



## Selected Topics: Psychiatric Emergencies

### SCREENING ELECTROCARDIOGRAMS IN COCAINE-POSITIVE CHEST PAIN-FREE PSYCHIATRIC PATIENTS REQUIRING MEDICAL SCREENING

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**Abstract—Background:** The current practice at a large urban academic emergency department (ED) is to obtain screening electrocardiograms (ECGs) as part of the medical screening on all psychiatric patients who test positive for cocaine. **Objective:** We sought to examine the impact of an ECG in the medical screening of chest pain-free psychiatric patients who test positive for cocaine. **Methods:** An institutional review board-approved retrospective chart review from January 2014 to December 2015 was performed on charts of adult ED patients requiring medical screening before transfer to a psychiatric facility. Patients who tested positive for cocaine on urine drug screens were included in this study. Patients with chest pain or those who did not have an ECG recorded were excluded. **Outcomes evaluated** included disposition and subsequent cardiac work-up. **Results:** One thousand nine hundred sixty-eight ED patients were identified who tested positive for cocaine on a urine toxicology screen, and 853 met the inclusion criteria. ECGs were normal in 812 patients (95% [95% confidence interval 93–96%]) and abnormal in 41 patients (5% [95% confidence interval 4–7%]). Of 41 patients with abnormal ECGs, 4 were admitted for cardiac work-up. Two patients had positive troponin values in the ED, 2 had cardiology consultations, and 3 had further cardiac stress testing, all of which were negative or nondiagnostic. No cardiac catheterizations were performed. **Conclusions:** Most ED patients with recent cocaine use but without chest pain have a normal ECG. Of the minority with an abnormal ECG, no cases of acute myocardial ischemia or infarction were identified. © 2019 Published by Elsevier Inc.

**Keywords—**chest pain; cocaine; ECG; EKG; electrocardiogram; emergency department; medical clearance; medical screening; psychiatric; urine drug screen

#### INTRODUCTION

According to recent research and 2016 data from the National Ambulatory Medical Care Survey, acute agitation and other psychiatric emergencies accounted for approximately 3–5% of all emergency department (ED) visits, and 1% required transfer to a psychiatric facility (1–4). When psychiatric patients are deemed by the emergency physician as necessitating transfer and admission to an inpatient psychiatric facility, a medical screening examination must first be performed before the receiving facility will accept the transfer. The medical screening examination's purpose is to identify and exclude medical comorbidities that require treatment before transfer and to assess whether the patient is intoxicated and therefore unable to cooperate with a formal psychiatric examination (5–7). The exact requirements of the medical screening examination remain controversial and are not standardized across the United States (6). The medical screening examination is an integral part of the evaluation of a psychiatric patient because a variety of medical illnesses may mimic as well as coexist with psychiatric disorders, and many psychiatric institutions lack the resources necessary to treat medical conditions.

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The American College of Emergency Physicians issued a policy statement stating that the medical screening of cooperative, alert, asymptomatic patients could be directed by the history and physical examination rather than a variety of laboratory testing (8). Multiple studies performed in the ED have yielded similar results, concluding that routine urine and blood testing do not appear to add additional high-yield clinical information in the medical screening of ED psychiatric patients (9,10). States such as Massachusetts have also established consensus guidelines that take the position that routine drug screens are not required in the evaluation of medically stable psychiatric patients, and if requested by the receiving psychiatric facility should not delay transfer of the patient (11).

Despite such policy and consensus guidelines, the common practice in many parts of the United States is for receiving psychiatric facilities to request a variety of additional testing, such as a complete metabolic panel as well as serum and urine drug screens (UDSs). While there is no clear requirement to obtain electrocardiograms (ECGs) as a part of the medical screening process in the Chicagoland area, some psychiatric institutions demand such additional testing. At times, ECGs are requested in patients that test positive for cocaine on UDSs regardless of cardiac symptoms despite limited research to support this (12).

The utility of using a positive UDS to direct further clinical studies is questionable when one considers established data on the interpretation of a positive UDS and the typical presentation of cocaine toxicity. Cocaine drug screens are well known to remain positive for 2–4 days after the last use (13). In addition, acute cocaine toxicity has a distinct sympathomimetic toxidrome that is identifiable by abnormal vitals and physical examination. Also, complications of recent cocaine abuse, such as vasospastic angina or myocardial ischemia, would be expected to cause symptoms of chest pain and discomfort. Despite the fact that no formal requirement exists to obtain laboratory testing in patients with an established psychiatric condition, who are alert, and who have an unremarkable physical examination and history in the particular state where this trend has been noted, many transferring facilities are refusing transfer without such tests (14). This retrospective analysis was designed to further investigate the role of ECGs in the medical screening of asymptomatic psychiatric patients.

## METHODS

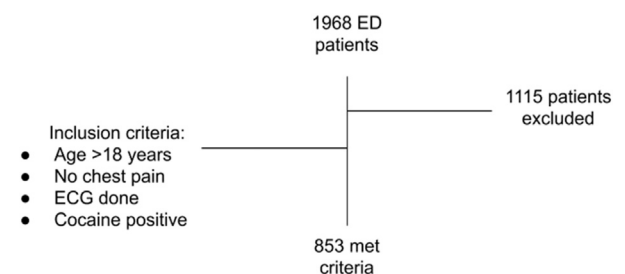
This study was conducted at large, urban tertiary care medical center with a census of >120,000 ED visits per year. It was approved by the institutional review board. A retrospective chart review between January 2014 and

December 2015 was conducted using consecutive ED charts in the electronic medical record. Charts of ED patients meeting the following criteria were included: 1)  $\geq 18$  years of age; 2) without chest pain documented in the medical record; 3) required medical screening in the ED before transfer to an inpatient psychiatric facility; 4) tested positive for cocaine on a screening urine toxicology test; and 5) for whom a screening ECG was obtained (Figure 1). Of note, ECGs were commonly asked for by many psychiatric institutions but not all institutions, so some patients did not have ECGs obtained despite testing positive for cocaine and therefore were not included in this study. Also, patients with inadequate documentation were also excluded. A research data manager generated an initial query in the electronic medical record of all ED patients admitted to psychiatric institutions during our study period and then applied the eligibility criteria to this dataset.

Data were obtained and analyzed by 4 trained and monitored abstractors using a standardized predesigned data collection Excel spreadsheet (Microsoft Corp., Redmond WA). ED charts of all enrolled patients were reviewed individually, identifying any mention of any chest pain or variations of chest discomfort. The investigators reviewed 1 out of every 20 cases to assess for interrater reliability. If discrepancies approached  $\geq 5\%$ , the discrepancies were addressed by retraining of abstractors. This did not occur in our study of note.

All ECGs included in this study had interpretations by the ED attending physician on duty as well as the cardiology attending in the patient's records. Abnormal ECGs were defined as those with nonspecific ST changes, T wave inversions, sinus tachycardia, ST elevation, or ST depression. All abnormal ECGs were compared to previous ECGs if available, and if no change was noted then these were categorized as normal. Trained abstractors applied these predefined definitions to categorize ECGs as normal or abnormal.

The primary outcome measured was the disposition of the patient to an inpatient psychiatric facility vs. an inpatient medical admission. Secondary outcomes were rates of subsequent cardiac work-up, including inpatient



**Figure 1. Inclusion and exclusion criteria. ECG = electrocardiogram; ED = emergency department.**

**Table 1. Demographic Information of Patients**

Demographic Information	n (%)
Age, years (average)	21–73 (45)
Gender	
Male	669 (78)
Female	182 (21)
Unknown gender	2 (0.2)
Race	
Black	659 (77)
White	91 (11)
Other	103 (12)
Insurance type	
No insurance or self-pay	164 (19)
Medical	689 (81)
Unknown	64 (8)

medical admission, cardiac enzymes, stress testing, cardiology consultation, and cardiac catheterization. The results of any additional testing were reviewed and analyzed for diagnoses such as myocardial ischemia, vasospastic angina, or other abnormalities.

## RESULTS

An initial query in the electronic medical record of all ED patients who are admitted to inpatient psychiatric institutions was performed. A total of 1968 ED patients were pulled during the initial query by a research data manager. When the eligibility criteria were applied to this group, 853 patients were identified and enrolled. As detailed in [Table 1](#) the average age was 45 years (range 21–73 years). A total of 182 (21%) identified their gender as female, 669 (78%) as male, and 2 (0.2%) were unknown as patients declined identification of their gender. Self-identified race was as follows: 659 (77%) black, 91 (11%) white, and 103 (12%) other. The majority were black males (n = 509). Of those categorized as other, 53 (6%) reported themselves to be of Hispanic ethnicity. No insurance or self-pay was reported by 164 (19%) patients, medical insurance coverage was reported by 689 (81%) patients, and 64 (8%) were classified as unknown.

ECGs were normal in 812 (95% [95% confidence interval 93–96%]) patients and abnormal in 41 (5% [95% confidence interval 4–7%]) patients. The ECG abnormalities noted were the following: 23 had nonspecific ST-T

**Table 2. Abnormal Electrocardiogram Findings**

Type of Abnormal Electrocardiogram Finding	n (%)
Nonspecific ST changes	23 (5.6)
T wave inversions	18 (4.4)
ST elevation	5 (1.2)
ST depression	2 (0.5)
Sinus tachycardia	0 (0)

**Table 3. Cardiac Testing Performed in Response to Electrocardiograms Classified as Abnormal**

Type of Test	n (%)
Additional abnormal electrocardiogram	41 (5)
Troponin	14 (2)
Medical admission	4 (0.5)
Cardiology consultation	2 (0.2)
Cardiac stress test	3 (0.3)
Cardiac catheterization	0 (0)

wave abnormalities, 18 had T wave inversions, 5 had ST elevations including J point elevation, 2 had ST depressions, and 2 had a right bundle branch block ([Table 2](#)). No patients had a left bundle branch block. No patient had an acute ST elevation myocardial infarction. Of the 41 patients with abnormal ECGs, 4 were admitted for a cardiac work-up ([Table 3](#)). Fourteen patients had troponin levels obtained, of which 2 patients had positive troponins in the ED.

Regarding the 4 patients admitted for additional cardiac testing, patient 1 was a 56-year-old man with a history of hypertension and a seizure disorder who endorsed using cocaine, marijuana, and alcohol before arrival to the ED. His troponin level was normal but his ECG showed lateral T wave inversions. Cardiology was consulted and the patient underwent a thallium stress test. This did not demonstrate any evidence of ischemia and the patient was medically cleared without additional cardiac testing. Patient 2 was a 54-year-old man with a history of hypertension, iron deficiency anemia, thoracic aortic dissection, and aortic bioprosthetic valve replacement who last used cocaine 1 night earlier. His ECG showed lateral T wave inversions. The patient had serial troponin measurements taken that were positive but were down trending on repeat testing. The patient was admitted for observation and discharged home with an outpatient echocardiogram appointment. Patient 3 was a 43-year-old woman who had a medical history of hypertension, heart failure, asthma, and chronic obstructive pulmonary disease who endorsed regularly using cocaine and heroin. Her ECG revealed new T wave inversions in the anterior leads. The patient was admitted to the hospital where she had 2 troponin measurement taken that were negative, and a thallium stress test that did not demonstrate any ischemic changes. She was medically cleared without additional cardiac testing. Patient 4 was a 56-year-old man with a history of hypertension and diabetes. He endorsed abusing cocaine regularly. His ECG had T wave inversions in the inferior and lateral leads. In light of the abnormal ECG, the patient had a troponin measurement taken in the ED, which was mildly positive. The patient was admitted and cardiology was consulted. The patient underwent a dobutamine stress echocardiogram per their recommendations which was unremarkable.

In total, 2 of 4 patients had cardiology consultations and 3 of 4 had cardiac stress testing performed—all of which were negative or nondiagnostic, and no patients had a cardiac catheterization. No patients were identified as having an acute myocardial infarction or requiring acute cardiac interventions, such as stenting. All patients were thereafter evaluated by psychiatry, which was their initial presenting chief complaint.

## DISCUSSION

While many studies have explored the utility of laboratory testing in the medical screening examination of psychiatric patients, little information has been published to date on the utility of ECGs in asymptomatic psychiatric patients. Olshaker et al. performed a retrospective review of 352 patients and found that the majority of medical and substance abuse can be diagnosed based on the history and physical examination (10). More specifically, the history and physical examination yielded higher sensitivities for diagnosing medical conditions compared with laboratory testing; 94% were identified based on history and 51% based on physical examination compared with 20% by laboratory testing (10). Similarly, Janiak and Atteberry retrospectively reviewed 519 consecutive adult ED patients and found that no patients were found to have a pure medical problem based on laboratory testing, and no patients were transferred from the psychiatric facility back to a medical unit for treatment of an initially undiagnosed medical illness (15). One case of note had abnormal laboratory testing. However, this patient also had vital sign abnormalities, such as a heart rate of 114 beats/min, and complaints of decreased energy and decreased appetite by history. Many would argue that laboratory testing would have been obtained anyway in the evaluation and stabilization of the patient given their abnormal history and physical. This study ultimately concluded that routine laboratory testing is not cost effective and does not significantly alter management after a careful history and physical examination are performed in the ED.

In addition, studies evaluating the utility of the UDS in guiding ED management have shown that routine drug screening has no clinically significant impact. Schiller et al. performed a prospective analysis of the impact of mandatory urine drug screening on the disposition of 392 psychiatric ED patients (16). This study found that mandatory drug screening did not impact disposition or length of stay. Montague et al. prospectively analyzed the use of UDS results in the management of acute overdoses, and found that being blinded to the results of UDS results did not affect the outcome or management of 107 patients (17). Tenenbein also published a literature review that included 17 studies and 6870 patients. His re-

view article found that no studies demonstrated the UDS to have a significant clinical impact upon the treatment and management of patients in the ED (18).

In contrast, little has been published on the benefits of ECGs in asymptomatic psychiatric patients. In 1995, Hollister published a study evaluating the utility of screening ECGs in psychiatric admissions (12). This study concluded that the sensitivity of screening ECGs diagnosed few abnormalities except in patients  $\geq 55$  years of age, and the role of screening ECGs in psychiatric patients remained unclear (12). Outside of this study, little is known on the usefulness of ECGs in this specific ED population.

Our study evaluated the usefulness of ECGs in the medical screening of asymptomatic psychiatric patients and found similar results as previous studies evaluating the utility of routine laboratory testing. Most of the time, ECGs, like laboratory testing, were found to be normal. Of the minority of patients with an abnormal ECG (5% [95% confidence interval 4–7%]), there were no cases of acute myocardial ischemia or infarction identified in the absence of chest pain. Therefore, a screening ECG in patients without chest pain simply because of a cocaine positive urine toxicology test does not appear to identify any cases of myocardial ischemia or infarction.

The ramifications of unnecessary ECGs include potential overtesting, unnecessary admissions, and the misuse of resources. Little evidence appears to support routinely obtaining ECGs in asymptomatic patients based on the results of this current study as well as previous research studies evaluating the utility of routine laboratory tests and drug screens.

### Limitations

Several limitations are important to note. Given its retrospective design, the study was reliant on the documentation available in the medical record, which at times was incomplete. There is the possibility that a patient could have endorsed chest pain, but that because it was not explicitly charted then the patient may have been incorrectly included in this study.

In addition, this study was performed at a single urban tertiary care center in the Chicagoland area. Therefore, our conclusions are limited with regard to the generalizability to other institutions and other areas of the country. Moreover, the demographics were markedly skewed in our study to include mostly black men, which may be a reflection of this single institution's servicing area. Future directions for this study would include obtaining data from multiple sites to compare any differences from site to site and to obtain a broader demographic.

Other limitations included the fact that the study was only partially blinded: the trained abstractors were blinded to the study, but the attending emergency physicians evaluating the ECGs were not blinded to the study.

In addition, given the underlying psychiatric conditions, it is possible that a patient may have been so severely psychotic or depressed to the point that they could not provide accurate clinical histories. In these cases, the patients may have been incorrectly categorized as meeting the inclusion criteria when they in fact had chest pain, excluding them from our study.

## CONCLUSIONS

Based on this preliminary pilot study, routinely obtaining ECGs in chest pain-free ED psychiatric patients who test positive on routine UDS for cocaine does not appear to identify any missed cases of myocardial ischemia or other cardiac-related complications. In fact, the additional ECGs may have resulted in unnecessary testing. These conclusions are limited given the retrospective, single-center, partially blinded nature of our study. Future directions would include a prospective, multicenter, double-blinded study to allow for more generalizability and more definitive conclusions regarding the use of screening ECGs in asymptomatic psychiatric ED patients. More studies are necessary to better understand the necessity and impact of such testing before it becomes a routine practice in the medical screening of ED psychiatric patients.

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### ARTICLE SUMMARY

#### **1. Why is this topic important?**

The medical screening of psychiatric patients is a common scenario encountered by all emergency physicians. A standardized definition of medical screening has not yet been clearly established. The necessary testing involved in medically clearing a psychiatric patient remains controversial. Little has been published to date on the utility and impact of electrocardiograms (ECGs) in the clearance of asymptomatic psychiatric patients with abnormal drug screening results.

#### **2. What does this study attempt to show?**

This study seeks to evaluate the utility and impact of ECGs in the medical screening of chest pain-free psychiatric patients.

#### **3. What are the key findings?**

Most emergency department psychiatric patients who tested positive for cocaine had a normal ECG. Of the small percentage of patients with an abnormal ECG, no cases of acute myocardial ischemia or infarction were identified.

#### **4. How is patient care impacted?**

ECGs in the medical screening of psychiatric patients did not appear to identify any cases of myocardial ischemia or infarction in chest pain-free individuals. This raises questions about the utility of routinely ordering this test in asymptomatic patients.