

Day of Week Analysis of Myocardial Infarctions Using ESSENCE-FL Emergency Department Data

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Objective

To investigate the day of week effect on myocardial infarctions (MI) in the age group of 18 – 64 years using ESSENCE-FL emergency department (ED) data.

Introduction

Syndromic surveillance ED data has historically shown the highest number of visits on Mondays, with decreasing volumes throughout the week. Previous studies have shown that increased negative health outcomes have occurred on Mondays (Barnett and Dobson, 2004). A study in the European Journal of Epidemiology provided evidence that suggests a higher incidence of cardiovascular events on Mondays compared to other days of the week (Witte et al., 2005).

Methods

The Florida Department of Health (FDOH) utilizes the Electronic Surveillance System for the Early Notification of Community Based Epidemics (ESSENCE-FL) as its statewide syndromic surveillance system. Visits from 210/237 emergency departments and 33 urgent care centers are analyzed by FDOH epidemiologists each day.

A query was created in ESSENCE-FL to identify MI related chief complaints and discharge diagnoses:

MI, or, ^MI^, or, ^MI, or, MI^, or, ^heart attack^, or, ^cardiac arrest^, or, ^myocardial infarction^, or, ^acute myocardial infarction^, or, ^cardiopulmonary arrest^, or, ^stemi alert^, or, ^stemi^, or, ^nSTEMI^, or, ^subendocardial infarction^

This analysis focused on individuals 18 – 64 years of age. MI related terms were used to query ED visits from the time period of December 1, 2012 to August 10, 2015. The total number of ED visits analyzed in this study was 25,448,785.

Exponentially weighted moving average (EWMA) detection algorithms in ESSENCE-FL were used to determine anomalies in the targeted data, which generated alerts signaling a larger than expected number of MI related ED visits for a given day.

Results

The created MI query detected 18 red alerts and 57 yellow alerts for the time period of December 1, 2012 to August 10, 2015. A total of 33% of the red alerts occurred on Monday. The total of red and yellow alerts demonstrated that 29% of these flagged days occurred on a Monday. In comparison to all other days of the week, Monday was shown to have the highest proportion of red and yellow statistical alerts. Additionally, the daily mean analysis demonstrated that Monday, followed by Tuesday, showed the largest positive deviation from the overall daily mean (Table 1). Saturday, followed by Sunday, proved to be the two days with the lowest proportion of red and yellow statistical alerts.

Conclusions

Results from this analysis provide evidence that a disproportionate number of individuals aged 18 – 64 years with MI related complaints present to the ED on Mondays. This study supports the results that were found by previous researchers (Witte et al., 2005).

A similar analysis of chest pain visits in ESSENCE-FL presented analytic validity of a day of the week effect, with the highest

proportion of visits occurring on Mondays. Efforts to understand the periodicity of FDOH's syndromic surveillance data have resulted in epidemiology staff that are better able to respond to both chronic and infectious disease public health threats.

Additionally, this study suggests that there is a reduced incidence of myocardial infarction and chest pain on Saturday and Sunday. This study assumes that an individual having a myocardial infarction, or believed to be having a myocardial infarction, will present to the ED regardless of the day of the week. Many ED patients with lesser morbidities, or those who are using the ED for primary care, appear to preferentially select days to go to the ED (Faryar, 2013). One limitation of this study is that it relied on, at least in part, chief complaint data. Further study of heart attacks by day of the week using a hospital discharge data set would help confirm this finding.

Day of Week Effect for Total Volume and MI Query Volume December 1, 2012 - August 10, 2015 (983 days)				
Day of Week	Daily mean volume	Deviation from total daily mean	Daily mean - MI Query	Deviation from MI daily mean
Monday	28532	10.20%	86	7.00%
Tuesday	26681	3.10%	82.1	2.20%
Wednesday	26061	0.70%	79.6	-0.90%
Thursday	25484	-1.60%	79.2	-1.40%
Friday	25389	-1.90%	78.6	-2.10%
Saturday	24274	-6.20%	76.6	-4.60%
Sunday	24801	-4.20%	80.2	-0.20%

Table 1

Keywords

myocardial infarction; heart attack; day of the week effect

References

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