Transfer In and Out of Stroke Care Units: A Preliminary Study Using Bayesian Networks

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Abstract and Objective

Some reports have questioned the cost effectiveness of SCUs. Therefore the focus was to compare episodes treated by teaching hospitals with and without SCUs that experience ongoing care or transfers. The transfer-patients are often high users of the system; with an associated high cost. As a proof-of-concept Bayesian Network (BN) was applied to routinely collected public-hospital administrative data. The results demonstrated that SCUs mainly treat Subarachnoid haemorrhages whereas the non-SCUs the Cerebral infarctions. There were differences in the mix of admission types, care types, the hospitals transferred from and transfer destinations. Although the teaching hospitals with SCUs achieved shorter LOS, they treated younger patients with lower overall complexity than non-SCU teaching hospitals. This preliminary study demonstrated the value of BN to explore in an ad hoc *manner the caseload, trajectory and outcomes recorded in hospital-administrative data. Studies such as this are important for gathering information on the current practices and creating opportunities for benchmarking and improving care.*

Keywords:

Health services research, Bayesian networks, Administrative data, Stroke units.

Methods

Three fiscal years of the Victorian Admitted Episode Dataset, a data collection of acute admitted patients in hospitals of Victoria (Australian) was used. Public hospital separations/discharges were selected from the de-identified subset. The data was screened, cleaned and transformed as required, prior to selection of the cohort. For each episode the dataset has one mandatory International Classification of Diseases version 10 with Australian Modification (ICD-10-AM) code for the principal diagnosis and provisions to record up to twenty-four additional codes. The principal diagnosis codes were used to select the cohort and assign the stroke-subtypes. Stroke-specific complexity (of patient presentation) index was computed using non-principal diagnoses. Other relevant data elements include patient demographics, care received, LOS, admission and separation types, and notably transfer and treating facility details.

CaMML has been successfully used to learn the local structure in BNs in a particularly flexible way by using full CPT Tables or logit models or decision trees, or any combination (hybrid models) determined on a node-by-node basis. Therefore it was the method of choice. The arc between nodes which represent conditional dependency between variables was partly guided based on domain knowledge.

Results

There were 2,468 'transfer' episodes, out of which 955 (38.7%) had also left as a 'transfer'. In those who exited as 'transfer', 42.2% were treated in SCUs and 19.3% in non-SCU teaching hospitals. SCUs had slightly higher emergency admissions (61.7% versus 53.0%). The age distribution of SCUs patients was skewed towards the younger age groups (50.0% versus 18.7% <=60 year olds in non-SCUs and 32.4% versus 66.2% >=71 year olds in non-SCUs). SCUs treated less complex patients (>=10 of 49.6% versus 60.0% in non-SCUs). The predominant stroke subtype in non-SCU was CI (46.8%) and SAH (42.3%) in SCU. There was greater percentage of >=20-days LOS in non-SCUs (33.3% versus 27.4% in SCUs). Just over a fifth of the transfers into non-SCU teaching hospitals came from SCUs; in contrast, about 4 % of transfers to SCU came from another SCU. There was twice the likelihood (13.7% versus 6.62%) of a separation destination to SCU following non-SCU care compared to SCU care.

Conclusion

The algorithm and the hybrid BNs when applied to administrative datasets allowed the viewing of the details of the transfers between the health care facilities, thus giving an overview of the differences in the care profiles between teaching hospitals with and without SCUs. Further investigations of the variations in services provided in the different hospitals and for different types of patients are required. Studies such as this are important for gathering information on the current practices thus creating opportunities for improvements and benchmarking.

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