

Interprofessional Education and Practice and the Application of Social Network Analysis

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Abstract

Interprofessional teams improve quality of care and patient safety. There is a growing interest in understanding how interprofessional education and practice (IPEP) functions and to endorse its philosophy in healthcare professionals. Furthermore, many hospitals and healthcare organizations have specific policies for the promotion of interprofessional education and practice in the health personnel. Therefore, understanding the dynamics of collaborative practice becomes pivotal for the improvement of research and applications in interprofessional teamwork. Social Network Analysis (SNA) is becoming a promising venue for understanding and representing dynamics and flaws in interprofessional practice. The current commentary explores the basics of IPEP and the application of SNA research.

Abbreviations

IPEP: Interprofessional Education and Practice

SNA: Social Network Analysis

Introduction

Interprofessional Education (IPE) occurs when students learn to collaborate by sharing responsibilities and their know-how with colleagues. IPE is fast becoming a core training component in undergraduate and graduate medical schools. In effect, the growing sub-specialization of medical and nursing schools and the growth of specialized hospitals are gradually reducing the dialogue between healthcare professionals in distinct specialties and between those who work in different wards and catchment areas. These events could lead to an increased risk of fragmented care, reduced quality of care for patients, and a higher likelihood of unattended needs and, in extreme cases, a more significant chance of medical errors. During recent years, there has been a development in research instruments to assess and explore interprofessional education and practice. One of the latest is Social Network Analysis (SNA) which allows triangulation of research methods while capturing the dynamics of collaborative practice. The current commentary explores the central aspects of interprofessional education and practice (IPEP) and the flaws in collaborative performances that can be captured by SNA.

Definition of Interprofessional Education

IPE is defined as follows: 'Interprofessional education involves students of two or more professions learning together, especially about each other's roles, by interacting with each other on a common educational agenda' [1]. The World Health Organization describes IPE as follows: 'Interprofessional education occurs when students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes' [2]. The Centre for the Advancement of Interprofessional Education (CAIPE) provides another description: 'Interprofessional education is occasions when members or students of two or more professions learn with, from and about each other to improve collaboration and the quality of care and services' [3].

Curricula in Interprofessional Education in Medical Schools Around the World

As a stand-alone module or a short or long course, interprofessional education and practice (IPEP) have been introduced in medical schools, nursing schools, and pharmacy and physiotherapy schools in several universities around the world (Table 1). A research project involving sixteen American medical universities indicated that the most popular forms of IPE instruction included team-based learning and simulations [4]. In American teaching hospitals, the professions mostly involved in IPEP are nursing (89%), pharmacy (59%), allied health (45%), physician assistants (39%) and social work (35%) [5]. The various formats for IPE training include small-group classes (27%), large-group lectures (22%), simulation laboratories (10%) and community organizations (10%) [5].

Table 1: *Some of the medical schools around the world offering curricula in Interprofessional Education as stand-alone modules or as intercalated modules.*

Country	Medical School	URL Link to IPE course and source of statement of goals
Sweden	Karolinska Institute	http://ki.se/en/lime/interprofessional-education-at-karolinska-institutet
UK	King's College London	http://www.kcl.ac.uk/health/study/facilities/chantler/teaching/ipe.aspx
	University of Southampton	http://www.southampton.ac.uk/alps/interprofessional_learning/index.page
	Glasgow Caledonian University	http://www.gcu.ac.uk/hls/study/learningathls/interprofessionaleducation/
	Sheffield-Hallam University	https://www.shu.ac.uk/about-us/academic-departments/allied-health-professionals/study-with-us/inter-professional-education
	University of Keele	https://www.keele.ac.uk/health/info/interprofessionaleducation/
Germany	University of Heidelberg: stand-alone bachelor's course in interprofessional education	http://www.uni-heidelberg.de/courses/prospective/academicprograms/Health_Care_ba_en.html
USA	Thomas Jefferson University	http://www.jefferson.edu/university/interprofessional_education.html
	University of California San Francisco	http://interprofessional.ucsf.edu/
	University of South Florida	http://health.usf.edu/ahec/College/
	University of Washington	http://depts.washington.edu/uwhsa/initiatives/inter-professional-education/
	University of Kansas	http://www.kumc.edu/center-for-interprofessional-education-and-simulation.html
	University of Minnesota	http://www.health.umn.edu/our-impact/inter-professional-education
	University of New England	http://www.une.edu/wchp/ipec
	John's Hopkins University	http://nursing.jhu.edu/excellence/interprofessional/
Australia	Curtin University	http://healthsciences.curtin.edu.au/studying-health-sciences/interprofessional-education/

Competencies and Frameworks in Interprofessional Education

IPEP has become a major learning goal in medical schools and hospitals around the world. This current commentary explores many of the IPEP frameworks that universities or organizations offering an IPEP course have created to direct the training and assess the outcomes (Table 2). The interprofessional competency frameworks adopted by several countries (Table 2) allow medical teachers to design IPEP courses and reinforce the skills learners need in order to become operative members of interprofessional teams [6].

Table 2: *Interprofessional capabilities frameworks, published and unpublished (see Thistlethwaite, 2012) [7].*

Framework source	Country or medical school adopting the framework	Mission or domains emphasised	Sources
GMC, General Medical Council, UK website	United Kingdom	'An increased focus on inter-professional education/training can help to encourage positive multi-disciplinary working (which itself is associated with improved outcomes)'	GMC, 2017
General Medical Council. Tomorrow's Doctors. London: GMC; 2009	United Kingdom	-Values and ethics -Quality of care and safety provided for patients -Communication and problem solving -Teambuilding and teamwork	GMC, 2009
Combined Universities Interprofessional Learning Unit (CUILU)- Sheffield-Hallam and University of Sheffield	United Kingdom	-Moral performance -Tangible know-how -Interprofessional functioning -Mindfulness	Walsh <i>et al.</i> , 2005
Interprofessional Capability Framework, Curtin University	Australia	-Consultation -Teamwork -Job clarity -Solution of divergences -Mindfulness	Brewer and Jones, 2013
Interprofessional Education Collaborative (IPEC, 2016).	United States	-Standards and codes -Tasks and accountabilities -Interprofessional consultation -Teams and collaboration	IPEC, 2016
World Health Organisation (2010).	Other Countries	-Collaboration -Tasks and accountabilities -Interprofessional consultation -Knowledge and judicious mindfulness -Connection with and identification of the desires of the client -Honest performance	WHO, 2010 (p. 26)

Different countries adopt some variations of the basic principles in IPE. In the United Kingdom, the General Medical Council [8,9] focuses on the need for multidisciplinary practice as a professional requirement for doctors and as a route leading to improved conditions of treatment and protection for patients. Other UK-based medical schools, like Sheffield-Hallam and the University of Sheffield, created the Combined Universities Interprofessional Learning Unit (CUILU) to guide interprofessional training. For instance, the CUILU emphasizes the importance of reflective practice and the ethics in teamwork for a successful IPE [10].

The interprofessional framework introduced by Curtin University in Australia highlights the need to improve communication, conflict resolution, and reflection to advance collaborative practice [11]. Furthermore, each member of the interprofessional team should be able to recognize how his or her expertise integrates with that of others [11]. The Interprofessional Educational Collaborative adopted in the United States emphasizes 'interprofessional communication, team building, and teamwork' as central in IPE emphasizing that communication and social skills are essential to working in an interprofessional team [12]. Lastly, the World Health Organization highlights the importance of recognizing the need of the patient and that learning with critical reflection is necessary for interprofessional practice [2].

Summary of Key Points from the Frameworks

IPE competences have been divided into six domains; each contains the major skills that students in IPE, and health carers working in interprofessional teams, should master to succeed in cooperative practice [6]. These domains summarize what are suggested as being IPE frameworks and the practitioners' needed skills in mastering interprofessional practice [2,8-12]:

Teamwork

- working collaboratively with colleagues from other healthcare fields
- recognizing barriers to cooperation

Roles and Responsibilities

- understanding functions and duties of each participant of the interprofessional team
- providing unified care to patients
- questioning stereotypes linked to roles

Communication

- communicating personal ideas to other members
- actively listening to other members
- proficiently communicating data about common patients

Learning and Critical Reflection

-using self-reflective practice to improve cooperative care

Relationship with Patients

-using collaborative practice to enhance outcomes of care, client safety and decrease medical mistakes

Ethical practice

-recognizing the individual biases towards others and acknowledging others' opinions

-promoting an atmosphere of joint esteem and collective principles

Social Network Analysis in Interprofessional Teams

The interprofessional practice entails the dynamic interaction between different professionals, with individual skills and behaviors, aiming to the shared goal of patient care and quality of life. Although there is extensive freedom for each professional to decide the own course of accomplishment, each one is regulated by a different professional body, and the level of personal autonomy complies with the legal and ethical demands of the own profession. All the competencies of the framework are dynamically shared, which means that there is a constant flow of giving and take about collaboration, roles, responsibilities, communication, learning, interactions with patients and with agencies outside to hospitals or wards.

A complex network of interactions, communication, exchange of information and expertise occurs within interprofessional team members. Furthermore, these interactions are dynamic and very adaptable according to the needs of care and requirements of patients and members of the team. Within a team of interacting healthcare professionals, there is a constant exchange of information and advice about patient care. Furthermore, different professionals are more tied within themselves and interact more frequently compared to others who also belong to the multi-professional team. Hence, dyadic and more extended sub-groups and clusters characterize a network of relations between interacting professionals. Also, within these sub-groups, there are those who more frequently provide information and advice and those, instead who require constant guidance and frequently seek information and guidance from others. Partly, personal knowledge and experience can explain the flow of information and advice but also personal factors like self-esteem, accountability, and leadership skills.

In recent years, there has been a growing interest in using Social Network Analysis to capture interprofessional teams relations and in providing both figurative and mathematical models to describe the typologies of their interactions. In a social network, we usually refer to 'relations' between units while a 'Social Network is defined as a set or sets of actors and the relation or relations defined on them' [13]. As the social network could be inclusive of different typologies of relations, in interprofessional teams, it can occur that not all the configuration of ties are advantageous to team members and in patient safety and quality of care.

Researchers using SNA to study task-based groups can eventually help interprofessional teams recognize how to improve their approaches [14]. Also, a graphic representation of SNA offers some advantage over quantitative research [14] by visually evidencing hidden interactions within the actors of a network [15]. SNA is a collection of qualitative methods portraying interpersonal and social events inclusive of interactions, connections, group bonds and consultations that connect one unit of the network to other units while seeking statistical significance of the forms of these interactions [16]. The units of the social network are usually called 'nodes' and are presented by persons or groups and 'ties' that represent some form of mutual exchanges between the nodes that can have different arrangements [17]. Exchanges between units are usually represented by double-headed arrows representing information sharing, trading of assets, or cooperative ventures connecting subjects in the network [17]. There are numerous parameters indicating the typology of interactions between units. The author of the current commentary has found that the one which can mostly represent the exchanges types in the healthcare system is 'degree centrality' and the subcategory of 'indegree centrality' indicating the number of ties received by one actor from others - also indicating the 'prestige' of that unit - and 'outdegree centrality' the number of ties by one actor to others - also indicating the 'expansiveness' of that unit [18].

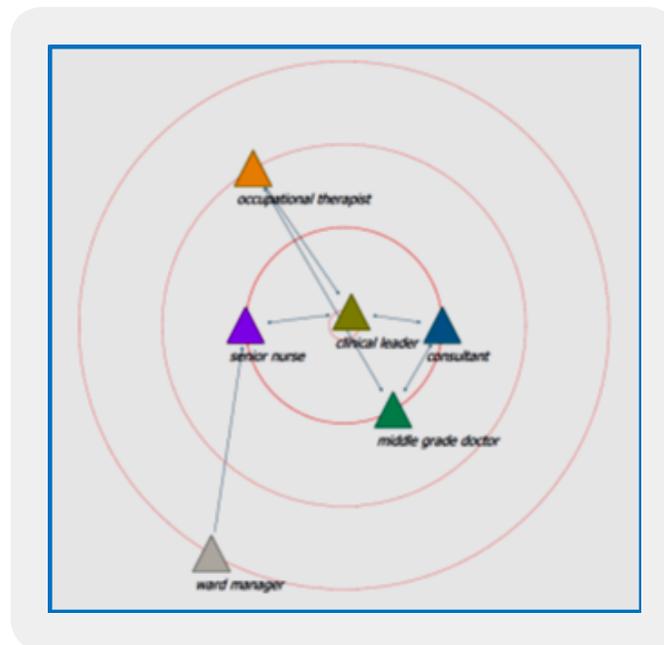


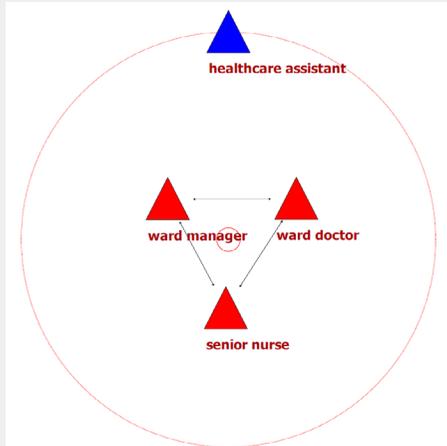
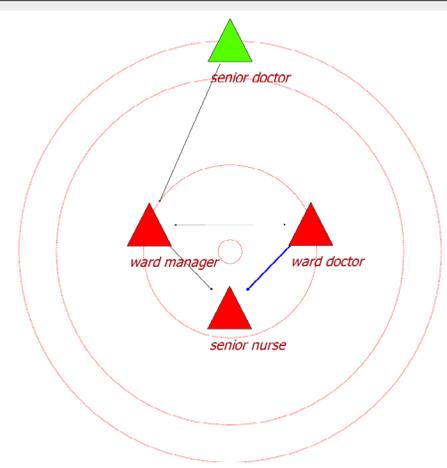
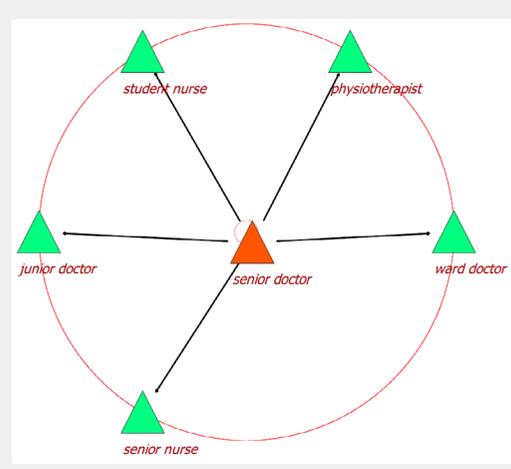
Figure 1: A characteristic social network graph created with SocNetv program. The layout corresponds to the degree centrality with emphasis on prestige. In this case, the clinical leader is the professional with more links with the other members of the interprofessional team and occupies the most central position in the social network.

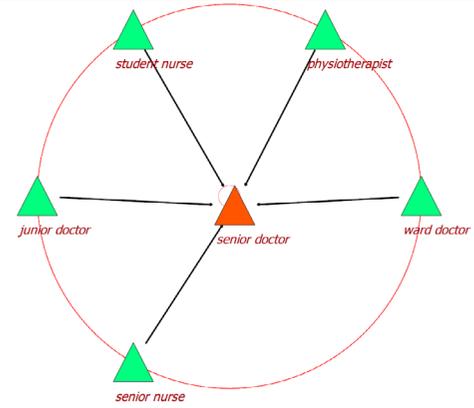
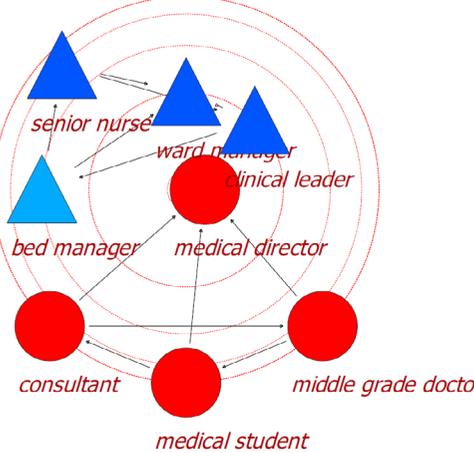
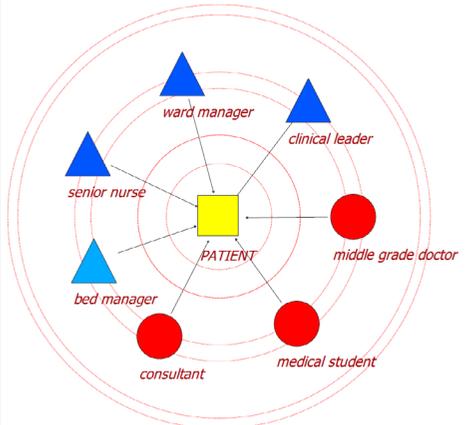
At the moment, several software programs are used to generate the math of social networks. The author of the current commentary has found the open source SocNetv 2.4 [19] program useful for this purpose. SNA starts from the assumption that all bonds between units are dependent on each other [20]. Therefore, the routine statistical methods that look for independent samples cannot be applied in SNA research. Hence, SNA can help identify areas of reinforcement within interprofessional teams. The major categories of flaws

in interprofessional practice that the author of the current commentary has observed can be described as following (Table 3):

- **Isolation:** Some professionals in the team are rarely involved in team decisions and discussion although holding important information about patient progress and care. In the example, the Healthcare Assistant. There is the risk of loss of vital information in patient care. As referred to the framework there is a threat to collaborative care an in understanding the roles and the support that can be gathered from other members of the team.
- **Decentralization:** Although some professionals are meant to occupy more central positions in the network, the team appears to exclude them from the consultation flow. In decentralization, there is the risk of loss of vital guidance in patient care. In this case, the major threat is to communication exchanged as ideas, plans and data about a patient are not appropriately shared within the team.
- **Hyper-Centralization:** It is the case of a single professional who does most of the work in the team. E.g., always the same health carer provides advice, information, instructions, leadership to other members of the team; however, he or she is not receiving enough information, guidance, and management from the group. The risk is a lack of collaboration while the network is biased toward the central figure in the system. This category of a network can favor an inactive behavior of those who are less involved in the teamwork. In hyper-centralization, the threat to collaborative practice derives from a lack of active listening with scarcity in the acknowledgment of other's opinions, information, advice, and support.
- **Overloading:** The responsibilities for information, advice, and action are frequently downloaded on a single person of the team. This person is erroneously considered as 'the least expert in the team.' Team members focus on the same person of the team to provide information, advice, support with no expectation of exchange. It is a form of patronization, and the risk is that the centralized person is devalued beyond what is required. The threat to IPEP derives from a reduced understanding of the duties of each participant in the team. At the same time, the bias of the team towards a person who is deemed as needing constant control and direction can reduce this person's active participation in teams while inhibiting those who are less forthcoming.
- **Clusterization:** Professionals with similar educational background tend to cluster and to form tighter bonds with the exclusion of professional from a different cultural context. E.g., doctors and nurses create two separate clusters with the risk of silos management of patients. These clusters form subunits that rarely or never communicate within them. It is a form of silos management with flaws in interprofessional communication and the ethical practice with biases towards others, lack of acknowledgment of others' opinions and reduced collaborative practice.
- **Patient as the Only Center:** Several professionals in the interprofessional team practice on the same patient. However, there is no interprofessional collaboration within the team. The teamwork is only apparent. Although many professionals share the same patient, they might not approach the care with a collaborative practice. This occurrence can happen because there are divergences in skills, opinions or because geographical separation is a sharp divide between professionals. Other times, a competitive organizational culture brings people with different expertise to compete instead of uniting their efforts towards a shared care plan.

Table 3: Some drawbacks of interprofessional practice that SNA can help evidence. SNA created with program SocNetv 20.0.

Category	Content	SNA graph
<p>Isolation</p>	<p>Some professionals in the team are rarely involved in team decisions and discussion although retaining important information about patient progress and care. In the example, the Healthcare Assistant. There is the risk of loss of vital information in patient care.</p>	
<p>Decentralization</p>	<p>Although some professionals are meant to occupy more central positions in the network, the team appears to exclude them from the flow of consultation. E.g., a junior or senior doctor is not consulted if needed. In this model, there is the risk of loss of vital guidance in patient care.</p>	
<p>Hyper-centralization</p>	<p>It is the case of someone who does most of the work in the team. E.g., always the same professional provides advice, information, instructions, leadership to other members of the team; however, he or she is not receiving enough information, instruction, and leadership from the group. The risk is lack of collaboration and while the network adapts to the central figure in the network. This network can favor an inactive behavior of those who are less involved. In the example, the arrow-heads are directed from the central figure, (consultant) to all team members.</p>	

<p>Overloading</p>	<p>The responsibilities for information, advice, and action are frequently down-loaded on a single person of the team. This person is erroneously considered as ‘the least expert in the team.’ Team members focus on the same person of the team to provide information, advice, support with no expectation of exchange. It is a form of patronization and the risk is that the centralized person is devalued beyond what is required. In the example, the arrowheads are directed from each member of the team to the senior doctor, at the center.</p>	
<p>Clusterization</p>	<p>Professionals with similar educational background tend to cluster and to form tighter bonds with the exclusion of professional with different cultural background. E.g., doctors and nurses create two different clusters with a risk of silos management of patients and organizations.</p>	
<p>Patient as the only center</p>	<p>Several professionals in the interprofessional team work on the same patient. However, there is no interprofessional collaboration within the team.</p>	

Conclusion

The current commentary has highlighted the importance of interprofessional education and practice in the promotion of integrated care and the advancement of patient health and safety. Interprofessional curricula

are now adopted by almost every healthcare organization which might decide to focus on specific components of interprofessional practice. Nonetheless, also the most experienced interprofessional teams can show interpersonal dynamics which can jeopardize collaborative care. There is an increasing interest in adopting Social Network Analysis for research in interprofessional practice. SNA has the advantage to capture the graphical dynamics of interpersonal practice while providing mathematical models to describe how people in a team interact in integrated care. The current commentary has suggested that some of the flaws in interprofessional practice that can be easily evidenced by using SNA models.

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Conflict of Interests

The author declares no conflict of interest. The author declares that he has no financial or personal relationships that may have inappropriately influenced him in writing this article. Part of the content of the current article was extracted from the author's introduction in an unpublished master dissertation at the University of Dundee.

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