

Capacity modelling of an Endoscopy unit in Northern Ireland using Discrete Event Simulation

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The purpose of this research is to use Discrete Event Simulation (DES) to model a local day procedure unit to assess the impact of additional activity on the Northern Ireland (NI) endoscopy service as a result of bowel cancer screening, due to be implemented in NI from 2009. Health-care providers have estimated the effect this programme will have on the workload within the service from pilot schemes carried out in mainland UK. But to date, no formal modelling of capacity and waiting lists has been done. DES represents the operation of a system as a chronological sequence of events where each event occurs at an instant in time and marks a change of state in that system. The appeal of using DES is its ability to capture information such as flow time, waiting times and competition for resources. It will also identify the factors having the greatest impact on throughput, including 'bottlenecks' to the system and illustrates the effects of improving on these. A day procedure unit is a classic example of where there is competition for resources. A DES model of a day procedure unit using data from a local hospital was built to mimic current practice using the Arena Simulation package. The model was designed to assess the extent of which the current system could cope with the additional activity generated from the screening programme. The model tracks patients from admission through to anaesthesia, surgery, recovery and discharge. Process times were modelled by Beta, Gamma, Weibull, Normal and Continuous distributions. Resources including staffing levels, number of theatres, numbers of beds in recovery and equipment were modelled. Current model estimates suggest that the additional screening activity likely to be generated to this particular unit can, for the most part be readily absorbed into the existing system. However it will be necessary to change the scheduling of patients to improve on waiting times and patient throughput and to consider the possibility of introducing new lists to deal with any potential overload. Resource constraints and process delays were found to considerably affect throughput. This model is a template that can be adapted for use by other endoscopy units in the province.