HOSPITAL PATIENT FLOW NETWORK ANALYSIS

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PROJECT MOTIVATION

- Hospitals face the challenges of patients waiting a long time and queues in an emergency department.
- Network analysis has long history, but much less work has been done on patient flow network analysis[1].
- This research explores Flinders Medical Centre as a patient flow network, then analyses the network to identify features of interest and gains further insights into hospital functions.

METHODOLOGY

- Reading journal articles and peer review papers, reading network theory books.
- Discussing with experts in mathematical, hospital management and software engineering fields.
- Using supported tools to implement network analysis and visualisation.

PROJECT ANALYSIS AND VISUALISATION

- Network construction [2] (Fig 1).
- Network analysis and visualisation (Fig 2).

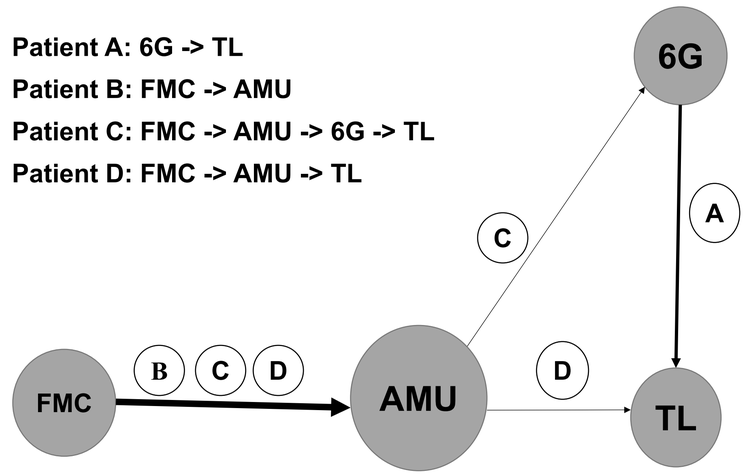

Fig 1: Example of network construction

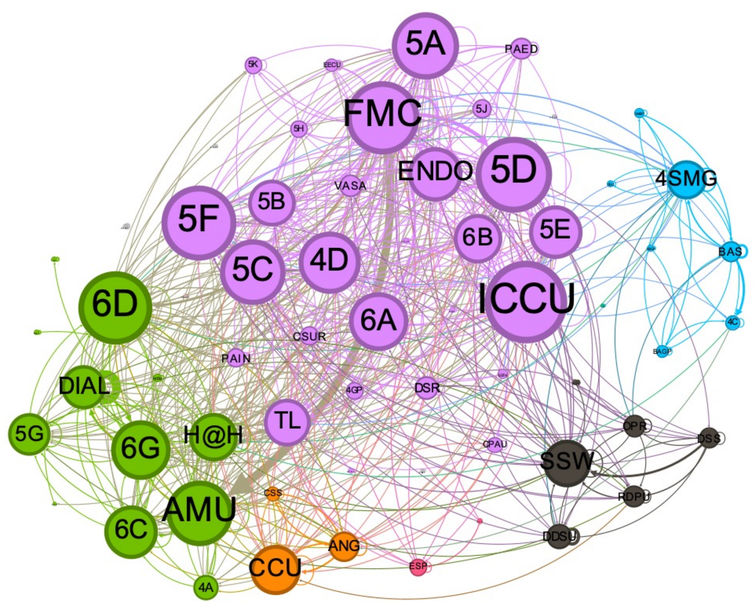

Fig 2: Network analysis and visualisation of a subset of data using Gephi software

RESULTS

- There is a large movement of patients from FMC to AMU. FMC is an administrative category for patients in the Emergency Department and AMU is the acute medical unit where many of those patients are treated when a bed becomes available.
- Large number of patients only stay in ward DIAL during their admissions. DIAL is Renal Dialysis, which is the treatment for kidney problems. Flinders has a dialysis unit (DIAL) within the hospital, and patients are admitted for a day on three days each week.
- FMC, AMU and ICCU (Intensive and Critical Care Unit) have highest connections within the network.

CONCLUSION

- The research results show Flinders Medical Centre is a complex system of intensive emergency and elective care.
- In the system, the FMC, AMU and ICCU are potential hubs and bottlenecks with vast patient transfers go through these wards. These wards could be the starting point to improve the overall system.

REFERENCES

[1] Ben-Tovim, D., Bajger, M., Bui, V. D., & Qin, S. (2022, January). Network Graph Analysis of Hospital and Health Services Functional Structures. In *Advanced Data Mining and Applications: 17th International Conference, ADMA 2021, Sydney, NSW, Australia, February 2–4, 2022, Proceedings, Part I* (pp. 33-44). Cham: Springer International Publishing.
[2] Kohler, K., & Ercole, A. (2020). Can network science reveal structure in a complex healthcare system? A network analysis using data from emergency surgical services. *BMJ Open*, *10*(2), e034265. https://doi.org/10.1136/bmjopen-2019-034265