

Improving access and efficiency in care delivery for patients with spinal cord injury in NSW Australia: A discrete-event dynamic simulation modelling approach

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Abstract: Spinal cord injury (SCI) is often a life-changing injury requiring timely and specialised care. Significant variability in the factors affecting patient outcomes along with a relatively small number of cases present a challenge to developing effective care policies. The aim of this investigation is to identify timely and appropriate care for patients, improve access to and efficiency of specialist care services.

Spinal cord injury refers to persistent damage to neural tissue and disruption of transmission along the nerves and can have profound effects on patients' quality of life. Timely and direct admission to specialised care is associated with better neurological outcomes, lower complication rates, and reduced length of stay (Parent et al. 2011). Further, specialist rehabilitation has been shown to be cost-efficient and relieving pressure in the acute care services. In NSW, services for people with SCI are delivered by a variety of specialists and generalists. Provision of care for adults with a SCI is centred at two specialist acute units and a specialist rehabilitation unit. There are 28 specialist acute adult beds and 46 specialist adult rehabilitation beds. For admission to a specialist SCI service in NSW, a person must have a persistent SCI resulting from either a traumatic injury or a non-progressive disease. Despite the recommendations, there is no central triage and allocation process or criteria to optimise allocative efficiency of SCI specialist resources. As a result, some of complex patients who could have benefited from specialist care do not get access to it in a timely manner.

A discrete-event dynamic simulation model (DSM) was developed by a participatory co-design approach. A series of workshops were conducted in 2022 incorporating clinicians, managers, and health executives to map current SCI pathways and processes and to identify and use existing data sources to understand the performance of these pathways including the identification of delays and gaps in care delivered against the evidence base. The data sources used in the SCI DSM were clinical registry data (estimating case mix), hospital admission data (current patients' journey), occupancy data (bed utilization and treatment time and delays) and expert knowledge (triage criteria).

Current flow: Between 2012 and 2022, there were 4642 people with a new SCI admitted to NSW hospitals. 34% were diagnosed with tetraplegia, 20% with paraplegia and the remaining 46% with cauda equina. During this period 36% of people with SCI received care either fully or partially at specialist SCI units. Bed block caused the following transfer delays between settings: a) ICU to specialist unit: 2.3 days, b) Specialist unit to specialist rehabilitation: 14 days, c) Rehabilitation to community: 40 days.

Improving access (central notification and triage): Applying the central notification, triage process and criteria-based allocation of people with SCI to the clinical pathways revealed a) 39% (an additional 3%) of patients would receive care at a specialist unit, b) 8% patients would be transferred to specialist units and mostly before surgery or ICU care. c) 36% of patients would receive specialist guided care in a non-specialist unit, and d) 24% would receive care at a non-specialist unit and without specialist input.

Improving flow (eliminating delays): The DSM model revealed that 33 acute specialist beds (22 for new SCI and 11 for re-hospitalisation) and 64 specialist rehabilitation beds would completely eliminate the current delays due to bed block for new SCI patients. This equates to an additional 5 acute and 18 rehabilitation beds to current availability. This number would result in occupancy rates of 79% and 78% respectively.

REFERENCES

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