

Applications of Operations Research for Coping with Ambulance Offload Delays

Nova Scotia's urban Emergency Departments (EDs) often experience overcrowding resulting in delayed handovers of patients by paramedics to the ED. This phenomenon is common across Canada, Australia, and in some US states. It can have a significant impact on the ambulance provider's response times and service levels as well it delays patient care. In this seminar I will present a Markov Decision Process (MDP) model used to determine an ambulance destination policy that accounts for ambulance offload delay (AOD).

We formulate a discrete time, infinite-horizon, discounted MDP model to determine when it is advantageous to send appropriate patients to out-of-region EDs, which have longer transport times but shorter offload times. Based on the MDP model, an optimal ambulance destination policy is constructed by using the policy iteration technique. A computational study is applied with a 12-month period data from an EMS provider who experiences AOD regularly. We find that the optimal policies can significantly reduce AOD, time to bed for patients, and out of service time for paramedics but increases ambulances travel distances. The model can be generalized and used as a decision support tool for EMS systems to mitigate the impact of AOD on their operations.

Bio

Dr. Peter T. Vanberkel's primary research involves improving healthcare operations using stochastic operational research methods. He is an Associate Professor with the department of Industrial Engineering at Dalhousie University and a Staff Scientist at the IWK Health Centre, both in Halifax, Nova Scotia, Canada. His PhD is from the University of Twente (The Netherlands) and he was the first graduate from the Center for Healthcare Operations Improvement and Research, the knowledge center for optimization of healthcare processes and research in The Netherlands. Dr. Vanberkel is a registered professional engineer with Engineers Nova Scotia and has worked as an industrial engineer at the IWK Health Centre, the Capital District Health Authority, Stylus Consulting Inc. and is co-founder of Stromline Technologies Inc. As a researcher he has worked with The Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, the British Columbia Cancer Agency, the Nova Scotia Health Authority, the IWK Health Centre, Eastern Health Newfoundland, Halifax Biomedical, Emergency Medical Care Inc. (Medavie EMS Group of Companies), the NS Department of Health and Wellness, Atlantic Veterinary College, and others. Dr. Vanberkel's research is funded by NSERC, NSHRF, Atlantic Canada Opportunities Agency, Innovacorp and others.