Research collaboration in pediatric critical care: A social network analysis of coauthorship

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Background

Clinical research is a social enterprise. Studies are the product of groups of researchers and individual researchers have access to expertise, experience, and resources through their collaborators. Social network analysis is a set of techniques used to examine the patterns and nature of relationships within groups.

Objectives

1. To describe the extent and patterns of collaboration among researchers who have published pediatric critical care RCTs.
2. To identify influential individuals, and countries.

Methods

Design: Social network analysis of coauthorship.

Inclusion criteria: Individuals and groups who have coauthored a published RCT in pediatric critical care.

Data sources: We used Web of Science (which uses comprehensive citation databases) to identify RCTs in pediatric critical care (January 2018 update). We extracted the names and affiliations from the references in the publications. We used Science Citation Index Expanded™ to determine the number of times each publication was cited.

Network: We constructed 2 social networks:

1. Researchers: nodes are researchers and they are connected to other researchers by ties representing coauthorship of at least one publication.
2. Countries: nodes are countries and they are connected to other countries by ties representing coauthorship of at least one publication.

Network structure

The network was composed of 168 components (isolated subgroups of researchers who are connected to each other, but not to other researchers): 1 large component, 27 smaller components (2-15 RCTs) and 130 single RCTs.

1 large component

- Researchers: 742 (48%)
- RCTs: 128 (34%)

27 smaller components (2-15 RCTs)

- Researchers: 172 (31%)
- RCTs: 309 (29%)

3. 2, 4, 2 component

- Researchers: 802 (40%)
- RCTs: 140 (37%)

Research experience

317 (16%) researchers published more than 1 RCT and 111 (6%) published more than 2 RCTs.

209 (55%) of RCTs were published by groups of collaborators with at least one member who had previously authored an RCT in pediatric critical care.

Networks were used to determine the number of times each publication was cited.

Measures of researcher influence

- Productivity: the total number of RCTs coauthored.
- Impact: the total number of citations of all of the RCTs coauthored by each researcher.
- Collaborators: the total number of researchers with whom a researcher has coauthored a publication.
- Betweenness: the number of times each researcher connects pairs of researchers (directly and indirectly).
- Closeness: the mean distance (the number of ties on the shortest path) from a researcher to all other researchers.
- Eigenvector centrality: considers not only the number of connections to other researchers, but their importance.

Inclusion of researchers

We included 1981 authors (954 individual researchers and 27 research groups) who published a total of 377 RCTs between 1986 and 2017.

Coauthorship network diagram in pediatric critical care RCTs

Each circle represents a researcher. The area of each circle is proportional to the number of RCTs to which the researcher has contributed. The width of each line is proportional to the number of RCTs between researchers.

Coauthorship network diagram

The area of each circle is proportional to the number of RCTs that researchers from that country have coauthored. The width of each line is proportional to the number of RCTs that researchers from each pair of countries have coauthored together.

Conclusions

We used social network analysis of coauthorship to better understand the scope and patterns of collaboration of the pediatric critical care community. The research enterprise in pediatric critical care RCTs is highly clustered and highly fragmented, particularly geographically. The most influential individuals — ranked using a variety of measures — were most often from the United States and Canada.