



## Health service efficiency mapped with simulation tools

There has never been as keen a spotlight on health service performance and efficiency as there is now. Waiting lists, along with patient choice, are policy areas whose measurement – and the ability to study the effects of change on waiting times, for example – is of critical importance. Discrete event simulation models, developed at Lancaster University using Micro Saint Sharp from Adept Scientific, are providing health service managers with the tools to increase efficiency and reduce costs around patient flows.

Simulating patients entering and moving through hospitals, District General Hospital Performance Simulation (DGHPSim) is a suite of models covering outpatients, in-patients and those accessing emergency care. The models can be used to select and refine policies to meet targets, including the 18-week 'RTT' target, that requires NHS trusts to ensure patients wait no longer than 18 weeks from GP referral to treatment, while improving capacity utilisation. 'Smart thinking' is encouraged and supported by the models producing outcomes that reduce waiting times, whilst avoiding side effects, with 'what if?' tools predicting scenarios based on different actions. This avoids the disruption often caused by experimentation on the floor.

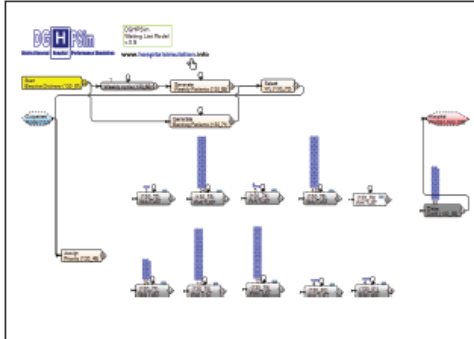


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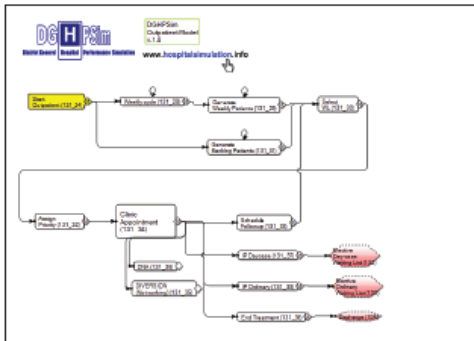
In meeting headline targets, there is a potential for moving the problem elsewhere, exacerbating pressures on managers and sometimes making the overall situation worse. Managers need tools that allow them to exercise a holistic approach, looking at all options in 'one hit'. DGHPSim consists of four separate models that focus on and track individual patients. Accident & Emergency, Outpatient Clinic, Waiting List and Inpatient Facilities can be run separately or together to show the interaction between departments, while options for change are applied to targets.

The parameters specified by users, to fit real hospital situations, come from two sources; local Patient Administration System (PAS) data and national Hospital Episode Statistics (HES) data. A further software tool, Hospital Activity Data Analyser (HADA), has been built to complement DGHPSim and integrates data from these two sources.

Research Assistant Murat Gunal, responsible for much of the work on DGHPSim, used Micro Saint Sharp because of its flexibility and ease of use for programming. “Inevitably there is a trade-off between the user-friendliness of the software and its suitability to the task,” says Murat, “Micro Saint Sharp has improved continuously since we started using it in 2004 but it is not necessarily the right tool for beginners.” He adds that the support from Adept Scientific has been first-rate, allowing him to focus on development rather than potential problems.



DGHPsim Waiting List Model



DGHPsim Outpatient Model

Now in version 2.6, Micro Saint Sharp uses intuitive graphical user interface and flow charting in a fast, modular modelling tool that allows accurate, flexible and optimised discrete-event simulation. It has helped Murat to build a set of models that, separately, can track the detailed performance of part of a hospital as patients pass through or, collectively, to investigate the interaction between targets and performance. It allows the exploration of questions based on current hospital resourcing, the theoretical resourcing needed to hit targets, effects on emergency demand buffers and the impacts of controllable and non-controllable factors.

The capabilities of Micro Saint Sharp have enabled the DGHPsim models to be built with standard features that can be tailored to the needs and conditions of different hospitals. They include stochastic elements such as length of stay, admission rates and case mix to fit individual hospital characteristics. "DGHPsim enables managers, clinicians and planners to add quantitative detail to the qualitative insights, on which policy is too often based, and provide useful advice both to those responsible for setting targets and for those whose role is to help hospitals achieve higher levels of performance," continues Murat.

DGHPsim has been built out of a research project, funded by EPSRC and using HES as the main data source, also supported by the databases of local hospitals. Murat has used Micro Saint Sharp in other, similar research projects including a UK police force contact centre and a warehouse simulation model for an electrical appliance company to predict staff workloads and room utilisation in their warehouse. "The capabilities of Micro Saint Sharp have helped me to give DGHPsim a range of functions that would otherwise have proved difficult and time consuming," concludes Murat.



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