Discrete Event Simulation Modeling: A valuable tool to optimize endoscopy unit efficiency

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Introduction

• Increasing demand for endoscopic procedures, coupled with decreasing reimbursement, has necessitated improvement in endoscopy unit efficiency.

• Discrete event simulation is a modeling methodology which has been used to improve manufacturing processes for several decades.

Objective

• To demonstrate the value of discrete event simulation in improving endoscopy unit efficiency

Methods

• We developed a conceptual model of patient flow in the six-room endoscopy unit at Georgetown University Hospital

• Endoscopy unit staff electronically captured time data for key tasks using EndoPro® (PENTAX Medical Co.)

• Statistical distributions were calculated for each time stamp for use in the model

• We then built an animated discrete event simulation model using Simio® Simulation Software (Simio LLC)

• We compared the average performance metrics of the baseline model with the results from alternative configurations of unit flow over 50 simulated days

• Key outcomes included: patient flow time; first case start time; and procedure room utilization

Results

• Average patient flow time was 170 minutes.

• Average procedure room utilization ranged from 51%-77% and pre-op utilization averaged 44%.

• The first procedure of the day, scheduled to begin at 8am, began between 8:18am and 8:28am.

• The bathrooms in the pre-op area were identified as a bottleneck for the first cases of the day as patients waited to change prior to being prepped for their procedure.

• The model suggested that an 8am start time could be achieved with minor changes in unit flow, including prepping one patient in the procedure room in place of pre-op and shifting the prep time 15 minutes earlier in the morning.

Conclusions

• Discrete event simulation modeling provides insight into the interrelationship between variables influencing the performance of an endoscopy unit

• Simulation can identify opportunities for process improvement without disrupting clinical operations.