

Measuring the value of early expert decisions in urgent care via simulation modelling

Objectives: To determine if early expert decisions about in-patient versus out-patient urgent care realise better value than non-expert decisions. Urgent care settings in the UK experience long delays and crowding. These realise system inefficiencies, are harmful to patients, and lead to poor experiences of care. International urgent care systems face similar challenges. UK health policy promotes senior (expert) doctor decision-making about the suitability of out-patient care as patients are referred into hospital as an emergency, i.e., remotely. Despite the high staffing costs involved, this type of strategy is insufficiently researched to determine cost-effectiveness.

Method: We created a hybrid agent-based and discrete event simulation model of a representative urgent medical service in the UK. This served as a platform for virtual experimentation mitigating the ethical and logistical challenges of a field study. The model was informed by an ethnographic case study of activity, and staff decision-making, and validated via data from the ethnographic study site. Different strategies of early staff decision-making involving expert and non-expert staff were run in the model. Modelled outputs represented patient flow through the local, and hospital system, and patient experience. Health outcomes were not available in include. Results were analysed for differences between outputs that represented meaningful change to healthcare leaders as well as statistical significance. This allowed us to determine if statistically significant differences (e.g., a 2% change in admissions) had real world significance.

Results: Early expert decision-making strategies realised fewer instances of delays and crowding than strategies without experts but did not eliminate either. Unexpected delays in out-patient services emerged with increased expert involvement with a negative, but non-meaningful, impact upon patient experience. Staffing strategies involving clinical experts increased the number of patients admitted to hospital by statistically significant levels that had little real-world meaning compared with non-expert strategies.

Discussion: Employing clinical experts to remotely gauge suitability for out-patient care improves efficiencies at the local level with the potential for safer care when compared with non-experts. A ceiling to gains may be observed. Inefficiencies arise in other areas of care delivery from increased out-patient activities. Costs of employing senior staff in a remote decision-maker role should be evaluated alongside harms to patients from fewer in-patient, but greater out-patient delays as observed in this study. This work supports dynamic simulation modelling to be excellent platform for efficiently, safely, and ethically evaluating whole system costs and consequences as recommended.