

## Modelling Patient Condition-Based Demand for Managing Hospital Inventory

**Authors :** Esha Saha, Pradip Kumar Ray

**Abstract :** A hospital inventory comprises of a large number and great variety of items for the proper treatment and care of patients, such as pharmaceuticals, medical equipment, surgical items, etc. Improper management of these items, i.e. stockouts, may lead to delay in treatment or other fatal consequences, even death of the patient. So, generally the hospitals tend to overstock items to avoid the risk of stockout which leads to unnecessary investment of money, difficulty in storing, more expiration and wastage, etc. Thus, in such challenging environment, it is necessary for hospitals to follow an inventory policy considering the stochasticity of demand in a hospital. Statistical analysis captures the correlation of patient condition based on bed occupancy with the patient demand which changes stochastically. Due to the dependency on bed occupancy, the markov model is developed that helps to map the changes in demand of hospital inventory based on the changes in the patient condition represented by the movements of bed occupancy states (acute care state, rehabilitative state and long-care state) during the length-of-stay of patient in a hospital. An inventory policy is developed for a hospital based on the fulfillment of patient demand with the objective of minimizing the frequency and quantity of placement of orders of inventoried items. The analytical structure of the model based on probability calculation is provided to show the optimal inventory-related decisions. A case-study is illustrated in this paper for the development of hospital inventory model based on patient demand for multiple inpatient pharmaceutical items. A sensitivity analysis is conducted to investigate the impact of inventory-related parameters on the developed optimal inventory policy. Therefore, the developed model and solution approach may help the hospital managers and pharmacists in managing the hospital inventory in case of stochastic demand of inpatient pharmaceutical items.

**Keywords :** bed occupancy, hospital inventory, markov model, patient condition, pharmaceutical items

**Conference Title :** ICCIE 2016 : International Conference on Computers and Industrial Engineering

**Conference Location :** San Francisco, United States

**Conference Dates :** June 09-10, 2016