Optimizing Dialysis Initiation Strategies

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Currently little is known about the relationship between the timing of dialysis and the therapy's cost and effectiveness. While attempts have been made to encourage an earlier start time, many questions remain and guidelines and practice continue to differ. Here we examine the cost-effective initiation of dialysis and compare standard initiation criteria to computationally-derived policies. Comparisons make use of a simulation model that integrates sub-models of disease progression, hospitalization, transplantation, cost and quality of life. The model is also used by an Approximate Dynamic Programming algorithm to derive optimal policies. Numerical results highlight the following findings: (i) Standard early initiation strategies, where patients are simply kept on a fixed weekly program, have a limited potential. (ii) Dialysis with incremental dosage and customized to each patient can yield a significant cost advantage. Compared to guidelines proposed by the National Kidney Foundation, annual cost savings of $435 million may be realized. More generally, the problem investigated here is the optimal initiation of an expensive therapy. This problem is systemic in health care and important for policy setting and clinic management. Specifically, it is now recognized that optimal strategies should be customized to patients' attributes. Yet robust methodologies to develop such strategies are not widely available, inhibiting the practical implementation. This research develops such methodologies utilizing the tools of Operations Management.

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