**Considering Degree Centrality for More Interpretive Communities in**

**Oncological Clinical Trial Referral Networks**

Benjamin Smith1, Tyler Pittman2, Wei Xu3

1Dalla Lana School of Public Health, Biostatistics Division, University of Toronto, Toronto, Canada.

2 Department of Biostatistics, University Health Network, Toronto, Canada.

3 Department of Biostatistics, University Health Network, Toronto, Canada.

\*E-mail: [benyamin.smith@mail.utoronto.ca](mailto:benyamin.smith@mail.utoronto.ca)

*Background*: Cancer patients who do not responded to standard treatments often become candidates for clinical trials. It is known that the collaboration networks between oncologists is a primary factor for further engagement in subsequent trials. We employ Social Network Analysis (SNA) and community detection algorithms to explore collaboration patterns using data from the Cancer Registry and Princess Margaret (PM) Clinical Research Record. The data consists of 2970 unique patients in 515 clinical trials between the January 2016 and December 2018. Objectives: Among 389 distinct patients enrolled in more than one of 288 trials, we aim to identify working groups based on intervention types. *Methods*: Our approach involves applying community detection algorithms, including Girvan-Newman and Louvain, and comparing them to an author-developed algorithm that considers degree centrality to identify influential studies. The quality of communities assessed by viewing them overlaid the constructed graph and by visualizing the contrast between the degree distribution and the communities identified. *Results*: The results from application of Girvan Newman and Louvain are uninformative. The algorithm developed by the authors offers intuitively descriptive communities which are also supported by the visualized degree distributions. *Conclusions*: The Girvan-Newman and Louvain algorithms are not useful for understanding patient referrals in this setting as the algorithms do not consider influence directly via degree centrality. In contrast, our custom algorithm, which considers degree centrality, unveils meaningful communities. With this understanding, it is possible to delve deeper into patient engagement and improve organizational design of clinical trial referrals.