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The impact of computed tomography head scans on emergency department management and length of stay in bizarre behavior patients

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ABSTRACT

Methods: A 5-year retrospective chart review was conducted at 3 EDs. Inclusion criteria were patients ≥18 years old triaged as "mental health - bizarre behavior" (deviation from normal cognitive behaviour with no obvious cause) with a CT head scan ordered in the ED. Exclusion criteria were focal neurologic deficits on exam, alternative medical etiology (i.e. delirium, trauma) and/or pre-existing CNS disease. Clinical, demographic and administrative data were extracted with 10% of charts independently reviewed by an Emergency Physician for inter-rater reliability.

Results: 266 cases met study criteria. Population demographics: 49% percent female, average age 51 years old, 28% homeless, 58% arrived by police or ambulance. CT head results: 1 (0.4%) case with possible acute findings, 105 (39%) with incidental findings (i.e. cerebral atrophy) that did not impact clinical management. Average time to physician assessment was 1:48 (hour:min) (sd 1:11), time to CT completion was 5:05 (sd 7:28) and an average delay of 3:17 awaiting results. Subgroup analysis revealed a net increase in ED length of stay (ED LOS) of 5:02 from obtaining neuroimaging. 85% of patients were referred to a consultant, 92% were to psychiatry.

Conclusions: CT head results prolonged ED LOS, delayed patient disposition and did not change the patient's clinical management. A prospective trial for ordering CT head scans in these patients is warranted.

1. Introduction

Psychiatric visits comprise a significant and growing proportion of Emergency Department (ED) visits each year [1,2]. Patients presenting to the ED with bizarre behavior are often challenging to assess due to multiple factors, such as a lack of patient identification, an inability to obtain a history, and an absence of collateral information. The standard clinical approach by Emergency Physicians (EP) is to medically stabilize and "clear" the patient of any organic pathology prior to a psychiatric consultation [3]. This approach often involves ordering and interpreting a computed tomography (CT) scan of the head amongst other investigations such as blood work, to rule out organic causes of the bizarre behavior [3]. Studies of CT head findings in patients admitted to psychiatric wards with a diagnosis of first-onset psychosis and other presentations of bizarre behavior have revealed no benefit in obtaining this diagnostic test as the results have not been found to be causally related to the presentation [4-9]. The Canadian Psychiatric Association notes that patients with first-episode psychosis with an absence of neurologic findings will rarely have brain disease revealed by neuroimaging [10]. Despite this, they suggest there is level B evidence (recommendation on patient management principles that reflect moderate clinical certainty) to obtain neuroimaging with the onset of illness to rule out structural brain abnormalities [10,11]. Similarly, the American Psychiatric Association recommends neuroimaging for patients where the etiology of bizarre behavior is unclear [12]. While these associations recommend these tests, there appears to be limited evidence of the need for a CT head, particularly in an emergency context. The 2017 Clinical Policy on adult psychiatric patient management from the American College of Emergency Physicians indicates a lack of robust data in this area and suggests that individual assessment of risk factors should guide physicians on the need for neuroimaging [3].

The purpose of this retrospective study is to determine the impact of obtaining CT head scans in patients presenting to the ED with bizarre behavior by looking at how the CT results change management in the ED, and secondarily how it impacts a patient's ED length of stay (ED LOS).

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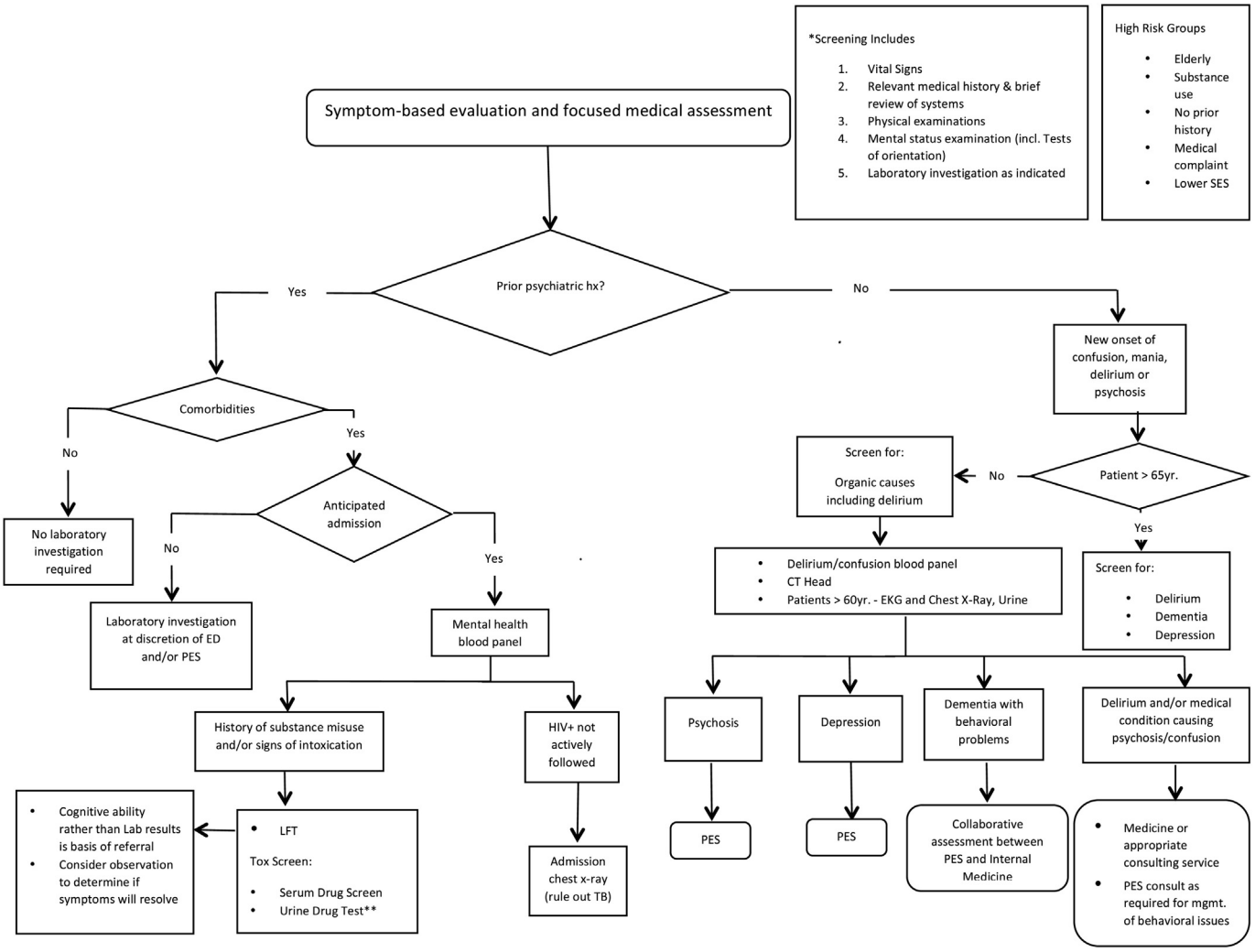

Fig. 1. SMH assessment guidelines for patients who are medically stable for consult to Psychiatric Emergency Services (PES).

2. Methods

A 5-year retrospective chart review over 2007–2012 was conducted at 3 academic urban ED sites in Toronto, Ontario, Canada: St. Michael's Hospital (SMH), University Health Network (UHN), and Mount Sinai Hospital (MSH). The UHN comprises both Toronto General (TGH) and Toronto Western Hospital (TWH). The TGH ED does not have Emergency Psychiatric services available on site. If a patient is deemed to need Psychiatric consultation, they are transferred to TWH which contains a locked unit for psychiatric assessment in the ED. SMH ED has 3 rooms dedicated for the assessment of psychiatric patients and has dedicated psychiatric nurses who assess these patients in collaboration with the EP. The SMH EPs and Psychiatric Emergency Services (PES) have an assessment guideline for patients that dictates the investigations needed prior to referral to Psychiatry (Fig. 1). MSH serves as a medical consult service to the Center for Addiction and Mental Health (CAMH). Patients seen at CAMH who need medical clearance are sent to MSH for assessment. These patients can then be admitted at MSH or sent back to CAMH for admission and treatment when cleared.

Patients 18 years of age or older with a clinical presentation triaged as bizarre behavior who had a CT head scan during their ED encounter were eligible for review. Bizarre behavior was defined as a deviation from normal cognitive function with no obvious external or structural cause. Patients with an alternative medical etiology accounting for the bizarre behavior were excluded (e.g. delirium, history of trauma, pre-existing central nervous system disease). We also excluded patients with abnormal vital signs, an altered level of consciousness, evidence of intoxication or substance misuse and those with signs of systemic illness or focal neurologic deficits noted on examination.

Clinical, demographic and administrative data was extracted from the chart by a trained research coordinator. All charts were reviewed by a physician to determine eligibility. The CT head results were not reviewed until a patient was deemed eligible for the study. Standardized abstraction forms were used to collect data (Appendix A, B). To ensure inter-rater reliability, a staff Emergency Physician (BDS) reviewed 10% of charts at each site. There was no discordance in any charts reviewed. Patients with abnormalities on neuroimaging had their CT scans undergo a blinded review by a staff neurologist (CDK) to determine if the CT head findings may have been causal to bizarre behavior.

This project was approved by the St. Michael's Hospital, Mount Sinai Hospital and University Health Network Research Ethics Boards.

2.1. Statistical analysis

Descriptive analysis was performed on the data using means, standard deviations and quartiles for continuous data, while frequencies and percentages were used to describe categorical data. All proportions include 95% confidence intervals, which were constructed using Wilson's method [13]. A non-parametric *t*-test was used to test the difference in ED LOS in a subset of the data (SMH site) between those who received and did not receive CT head scans in the ED. To compare ED LOS across the three sites amongst those who had a CT head scan, a

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