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Brief Report

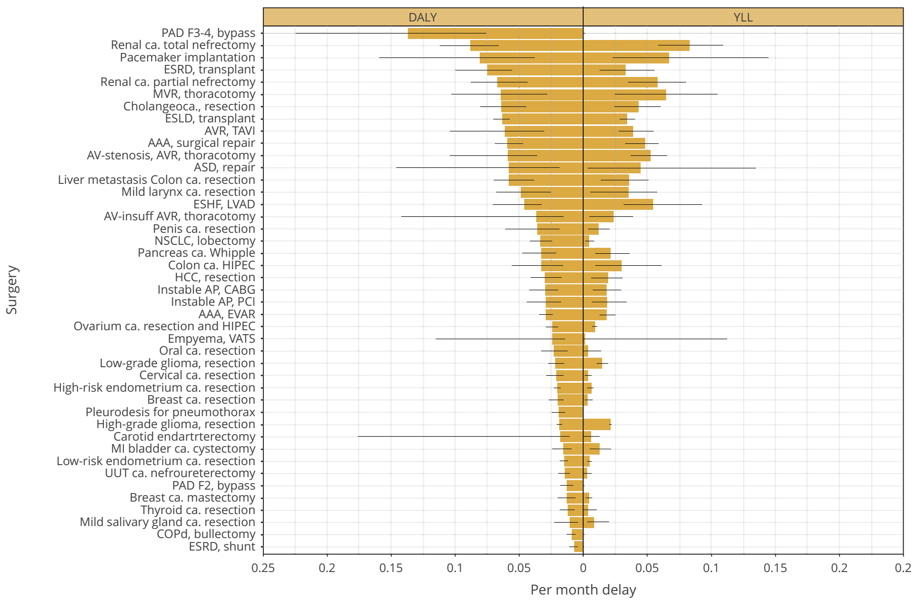
Update on a Model to Minimize Population Health Loss in Times of Scarce Surgical Capacity During the COVID-19 Crisis and Beyond

Benjamin Gravesteijn, PhD,*, Eline Krijkamp, MSc,* Anouk van Alphen, MD, Jan Busschbach, PhD, Geert Geleijnse, MSc, Isabel Retel Helmrich, MSc, Sophie Bruinsma, PhD, Céline van Lint, PhD, Ernest van Veen, BSc, Ewout Steyerberg, PhD, Kees Verhoef, PhD, Jan van Saase, PhD, Hester Lingsma, PhD, Rob Baatenburg de Jong, PhD, on behalf of the Value-Based Operation Room Triage Team Collaborators

Previously, we published a decision model to guide prioritization of semielective surgeries in times of operation room scarcity across disciplines from a utilitarian perspective.[1] The model estimates expected health loss because of delay of surgery for these procedures, for instance because of high incidence of patients with COVID-19.

During further model development, we identified inconsistencies in model output. These inconsistencies could eventually be explained by a coding error in the original model. The error involves the following mistake: Instead of dividing the weeks spent in perfect quality of life (the primary outcome of the model) by the number of weeks in a year (52 weeks), we divided the weeks spent in perfect quality of life by the number of simulated years for the cohort (eg, time between average age at start of the simulation until 100 years of age, interquartile range 34.9-44.0). Therefore, we did not calculate disability-adjusted life-years correctly.

Figure 1. The updated average DALYs and YLLs per month of delay for the investigated surgical procedures based on the simulation of surgery delay of 52 weeks. The estimates (gray bars) and 95% confidence intervals (black lines) are shown.



AAA indicates aneurysm of the abdominal aorta; AP, angina pectoris; ASD, atrial septum defect; AV, aortic valve; AVR, aortic valve replacement; ca., cancer; CABG, coronary artery bypass graft; COPD, chronic obstructive pulmonary disease; DALY, disability-adjusted life-years; ESHF, end-stage heart failure; ESLD, end-stage liver disease; ESRD, end-stage renal disease; EVAR, endovascular aortic repair; HIPEC, hyperthermic intraperitoneal chemotherapy; HCC, hepatocellular carcinoma; insuff, insufficiency; LVAD, left ventricle assist device; MI, muscle invasive; MVR, mitral valve replacement; NSCLC, non-small cell lung carcinoma; PAD F2, peripheral arterial disease Fontaine classification 2; PAD F3-4, peripheral arterial disease Fontaine classification 3-4; PCI, percutaneous coronary intervention; TAVI, transaortic valve implantation; UUT, upper urinary tract; VATS, video-assisted thoracoscopic surgery; YLL, years of life lost.

*Benjamin Gravesteijn and Eline Krijkamp contributed equally as first author.

The consequences of this error are that the urgency for younger patients was slightly underestimated, whereas the urgency for older patients was slightly overestimated. Therefore, the urgency ranking of the diseases changes somewhat and Figure 1 of the publication was updated. Bypass surgery for Fontaine III/IV peripheral arterial disease is still the highest ranked procedure, but total nephrectomy for renal cancer ranks second instead of transaortic valve implantation (which dropped to rank 9). Placing a shunt for dialysis in end-stage renal disease still ranks last, but bullectomy for chronic obstructive pulmonary disease now ranks second last instead of resection of thyroid cancer. The updated model output can be accessed through our user-friendly web application: https://tinyurl.com/y2yzudgw.

We would like to emphasize that the article as presented in *Value in Health* was a proof-of-concept description of the model. The message conveyed by the article does not change by our discovery of the coding error. Therefore, we will continue to develop the model and facilitate and evaluate its implementation. Because coding errors are inherent to model development, we want to once more raise awareness for systematic inconsistency checks to remove the most significant errors.

Article and Author Information

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Author Affiliations: Department of Otorhinolaryngology, Erasmus University Medical Center, Rotterdam, The Netherlands (Gravesteijn, van Alphen, Geleijnse, de Jong); Department of Public Health, Erasmus University Medical Center, Rotterdam, The Netherlands (Gravesteijn, Helmrich, van Veen, Steyerberg, Lingsma); Department of Epidemiology, Erasmus University Medical Center, Rotterdam, The Netherlands (Krijkamp); Department of Medical Psychology, Erasmus University Medical Center, Rotterdam, The Netherlands (Busschbach); Netherlands Institute for Health Sciences, Erasmus University Medical Center, Rotterdam, The Netherlands (Krijkamp, Busschbach); Department of Surgical Oncology and Gastrointestinal Surgery, Erasmus University Medical Center, Rotterdam, The Netherlands (Verhoef); Department of Internal Medicine, Erasmus University Medical Center, Rotterdam, The Netherlands (van Saase); Department of Quality and Patient Care, Erasmus University Medical Center, Rotterdam, The Netherlands (Bruinsma, van Lint); Department of Intensive Care, Erasmus University Medical Center, Rotterdam, The Netherlands (van Veen); Department of Biostatistics, Leiden University Medical Center, Leiden, The Netherlands (Steyerberg).

Correspondence: Benjamin Gravesteijn, PhD, Nt-310, Department of Otorhinolaryngology, Erasmus University Medical Center, Wytemaweg 80, Rotterdam, The Netherlands. Email: b.gravesteijn@erasmusmc.nl

Author Contributions: *Concept and design:* Gravesteijn, Krijkamp, van Alphen, Busschbach, Geleijnse, Retel Helmrich, Verhoef, van Saase, Lingsma, Baatenburg de Jong
Acquisition of data: Gravesteijn, Busschbach, Geleijnse, Retel Helmrich, Bruinsma, van Lint, van Veen
Analysis and interpretation of data: Gravesteijn, Krijkamp, van Alphen, Busschbach, Geleijnse, van Lint, Steyerberg, Verhoef, van Saase
Drafting of the manuscript: Gravesteijn, Krijkamp, van Alphen, Busschbach, Bruinsma, van Veen, Baatenburg de Jong
Critical revision of the paper for important intellectual content: Gravesteijn, Krijkamp, van Alphen, Busschbach, Geleijnse, Retel Helmrich, Bruinsma, van Lint, van Veen, Steyerberg, Verhoef, van Saase, Lingsma, Baatenburg de Jong
Statistical analysis: Gravesteijn, Krijkamp, Steyerberg
Provision of study materials or patients: Gravesteijn, Busschbach
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Supervision: Busschbach, Lingsma, Baatenburg de Jong

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REFERENCE

1. Gravesteijn B, Krijkamp E, Busschbach J, et al. Minimizing population health loss in times of scarce surgical capacity during the coronavirus disease 2019 crisis and beyond: a modeling study. *Value Health*. 2021;24(5):648–657.