Application of social network analysis to the study of post-injury rehabilitation and health service utilisation

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Abstract

Increasingly used in medical domains such as epidemiology to understand and describe the topology of illness and disease pathways, Social Network Analysis (SNA) has not been used in the context of post-crash rehabilitation and care. In this study, we demonstrate the utility of using SNA to study post-crash treatment pathways among a large group of injured persons compensated and treated under the Victorian Transport Accident Commission scheme. We demonstrate that, with minor conceptual adaptation, SNA can provide new insights for rehabilitation researchers and injury compensation scheme managers attempting to effectively understand and predict individual and population-level patterns of recovery.

Background

Social network analysis (SNA) is a technique that has gained considerable attention in recent years in part due to the increasing connection of individuals through electronic communication channels (e.g. the internet) and the growth in availability of data and computing power at researchers' disposal (Otte & Rousseau, 2002). Primarily, SNA has been used to understand the topology of complex social networks and information exchange; however it is also being adapted in epidemiological contexts to study transfer of disease or illness in areas such as HIV (Du Toit & Craig, 2015).

SNA and its associated analytical techniques are yet to be adopted within post-crash injury and rehabilitation medicine. This is despite the widespread understanding that rehabilitation often occurs in a complex post-acute environment involving multiple service providers and relationships that extend over long periods of time (Wissel, Olver, & Sunnerhagen, 2013); conditions well suited to SNA. SNA offers physical rehabilitation researchers not only an innovative way to visualise and better understand entire rehabilitation processes of injured populations, but enables application of new methods of statistical analysis leading to individual and population injury management insights not possible through more traditionally applied techniques.

Method, Results & Discussion

To explore the potential utility of SNA in post-injury rehabilitation, we present an analysis of a large cohort of clients (N=16,000) injured in transport accidents who received compensation and treatment services through the Victorian Transport Accident Commission.
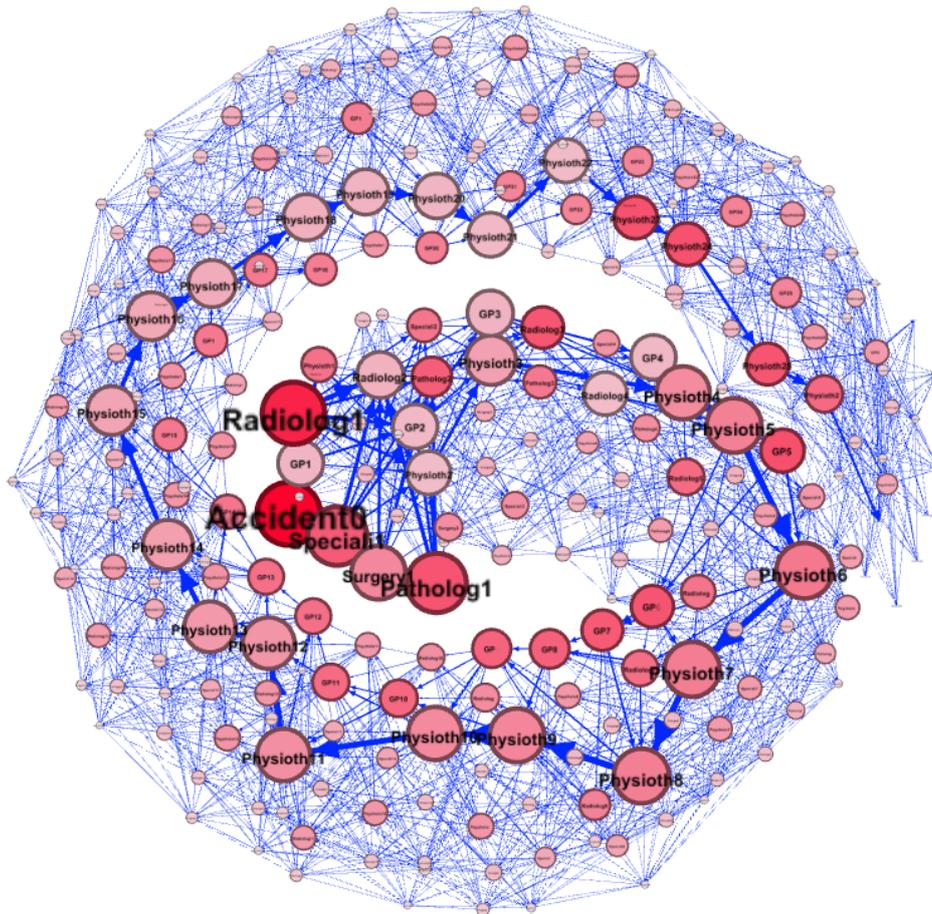
Figure 1. Social network analysis map of post-injury service use pathways from accident to 6 months post-accident from an original cohort of 16000 injured persons

Using SNA to map post-injury service use pathways over 6 months (see Figure 1), we demonstrate a bi-modal pattern of service utilisation for the injured population that peaks between weeks 1 and 2 immediately post accident, and again in weeks 6 to 7. This pattern indicates that, for a significant proportion of injured clients who do not recover within a few weeks after injury, the number and variety of treatment services accessed continues to expand for up to 2 months post-accident before beginning to decline. Further, analysis of individual service-type usage patterns (e.g., Radiologists, GPs, specialists, physiotherapists, psychologists) shows differences likely reflecting inter and intra-service referral patterns as well as stages of recovery.

We conclude that SNA may be an effective and efficient method for rehabilitation researchers and compensation scheme managers to understand, describe, and predict both individual and population-level patterns of post-injury recovery. The use of SNA and associated statistical techniques may lead to significant insight into 'typical' patterns of post-injury service access and recovery that are currently poorly understood.

References

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