

Chapter 3

A Study of the Cascading Effects of Ambulance Diversion among Hospitals

Abey Kuruvilla

University of Wisconsin Parkside, USA

Suraj Alexander

University of Louisville, USA

Xiaolin Li

Towson University, USA

ABSTRACT

This research effort is undertaken to determine the impact that one hospital's diversion status has on other hospitals in a region and the strength of these interactions. The conditional probability of one hospital going on diversion given that another is already on diversion is evaluated. Based on this analysis, the strength of interactions among the hospitals is established. Through statistical analyses of historical data, the strength of the mutual effects of diversion among a collection of hospitals is determined. These effects are mutual if one hospital's diversion status affected another's, then the reverse was also true. The intensity of these interactions between hospitals is varied, some being stronger than others. The model illustrates an approach to studying the cascading effects of diversion among hospitals in a region. This is important, because the status of any hospital in a region can signal the likelihood of impending diversion in every other hospital in the region. This allows actions that might prevent the occurrence of diversion or mitigate the cascading effects of Emergency Medical Systems diversion.

DOI: 10.4018/978-1-4666-2649-2.ch003

INTRODUCTION

As Emergency Departments (ED) become overloaded, they must divert ambulances to other hospitals or risk jeopardizing patient care. This phenomenon is referred to as “Ambulance Diversion” and may be defined as “the decision to redirect incoming ambulance traffic when an emergency department has reached saturation is anticipated to remain saturated, and there is capacity at surrounding facilities” (Northeast EMS Ambulance Diversion Policy, 2002). In general, hospitals ask EMS agencies to divert ambulances to other medical facilities because their ED staff is occupied and is not able to care immediately for new arrivals. Also, if certain services within the hospitals, such as the intensive care units are filled, hospitals can alert EMS agencies to divert ambulances. This paper uses historical diversion data from a region to study the cascading effects of diversion among hospitals in a region. Results from this study may allow hospitals, most susceptible to cascading effects from a hospital in the vicinity going on diversion, to take mitigatory action to prevent diversion.

This paper is organized as follows: in the next section we review the literature on ambulance diversion and in the following sections we present our study of the cascading effects of diversion in a region.

LITERATURE REVIEW

ED saturation and diversion have been indicated in some communities since the 1960’s. Now, it’s a nationwide phenomenon. The increasing trend in ambulance diversion started causing concern during the late 1980s (Richardson, Asplin, & Lowe, 2002). This resulted in many reports, position papers and task forces that studied this problem from the early 1990s (Frank, 2001; Drummond, 2002; Warden, Bangs, Norton, & Huie, 2003; Pham, Patel, Millin, Kirsch, & Chanmugam,

2006). Ambulance diversion continues to be a problem today and increasingly contributes to delays in emergency medical care (Redelmeier, Blair, & Collins, 1994). It can also lead to adverse outcomes including death (Upfold, 2002). Two of every three emergency departments reported going on diversion at some point in fiscal year 2001 and nearly 1 of every 10 hospitals—was on diversion more than 20 percent of the time (United States General Accounting Office, 2003). The number of hours that hospitals have been on diversion has increased dramatically in recent years because of human resource issues and bed shortages (McCaig & Burt, 2001).

Hospital diversion of ambulances is a multifaceted problem due to its impact on EMS system patients, providers, and EMS system readiness for the next urgent 911 call. Ambulance patients diverted from hospitals are subject to potential delays in their definitive emergency care. Also, patient continuity of care is interrupted as patients arrive at hospitals that are not a part of their usual primary care system. Ambulances, when forced to by-pass closer hospitals to deliver patients, are taken out of service longer. With more ambulances out of service, the medical 911 system is unable to quickly respond to the next 911 request for emergency medical assistance. Additionally, ambulances utilized for transferring patients to their original intended hospital destination are not available for a 911 response. Finally, EMS system’s hospitals are unable to receive their contracted patient population forcing later repatriation of patients after emergency department or hospital admission and thus delaying their definitive care (California Emergency Medical Services Authority, 1998).

Although the problem of ED diversion seems to be rampant in major metropolitan areas, the efforts to prevent or reduce its occurrence have been minimal. Most approaches to addressing this issue appear to be “band-aid” type solutions. Vilke et al. (2004) looked at an approach to decreasing ambulance diversion hours and

8 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/study-cascading-effects-ambulance-diversion/72541

Related Content

Understanding the Relationship Between Culture and Sensory Marketing in Developing Strategies and Opportunities in Emerging Economies: A Cross-Cultural Study

Abdulelah Althagafi and Mahmood Ali (2017). *Promotional Strategies and New Service Opportunities in Emerging Economies* (pp. 236-262).

www.irma-international.org/chapter/understanding-the-relationship-between-culture-and-sensory-marketing-in-developing-strategies-and-opportunities-in-emerging-economies/175557

The Semantic Interoperability Centre Europe: Reuse and the Negotiation of Meaning

Aldo Laudi (2011). *Interoperability in Digital Public Services and Administration: Bridging E-Government and E-Business* (pp. 144-161).

www.irma-international.org/chapter/semantic-interoperability-centre-europe/45787

An Agent-Based Model for Awareness-Based Sustainability

Giovanna Sissa and Ernesto Damiani (2015). *Green Services Engineering, Optimization, and Modeling in the Technological Age* (pp. 149-166).

www.irma-international.org/chapter/an-agent-based-model-for-awareness-based-sustainability/133062

A Goal-Driven Risk Management Approach to Support Security and Privacy Analysis of Cloud-Based System

Shareeful Islam, Haralambos Mouratidis and Edgar R. Weippl (2013). *Security Engineering for Cloud Computing: Approaches and Tools* (pp. 97-122).

www.irma-international.org/chapter/goal-driven-risk-management-approach/70042

Exploring the Factors Behind the Resistance to Mobile Banking in Portugal

Pedro Cruz, Tommi Laukkanen and Pablo Muñoz (2009). *International Journal of E-Services and Mobile Applications* (pp. 16-35).

www.irma-international.org/article/exploring-factors-behind-resistance-mobile/37445