Visualizing the Healthcare Fraud Detection – Doctor Patient Network - Demo

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Abstract - Fraud in healthcare industry is growing every day. Current anti-fraud approaches are unable to deal with the size, scope, and details of all the fraudulent activity. Therefore, new approaches should be adopted to detect specific patterns of fraud. No single measure of healthcare fraud detection is sufficient. In our approach to dealing with the specific issue of a network of healthcare providers acting in a conspiracy, we not only identify the providers that are suspect based on shared patients but also provide a visualization that hides all the analytic complexity and present the results in an intuitive way.

Keywords: Healthcare, fraud, visualization, doctor patient network, network fraud

1 Introduction

The cost of healthcare is high and each year this cost is increasing. A huge part of cost are losses due to fraud, waste and abuse. For example, the U.S. Office of Management and Budget estimates that improper payments made under the Medicaid program totaled $29.12 billion in FY 2015[1]. The current approaches to detecting fraud, waste and abuse are insufficient to keep up with the constantly evolving frauds. So it is imperative that new approaches that are simpler to use, easier to understand, and that can detect fraudulent activity as they occur rather than years after the fraud occurs be developed.

2 Discovering Fraudulent Network

Fraudsters are likely to be connected to other fraudsters. This is a reasonable supposition because of the sturdy and persistent interaction between an individual and his/her social network. This pattern of connections was evident in a recent case in which law enforcement agencies charged numerous Miami-based health care providers with conspiracy, obstruction, and health care fraud in connection with a $1 billion scheme [2].

Currently, it is difficult to identify this type of network. Each individual claim for payment is reasonable and thus processed and paid without incident. The evidence of the fraud is only apparent when this individual claim for payment is viewed in the context of all the claims from all the connections between this doctor, this patient, and all the other doctors that are connected to this doctor or this patient.

Further, when the law enforcement agencies come to know about the fraud, it is usually by the single act of a single person who files a complaint. As such, the fraud network has had a long time to mature and has operated for a long time. The result is that the fraud network has successfully defrauded payers for large sums of money without detection. There is a real benefit to identifying such networks early.

We can identify such networks when they are in the growing stage. We have developed a data analytic approach to identifying the fraudulent scheme in the growth phase. The supposition that underlies the unique success of this type of analysis is that such networks operate with a degree of regularity that exhibits a pattern in the transaction data. The fraud is exposed through complex network analysis. Next we use network visualizations, in the form of node-link diagrams, as an effective means to understand patterns of interaction between entities, to discover entities with interesting roles, and to identify inherent groups or clusters of entities [3].

2.1 Case Study – Doctors Sharing Patients

The doctors sharing patients visualization consists of a connected acyclic graph. The doctor who is the focus of interest is at the center. The patients are connected to the doctor through visual connectors. Important point to note is that the providers are of same specialty and the patients are visiting these doctors for the similar reasons.

Through our system, we have identified two such doctors. The doctor patient network graph is shown in Figure 1. Here you can see that in the center the main doctor, who is a suspect and is shown as a red bubble with a yellow border, is connected with patients that are shown as violet bubbles. The red bubbles are shared doctors. Now you can see that in a period of a year, a single patient is shared by more than 25 doctors. This network of shared doctors is alarming.

3 Conclusions

Combatting healthcare fraud requires continuous vigilance, because fraudulent networks are always forming, growing, and morphing. The challenging part is how to analyze the information and then how to make it easy to understand. In this paper we have discussed how to clearly identify the suspect and his network using connected graph. The approach we have used, deals all the complexity behind the visualization and makes it very easy to look into suspected group or network of doctors who are using the same pattern for committing fraud.

4 References