Reviewer’s report

Title: Adapting a Markov Monte Carlo simulation model for forecasting the number of Coronary Artery Revascularisation Procedures in an era of rapidly changing technology and policy

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Reviewer: Luc GA Bonneux

Reviewer’s report:

LB is a general medical epidemiologist with experience in cardiologic epidemiology and population health policy and limited experience in simulation modelling.

LB declares no interests in the subjects at stake. LB received no recent funding for research in the subject of interventional cardiology use. In 2004 and 2005 LB directed a study on the appropriate use and cost-effectiveness of interventional cardiology as a member of the health administration of the Belgian federal state.

General report

The authors make a “retrospective forecast” of PCI and CABG using a simulation model. They show that incorporating posterior knowledge improves a simulation model, which is hardly surprising.

Major points:

- The current paper is a “spin off” of another paper in press. It is impossible to judge the contribution of this paper without this one.

- The aims of this study are not well defined. The various methods of resource planning and forecasting are not mentioned nor discussed.

- It is hardly surprising that linear models do not capture rapid change and trend ruptures.

- The main assumption of this model is that resource use is determined by needs, without considering offer and demand. The large variability of interventions over time, place and disease epidemiology contradicts this assumption. Many health systems try to steer resource use (and health care costs) by steering the offer. I am not familiar with the Australian system.

- The added benefit of this model over a simpler time series models is assumed, but not discussed.

- CHD admissions seem to have been amalgamated to a same history. There is a world of difference between an elective admission for angina pectoris, an emergency admission for an acute MI, STEMI and non STEMI.
Simulation models are often used to model historical trends, by forcing parameters in the model till it fits. Scientifically, this is unconvincing: the number of unlikely and likely models fitting the observations is infinite. Scientific use of models rejects unlikely scenarios, and shows boundaries in within likely scenarios can move. Falsification is the name of the Popperian game.

The use of drug eluting stents (DES) is debated and debatable. The early benefits in preventing repeat PCI are clear. Repeat PCI are frequent but benign. However, the late complication, stent thrombosis, is infrequent but lethal. DES are not cost effective, and health systems try to limit their use, against the push of the industry. The use of DES is determined by the various actors determining and regulating the offer of riskier and more expensive DES, with less relapse treatment, versus safer and cheaper BMS (bare metal stenting), with more relapse.

New DES will flood the market. Future use and relapse probabilities (and PCI numbers) will dependent on expert consensus over their long term safety and cost-effectiveness.

Advice
Reject

The use of this type of model for modelling and understanding historical trend is irrelevant, used for forecasting it is invalid. It is unlikely that this model will do better in prediction, as it is equally unable to foresee and integrate technological progress.

Content of the present paper suggests it is a spin off of a previous paper, still in press.