Chapter 2
A Social Network Framework to Explore Healthcare Collaboration

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ABSTRACT

A patient-centric approach to healthcare leads to an informal social network among medical professionals. This chapter presents a research framework to: (1) identify the collaboration structure among physicians that is effective and efficient for patients; (2) discover effective structural attributes of a collaboration network that evolves during the course of providing care; and (3) explore the impact of socio-demographic characteristics of healthcare professionals, patients, and hospitals on collaboration structures, from the point of view of measurable outcomes such as cost and quality of care. The framework uses illustrative examples drawn from a data set of patients undergoing hip replacement surgery. The practical application of the proposed framework reveals structures of physicians' collaborations that are not favourable to cost and quality of care measures such as readmission rate. The authors believe that such a framework will enable healthcare managers and administrators to evaluate the collaborative work environment within their respective healthcare organisations.

INTRODUCTION

Healthcare spending is a major topic of discussion in practically every country in the world. Figure 1 shows the health spending as a percentage of GDP of a few Organisation for Economic Co-operation and Development (OECD) countries based on a report produced by the International Federation of Health Plans[1]. There are growing concerns all around about spiralling healthcare costs, budget constraints and their impact on quality of health outcomes for patients. In this context, a major goal of governments and

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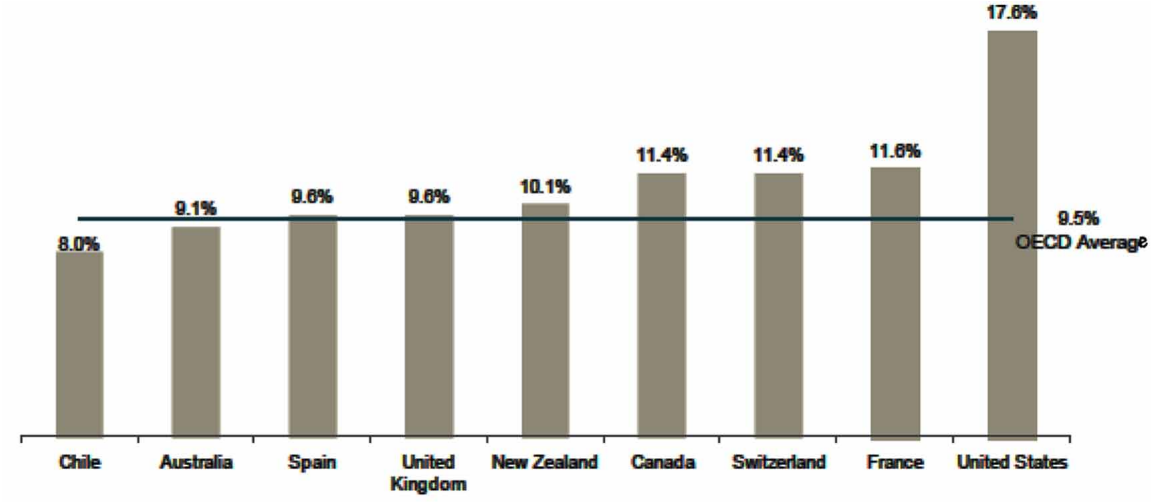
Figure 1. 2010 health spending as a percent of GDP



Source: OECD Health Spending 2012. Data represents 2010 or most recent year.

health providers is to achieve consistency of health outcomes for frequent and expensive health services and high volume and high cost procedures such as knee and hip replacement surgeries whose numbers have been steadily increasing over the years.

Figure 2 shows the comparative costs of hip replacement procedures from the same report. Comparisons across different countries are complicated by differences in sectors, fee schedules and health plans used for cost comparisons. Nevertheless, it is clear that consistent healthcare strategies are required to deliver high quality of services where health outcomes are consistent and predictable both for the patient and providers involved in caring for the patient.

Although not always formal, there is a protocol among physicians to collaborate while providing care to chronic patients both in a hospital setting as well as in an ambulatory care setting. Given that an informal social network exists or emerges among healthcare professionals to address a specific problem, the question that arises is whether there is a way to measure the network parameters of collaboration networks that consistently perform effectively and efficiently to achieve the desired outcome which could be, in the case of patient care, high quality care with optimal costs. Using principles of social network theories such as Bavelas' Centrality Theory (1950), Freeman's centralization theory (1978), and the social network model of exponential random graph model, we propose a social network-based framework that can serve as a basis to offer insights into the different types of collaboration patterns among healthcare professionals that are conducive to positive health outcomes to patients, as well as provide consistent quality of care measures in healthcare settings.

The rest of the paper is organised as follows: the next section presents a review of network-based collaboration models in a healthcare setting, which is followed by the theoretical background of healthcare collaboration related to network structures and measures of centrality. Then we presents our network-based framework that provides formal measures of physicians' collaboration networks and identifies network measures that indicate positive outcomes in terms of both costs and quality of care. After that, we presents an illustrative application and results of network structure measures on a specific (de-identified