Regional and seasonal variations in the US emergency department visits for acute pericarditis.

Brijesh Patel MD
Lehigh Valley Health Network, brijesh.patel@lvhn.org

Mahek Shah MD
Lehigh Valley Health Network, Mahek.Shah@lvhn.org

Tarick Sheikh
Lehigh Valley Health Network, Tarick.Sheikh@lvhn.org

Raman Dusaj MD
Lehigh Valley Health Network, Raman_S.Dusaj@lvhn.org

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Regional and seasonal variations in the US emergency department visits for acute pericarditis

The pericardium is an avascular fibro-elastic enclosure surrounding the heart, composed of two layers divided by a potential cavity; the pericardial space. Inflammation of this space is termed acute pericarditis (AP), the etiology of which is believed to be multifactorial with the most common cause worldwide being idiopathic [1]. Seasonality of AP is often attributed to increased incidences of viral infection, but regional variations in AP have not been examined. We conducted this study to assess regional and seasonal trends of AP.

We queried the National Emergency Department Sample (NEDS) database from 2010 to 2013 to assemble our cohort for AP as a principle diagnosis. The NEDS database contains on average 31 million unweighted cases, and provides >100 clinical and non-clinical variables to analyze [2]. We used the International Classification of Diseases, 9th revision (ICD 9) codes and Clinical Classification Software (CCS)- a cluster of similar diagnoses, to find clinical variables. We selected the variables based on common causes or associated conditions with pericarditis. We added diagnosis such as coronary artery disease and congestive heart failure to emphasize the presence of cardiac comorbidities. Since our study is based on an administrative database, it is prone to coding errors.

The primary aim of our study was identified trend in the ED visits related AP over 48-month study period across the four US geographic regions (Northeast, Midwest, South and West). The ICD 9 codes used to identify cases of acute pericarditis (420.0, 420.90, 420.91 and 420.99), and clinical variables listed in Table 1. Categorical variables were analyzed with a chi-square test. The list of ICD 9 codes for clinical variables or procedures is embedded in Table 1. The trends were further analyzed with the seasonal Mann-Kendell test. We believed that the seasonal Mann-Kendell test will be appropriate to assess seasonal variability. Chi-square test was used for the categorical variables. Cases with missing values for the regions, and age < 18 years were excluded from the study. We reported cases of AP per 100,000 ED visits.

A total 52,552 weighted cases of acute pericarditis as principle diagnosis were identified. Among the four regions, the Northeast region had the most cases per 100,000 ED visits. Females were less likely to have experience AP related visits. None of the regions exhibited any significant trends. Notably, the Northeast region had a peak in the incidence of AP in March 2012. Overall, only the Northeast region had increased incidences of AP in the winter months (Fig. 1). Most patients belonged to the 41 and 65 years age group. Patients who presented in the Northeast region were also found to have higher rates of concomitant cardiac tamponade or hemopericardium associated with a higher rate of pericardiectomy, while patients in the South region had a higher co-existence of connective tissue diseases (CTD). There was no significant difference in coronary artery disease or viral or respiratory infection among all the regions. The southern region had more patients with chronic kidney disease, while the western region had the lowest proportion of patients with concomitant congestive heart failure. Patients who present to emergency departments with AP in the Northeastern region least likely to be discharged routinely.

The major findings of our studies are: (1) There is no significant trend for any US regions. (2) Winter months in the Northeast region had greater numbers of emergency department visits. The exact reason behind the latter finding is not clear. A Prior study has supported a seasonal pattern AP in Israel but similar trends are not known for the US [3]. To our knowledge, this is the first study to examine regional variations for AP. In the Southern region, there was a higher proportion of patients with connective tissue disease, which is likely due to a higher proportion of females in the region. In general Females are more likely to be affected by connective tissue diseases [4].

Since we conducted our study using the largest national ED visits database, our data is generalizable to the US population. However, there are important limitations. The database does not include labs or imaging data. The diagnosis of AP is a clinical diagnosis and there is no clinical information available supporting the diagnosis of AP. The database does not allow us to analyze individual patient related information. That is, each entry in the database represents one ED visit, and therefore, multiple visits from the same patient could have been included.

In this multi-year study, we did not observe significant trends. There are higher incidences of AP in winter months, but only in the Northeast region. Further studies are needed confirm these finding and explain why winter months in certain regions have higher emergency department visits.

Table 1
Clinical variables and diagnosis codes.
CCS = Clinical Classifications Software; ICD 9 codes = International Classifications of Diseases, 9th revision.

	Northeast	Midwest	South	West	p-Value
	n = 14,714	n = 13,407	n = 12,913	n = 11,520	
Females	36.5	34.7	38.0	35.8	0.48
18 to 40 years	33.8	33.8	39.8	34.5	<0.001
41 to 64 years	40.4	42.7	41.2	38.7	
65 years or older	25.8	23.4	19.0	26.8	
Cardiac temponade or hemopericardium (ICD 9 codes: 423.0, 423.3 and 423.0)	10.2	9.2	6.8	8.0	<0.001
Congestive heart failure (CCS: 108)	8.8	8.9	8.7	7.8	0.004
Chronic/end-stage kidney disease (CCS: 158)	8.2	8.5	9.6	8.5	0.03
Connective tissue diseases including lupus (CCS: 210 and 211)	6.3	6.5	9.9	7.5	<0.001
Coronary artery disease (CCS: 109)	5.9	6.5	5.7	5.7	0.15
Hypertension (CCS: 98 and 99)	37.8	40.2	39.6	36.1	0.02
Viral and respiratory infections (CCS: 7, 123, 125 and 126)	5.4	5.9	5.2	5.6	0.82
Pericardiocentesis (ICD 9 procedure code: 37.0)	6.5	7.6	5.2	7.9	0.17
Pericardiectomy (ICD 9 procedure code: 37.31)	1.4	0.4	0.3	0.6	<0.001
Dispositions of patients					
Routinely discharged from emergency department	22.6	26.6	35.0	29.5	<0.001
Admitted to inpatient	73.9	69.7	61.9	66.6	<0.001

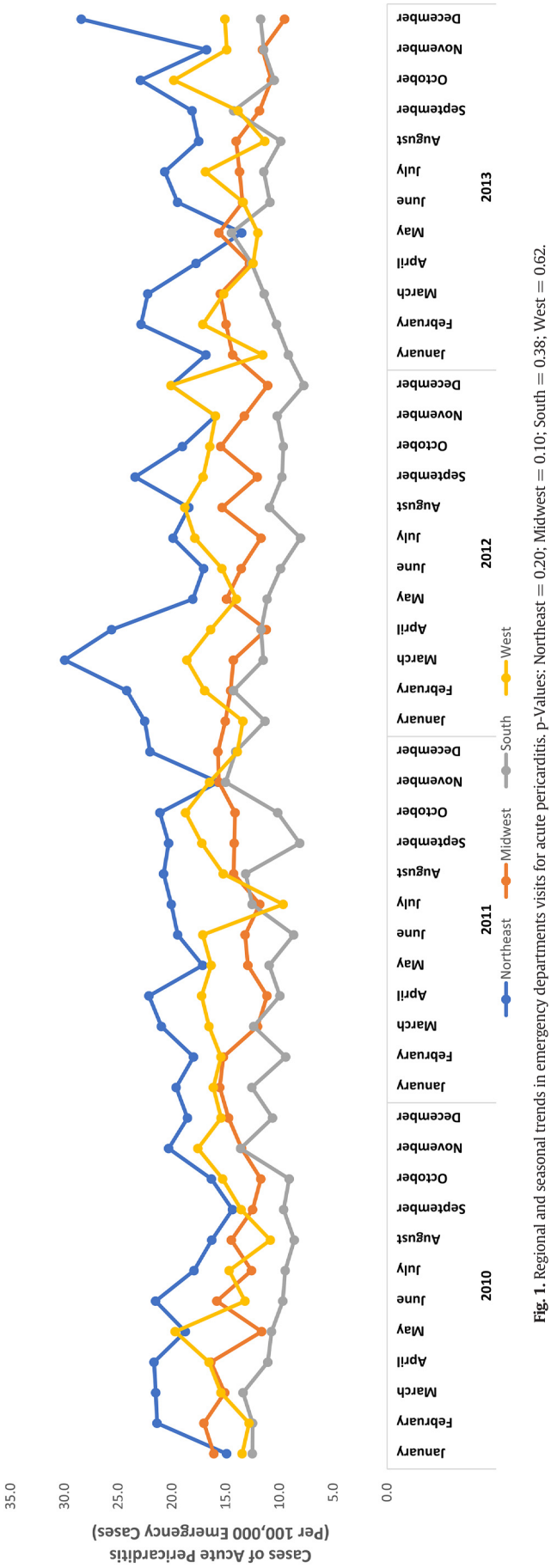

Fig. 1. Regional and seasonal trends in emergency departments visits for acute pericarditis. p-Values: Northeast = 0.20; Midwest = 0.10; South = 0.38; West = 0.62.

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Brijesh Patel*
Mahek Shah
Department of Cardiology, Lehigh Valley Hospital Network, Allentown, PA, United States of America
*Corresponding author at: Lehigh Valley Health Network, 1250 S Cedar Crest Blvd, Suite 300, Allentown, PA 18103, United States of America.
E-mail address: b2patel@gmail.com.

Tarick Sheikh
Department of Internal Medicine, Lehigh Valley Hospital Network, Allentown, PA, United States of America

Raman Dusaj
Department of Cardiology, Lehigh Valley Hospital Network, Allentown, PA, United States of America

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The forensic rape examination: Is colposcopy really necessary?

The physical examination of sexual assault victims is performed to identify and treat injuries, as well as collect forensic evidence for prosecution. Historically, three primary mechanisms have been used for sexual assault examination: direct visualization, nuclear staining using toluidine blue, and colposcopy [1]. Colposcopic photo-documentation of anogenital injuries as part of the medical-forensic examination of the sexual assault victim has become more widespread nationally; however, few studies have compared its effectiveness among other examination techniques. Research in clinical forensic medicine show that trained examiners using colposcopy obtain evidence of anogenital trauma in 71% to 86% of rape victims [1-3]. Although this is a significant improvement over protocols relying on gross visualization [3] or toluidine blue dye enhancement [4], drawbacks to colposcopy include the expense and maintenance of equipment, additional provider training, and the psychological trauma to the patient of a genital examination under magnification. The purpose of this study was to compare visualization of anogenital injuries in sexual assault victims among these three prominent forensic examination techniques.

This prospective controlled trial was set in a community-based nurse examiner program (NEP) over a 24-month study period. The majority of patients came from law enforcement dispatch and crisis line contacts. Those sexual assault victims presenting directly to the four city emergency departments were transferred to the NEP for evaluation after triage and initial assessment. The NEP was staffed by 9 forensic nurses trained to perform medical-legal examinations; each nurse had performed over 200 sexual assault examinations prior to study initiation. Sexual assault victims were eligible for inclusion in the study if they were age 13 years or older and consented to a genital examination. This examination consisted of direct visual inspection, 1% toluidine blue contrast application, followed by colposcopy using a Cooper Surgical Leisegang© colposcope system with 30× magnification. After each technique, nurse examiners documented the types and number of anogenital injuries visualized using a standardized classification system [5]. The study hypothesis was that colposcopy could identify injuries not easily demonstrated using direct visualization or nuclear staining. Data are reported with 95% confidence intervals (CIs).

Four hundred and forty-five consecutive cases of sexual assault met the eligibility criteria and were included in the study. The age range was 13 to 74 years (mean, 24 ± 11 years); 84% were examined within 48 h following sexual assault. Anogenital trauma was detected in 68% (95% CI 64% to 72%) of patients; 27% had single and 41% had multiple sites of trauma. A total of 837 anogenital injuries were documented in the study population (mean number of injuries, 1.9 ± 1.4). The majority (68%) occurred at three specific anatomic sites: posterior fourchette, fossa navicularis, and labia minora. The most common types of injury were lacerations (37%) and abrasions (25%), followed by erythema (23%), ecchymosis (9%) and edema (6%). Direct visualization alone demonstrated 531 (63%; 95% CI 60% to 67%) of anogenital injuries. Nuclear staining with toluidine blue identified an additional 285 lacerations or abrasions (34%; 95% CI 31% to 37%). Colposcopy identified 21 injuries (3%; 95% CI 1% to 4%) not seen using direct visualization or nuclear staining. These injuries were typically localized erythema or edema involving the cervix and hymen. Overall, three women (1%; 95% CI 0% to 1%) had subtle genital injuries detected only by colposcopy.

Colposcopy is a procedure that allows a health practitioner to perform a magnified visual inspection of the internal and external genitalia in the context of a standard gynecologic exam. Teixeira published the first study describing and endorsing the use of colposcopy in the forensic examination of sexual assault victims in 1981 [6]. This landmark study concluded that colposcopy was superior to gross visual inspection in the detection of microtrauma following sexual assault or rape. Subsequent research replicated these early findings, and by 2007, colposcopy with digital imaging had become the standard of care in the sexual assault forensic examination in the United States [7]. Our results call into question this practice. Of the few minor injuries detected by additional use of the colposcope, it is unlikely that this microtrauma had any clinical significance or was relevant for criminal prosecution. An examination of the effect of sexual assault evidence on criminal charge laying showed an odds ratio of 3 for moderate to severe injuries, though minor anogenital injuries were not associated with criminal sexual intent or charge laying [8].

Our results are consistent with Zink et al., who used a similar methodology to compare anogenital injury findings after consensual sexual intercourse [1]. They concluded that direct visualization and colposcopy yielded similar anogenital injury findings. One explanation for these findings may be attributed to the forensic examiner's background. Our sexual assault nurses had extensive experience and training at the NEP with backgrounds in emergency medicine. When compared to direct visualization and nuclear staining, colposcopy seems to offer little advantage to a skilled forensic examiner.

Abby Rogers[1]
Sarah L. McIntyre[1]
College of Health Professions, Grand Valley State University, Grand Rapids, MI, United States of America

Linda Rossman[2]
Stephanie Solis[2]
YWCA West Central Michigan Nurse Examiner Program, Grand Rapids, MI, United States of America

[1] 301 Michigan St NE, Grand Rapids, MI 49503, United States of America.
[2] 25 Sheldon Blvd. SE, Grand Rapids MI 49503, United States of America.