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Managing surgical waiting lists through dynamic priority scoring

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Abstract: Prioritising elective surgery patients under the Australian three-category system is inherently subjective due to variability in clinician decision making and the potential for extraneous factors to influence category assignment. As a result, waiting time inequities may exist which can lead to adverse health outcomes and increased morbidity, especially for patients deemed to be low priority.

This study investigated the use of a dynamic priority scoring (DPS) system to rank elective surgery patients more equitably, based on a combination of waiting time and clinical factors through a mathematical formula. Such a system enables patients to progress on the waiting list in a more objective and transparent manner, at a rate relative to their clinical need. The proposed formulation can be seen below, where P is priority score, t is waiting time in days, M is the maximum recommended waiting time (MRWT) for the patient's assigned urgency category (such that $M \in \{30, 90, 365\}$ – e.g., MRWT for category 1 patients is 30 days) and $\sum_{i=1}^{n} c_i$ is the clinical factor score: $P = \frac{t}{M}(1 + \sum_{i=1}^{n} c_i)$.

Clinicians from the project team assessed a cohort of historical patient case files and completed clinical factor selection forms for each patient. These forms were developed in collaboration with clinicians for ten procedures in the general surgery specialty by identifying factors relevant to each procedure and determining appropriate criterion weightings. Relative clinical factor criterion weightings were calculated using the PAPRIKA algorithm (Hansen and Ombler, 2008), implemented through the online multi-criteria decision-making tool 1000minds© (https://1000minds.com). Clinical factor scores for each patient were derived through the summation of the respective criterion weights for the selected clinical factors.

To assess the impact and compare waiting time behaviour of the DPS system with the current three-category system, a simulation model was developed. The simulation horizon was set for a period of three years, and patient arrival schedules for each simulation replication of the three-category system were generated through resampling historical arrivals from the collected data. A genetic algorithm was used to tune the number of daily theatre sessions in each replication to ensure summary statistics of the simulated model matched historical summary statistics. The DPS system was then run in parallel with the calibrated theatre schedule. The results were aggregated and compared, providing a retrospective comparison of the two prioritisation techniques.

Results indicate that the DPS system has significant potential to transform surgical waiting list management by incorporating explicit, defensible, and transparent criteria to prioritise surgical intervention. Using clinical factor selection forms to prioritise patients on predefined criteria may also reduce the subjectivity associated with urgency category classification and patient assessment, resulting in improved consistency across multiple clinicians. Incorporating these criteria through a standardised prioritisation formula enabled greater waiting time consistency for patients of similar clinical need, while also ensuring patients of higher clinical need were appropriately prioritised. This system is likely to improve overall efficiency of waiting list management by providing an objective metric to prioritise patients, systematically improving equitable access to surgery, increasing public trust and confidence in waiting lists, and greatly reducing the current administrative burden of managing waiting lists.

REFERENCES

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