Using Simulation to Compare Inventory Policies at UMMC

by

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Objective

- Develop a forecasting-based inventory policy that reduces the level of a certain product in stock (Ligasure20) while still maintaining the capacity to fully satisfy demand

Benefits of Meeting the Objective

- Reduce the average inventory level of Ligasure20 (by 30%)
- Reduce associated holding costs
- A single unit costs $425.00
- Reduce costs associated with inspection and ordering

Model of Current Policy

- Uses no forecasting, completely reactionary

- If the inventory level is below a minimum number (4 units) upon inspection, then an order is placed to restore it to a maximum number (12 units)

- Orders are made at the end of the working day, and fulfilled at the beginning of the next working day

Key Ideas for a Forecasting-Based Policy

- Prior to scheduled surgeries, a preference sheet is created listing those materials the surgeon wishes to have on-hand

- The data from these preference sheets could be used in the creation of a smarter inventory policy, in which orders are placed according to expected future demand

Model for a Forecasting-Based Policy

- Orders are made at the beginning of each *week* instead of daily

- An amount is ordered so that the demand will be met for all expected demand (scheduled surgeries) that week

- A par backup level (3 units) is maintained to meet unexpected demand (unscheduled surgeries, wastage)

Comparison Using Simulation

- Computer programs simulating each policy were created and executed

- Input streams representing demand for and waste of Ligasure20 were created using data obtained from the Business Operations Department of Perioperative Services at UMMC

Simulation Experiment

- For each day in a fifteen week period, we were given

  - the number of Ligasure20 requested

  - the number of Ligasure20 filled to cart (brought up from inventory and used or wasted)

  - the number of Ligasure20 actually used

- From this, we fit distributions to inter-arrival times of scheduled and unscheduled demand for Ligasure20

Results

■ The main performance measure is the average number of units of Ligasure20 in stock at a given moment

■ Below is the result of ten simulations

	1	2	3	4	5	6	7	8	9	10	Avg
Current	7.67	7.70	7.69	7.77	7.78	7.74	7.84	7.78	7.84	7.77	7.76
Forecast	4.97	5.53	5.72	4.77	6.73	5.57	4.22	4.60	6.51	5.56	5.42

More Results

- We see that the forecasting-based policy outperforms the current policy, with respect to average number of units in inventory, by around 30% $\left(\dfrac{7.76 - 5.42}{7.76} = .3 \right)$

- Also, since the inspections are made weekly instead of daily, the time associated with inspection and ordering could be cut by as much as 86% (1- 1/7 = .86)

More Results

- Shortages essentially never occur under either model

Conclusions

- It is reasonable to assume that under the forecasting-based policy the costs associated with holding product and with inspecting and ordering product could be cut by a substantial percentage

- If applied to other products as well, UMMC could realize a significant cut in costs associated with inventory