ESSAYS IN EFFICIENCY IMPROVEMENT IN MULTI-SPECIALTY HEALTHCARE SERVICE PROVIDERS

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ABSTRACT

The healthcare industry has undergone several transitions over decades and has been of keen interest to practitioners, academia and policy makers. The industry is expected to touch USD 280 billion by 2020 and would continue to be one of the chief revenue generators and employment providers for our nation. The hospitals and clinics would jointly contribute to about 80% of the revenue pie of the healthcare industry in our country. The health care industry is customer intensive in nature and mostly work in the context of need-based services. The health care delivery process involves complex interdependent tasks of myriad durations exploiting diverse capabilities. It is noteworthy, that the service delivery is accomplished by a harmonious interplay between the human, clinical (process) and infrastructural elements. There is a blend of standardization as well as case specific customization, thereby exposing the service providers to several operational challenges in maintaining or improving the overall efficiency and remain competitive in the market. Encapsulating the socio - economic interests of healthcare service providers and patients, in the backdrop of the scarcity of resources and competition among players, there has been, of late, an unsurpassed interest to explore the mechanisms of improving the efficiency. This goal has two dimensions: managing the revenue or demand and minimizing the costs.

Motivated by the zeal to remain competitive, the first study of the current dissertation looks at the revenue side by suitable management of the demand. Unstructured reviews about the NABH accredited hospitals have been collected, cleaned and analyzed. Through adequate validation, machine learning techniques has been used to understand the dimensions of the healthcare service that influences the potential patients and patients to remain satisfied with the care delivery. The study has implications for the online aggregators as well as for the healthcare administrators to ensure quality of service, remain committed to social demands and increase revenues for the

respective hospitals.The other aspect of improving the overall efficiency pertains to minimizing the cost. Healthcare service providers across the world are struggling to achieve optimal cost reducing strategies. The outpatients contribute a significant portion of the revenue pie for the service providers and are also a major concern for them in regard to the patients' idiosyncrasies, associated costs (waiting time, idle time and overtime) and perceived risks (ill - health, dissatisfaction and capacity maintenance). Efficient scheduling plays a key role in reducing the cost and making the healthcare service providers efficient.

The second and the third study concerns about building decision support models in regard to the outpatient department of a large heath care facility. The second essay focuses on cost minimization and involves a simulation-based optimization approach to minimize the total cost of operation. Discrete event simulation along with a single objective heuristic has been employed to achieve the results. The third easy is a direct extension of the second essay. In this study, we look at the total cost and the patient experience simultaneously. Since the two are conflicting goals with two distinct stakeholders (hospital and patient), the problem has been captured as a multi-objective optimization problem. Simulation based multi-objective heuristics has been employed to find the results. Both for study 2 and study 3 adequate scenario analysis has been done with a comprehensive set of numerical experiments to show the consistency of results. The findings are of prime relevance to healthcare administration engaged in tactical planning decisions pertaining to the outpatient care delivery and the quality assurance department of the concerned healthcare delivery units.

Keywords: Healthcare operations, Healthcare resource planning, Simulation, Simulation based Optimization, Multi-objective heuristics, Machine learning

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