A transport crash injury return-on-investment calculator

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Abstract

While the benefits of a whole-of-system approach to the prevention and management of trauma are widely acknowledged, operationalizing the systemic concept is difficult. As a result, the whole system is rarely visualized or evaluated in its entirety. In this paper we report the results of a policy simulation experiment that tested the relative benefits of a range of possible policies addressing different parts of the trauma care system. The specific aim of the study was to identify which of the investment options optimize the population satisfaction with the trauma system performance.

Background

Traffic crash injury was chosen as an indicator injury type for evaluation of a comprehensive trauma system because it is a leading cause of injury related death and disability, has well-documented risks and frequencies measured at all points of the continuum, and has mature institutional and financial responses within the social environment to respond to these systemic risks.

Methods, Results & Discussion

The methods used to address the study aim were conducted in a series of steps in accordance with the conventional system dynamics approach; i.e. i) development of the qualitative model, ii) specification of the dynamic hypotheses, iii) mathematical representation of the qualitative model, iv) specification of a base model, v) a set of simulation experiments.

The conceptual model of the causal factors for road crash serious injury and death was developed over a 12-month period on the basis of a systematic review of the literature and a series of workshops with road safety researchers, policymakers, and practitioners from across the world. The population health module was based on the definitions of epidemiology. The acute care module was based on the HHS/American College of Surgeons/American trauma society specification an optimally functioning acute care response, and the rehabilitation module was developed over a 12-month period on the basis of a series of workshops with rehabilitations researchers, policymakers, and practitioners in Victoria.

There were seven policy leavers included in the overall model. Three related to the crash module, one for the acute care module, and three for the rehabilitation module. These policy levers test whether i) road traffic crashes could be reduced by investment in protective infrastructure for vulnerable road users (bicyclists and pedestrians), ii) overall crashes could be reduced by investing in active safety interventions (ie crash avoidance and road user behavior measures), iii) injuries and severity of injury given a crash could be reduced by measures that increased occupant protection, iv) the distribution of outcomes from trauma care (death, needing rehabilitation, and discharged home) could be positively shifted by implementing ACS accredited protocols, and v). improved

rehabilitation outcomes could be achieved by increasing availability of services, implementation of optimal service, and optimally managed compensation/litigation procedures.

The dynamic hypotheses were operationalized using two units of measurement. The first was Australian Dollars, for charges to the population in Victoria for vehicle insurance premiums and insurance scheme costs required to cover medical and rehabilitation care of Traffic Crash Injury. The second unit of measurement was a measure of citizen satisfaction in relation to motor vehicle insurance premiums paid and client satisfaction in relation to post injury services received.

Two sets of results will be presented, relating to the two main hypotheses examined by the simulation. Findings of the study demonstrate the value of this methodology for use as efficient decision support for the formulation of effective policies to minimise road traffic injury related harm.