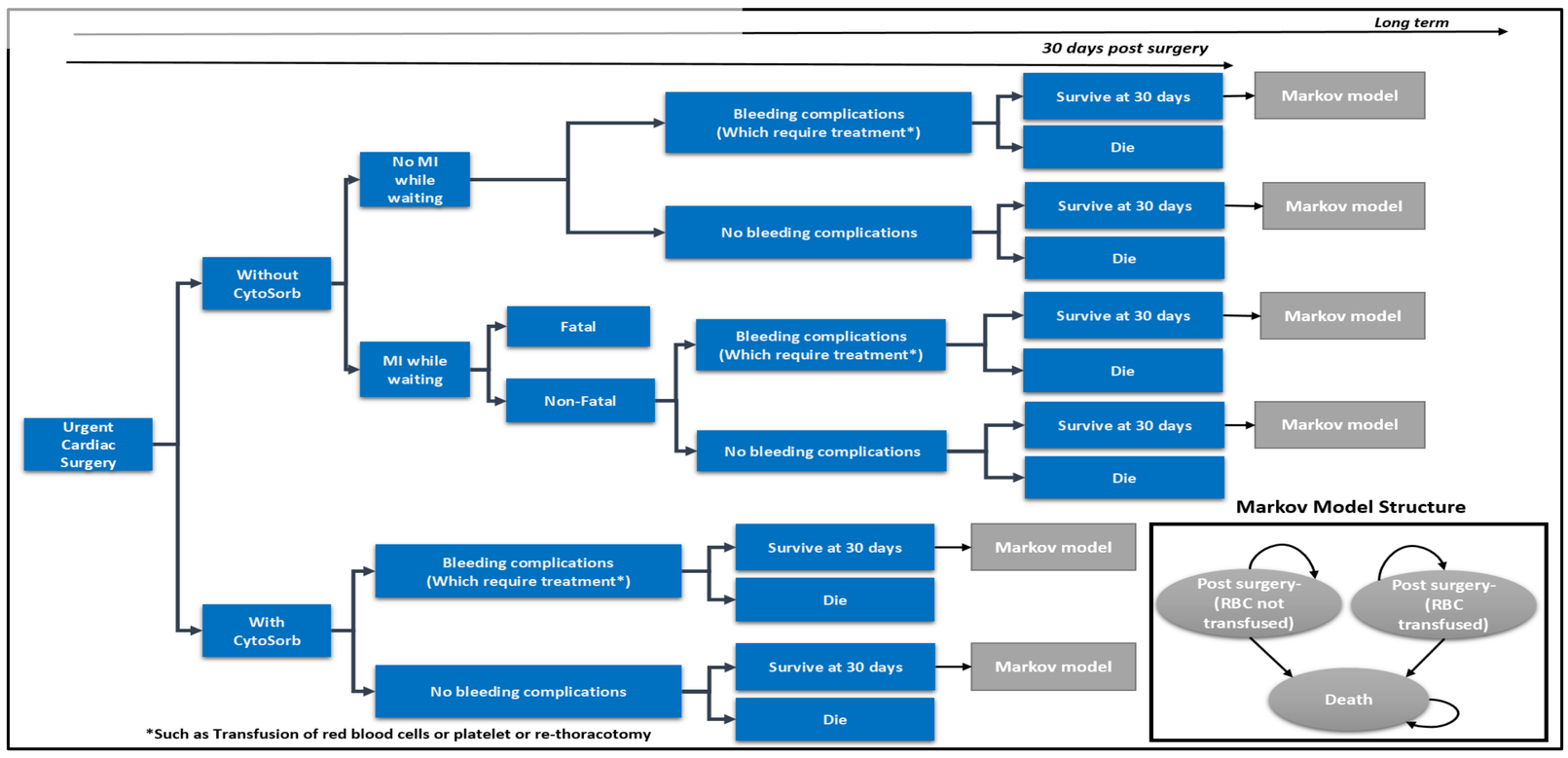


Figure 1 Model structure

Conclusions

The implementation of CytoSorb as an intraoperative intervention for patients on ticagrelor undergoing emergent or urgent cardiac surgery is a cost-saving strategy, yielding improvement in perioperative outcomes and decreased health resource use.

Declaration of funding

FD, DA, FP and JS are employees of CytoSorbents Europe GmbH, Berlin, Germany. EM is an employee of Cytosorbents Corporation, New Jersey, USA. SC is an consultant in CERobs Consulting LLC, North Carolina, USA. MT, MRH and KR have no conflicts of interest that are directly relevant to the content of this article. MJ and MBH received funds from Cytosorbents during the conduct of the study.

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