

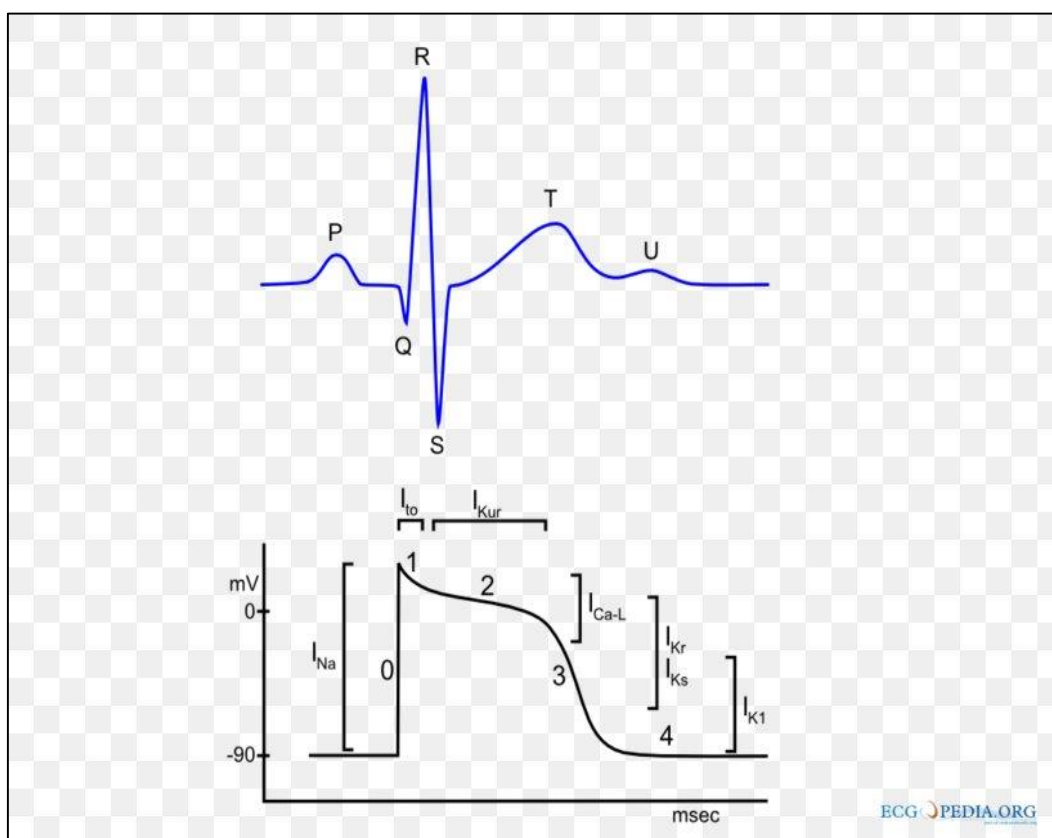
Prevalence of prolonged QTc interval in patients discharged home directly from the emergency department

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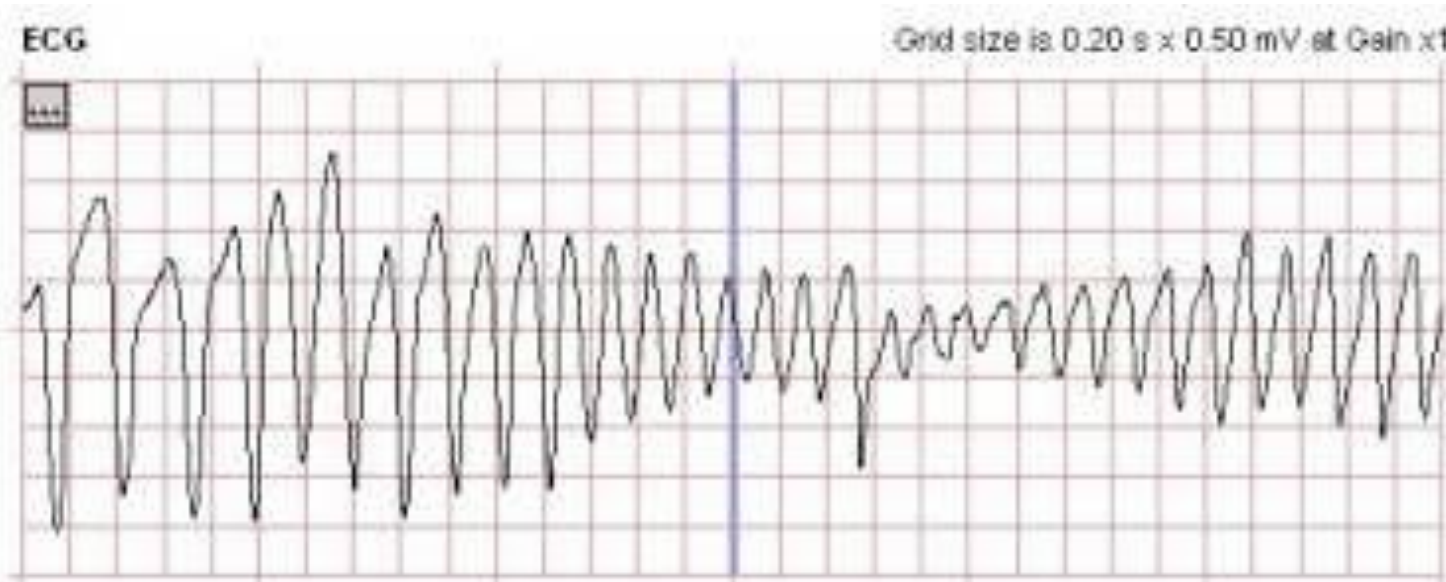
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Introduction

Long QT syndrome (LQTS) describes the prolongation of the QT interval, which spans from the start of ventricular depolarization at the beginning of the QRS complex to ventricular repolarization at the end of the T wave. This interval therefore serves as a surrogate measure of the ventricular action potential on the electrocardiogram (ECG).



Lengthening of the ventricular action potential, and subsequently the QT interval, is known as long QT syndrome (LQTS). It is associated with ventricular tachydysrhythmias such as Torsades de pointes (TdP) which can progress to ventricular fibrillation, and eventually sudden cardiac death (SCD). Studies have shown mortality can be as high as 20% within the first year among untreated symptomatic patients.



The etiology of a prolonged QTc interval can be congenital, acquired, or both. With congenital, at least 17 genes have been implicated, and the pathophysiology among these patients is cardiac ion channel derangement mediated by gene mutations. The most common involve loss-of-function mutations of potassium channels and gain-of-function mutations of sodium channels resulting in prolongation of action potential duration. Acquired LQTS, on the other hand, is most often caused by medications which interact with the potassium channel, most notably the hERG channel, such as antiarrhythmics, antimicrobials, antihistamines, antiemetics, antidepressants, and psychotropics. Other precipitating factors for acquired LQTS include electrolyte abnormalities such as hypokalemia, hypomagnesemia or hypocalcemia, bradycardia, drug overdose and structural heart disease such as heart failure or myocardial infarction. Not surprisingly, studies have demonstrated a high prevalence of LQTS among critically ill patients in the intensive care unit, yet few studies have been performed on its prevalence among patients seen in the emergency department (ED).

Methodology

This observational study examined undifferentiated patients consecutively seen and discharged from the ED who received an ECG. ECGs were excluded from the analysis if there was a wide QRS complex for any reason, atrial flutter or fibrillation, or supraventricular tachycardia. All ECG intervals were automatically generated by Mortara Instruments (Milwaukee, WI) Model ELI-380 ECG machines utilizing Bazett's formula ($QT_c = QT / \sqrt{RR}$). Prolonged QTc was defined as greater than 450 ms in men and 460 ms in women.

Results

After screening, 939 patients met criteria and of these, 151 (16%) had a prolonged QTc interval (Table). The mean age of the study cohort was 53 +/- 18 with a range of 11 to 96 years. The most common chief complaint was chest pain in 29 patients (20%) (Figure). Nine patients (six men and three women), had severe prolonged QTc intervals (QTc > 500 ms) with five complaining of palpitations.

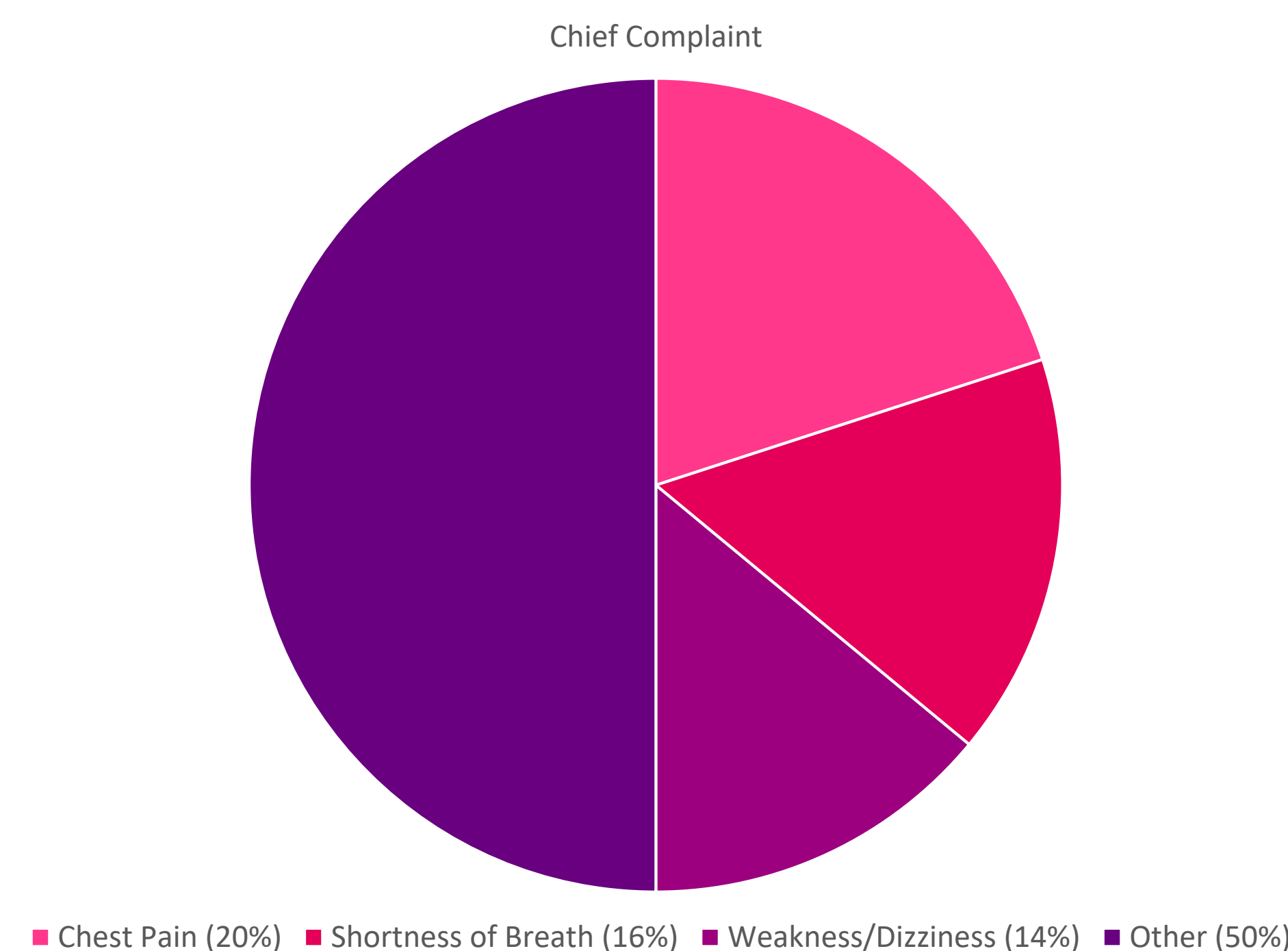


Figure 1. Frequency of presenting chief complaint among discharged cohort with prolonged QTc interval

Factor	ED Cohort (n = 151)
Age, years, median +/- SD	53 +/- 18
Female, n (%)	69 (45)
Heart rate, bpm, mean +/- SD	91 +/-17
QRS duration, ms, mean +/- SD	95 +/-10
QTc, ms, mean +/- SD	475 +/- 27

Table. Emergency department discharged cohort with prolonged QTc demographics
SD = standard deviation; bpm = beats per minute

Conclusion

This was the first known study to specifically evaluate consecutive undifferentiated patients who presented to the ED, received an ECG and subsequently discharged without hospital admission. The prevalence of prolonged QTc interval among patients discharged from the ED was 16%. This value is within the range of LQTS prevalence found in recent studies. In the interim, despite preliminary and recent evidence to indicate no difference in mortality among patients with and without LQTS, larger studies are needed to examine the prognostic value of closer QT interval monitoring in the ED. Until then, LQTS prevalence among discharged ED patients remains an important topic given not all patients are symptomatic on presentation, the ubiquity of QT-interval prolonging drugs within the ED and lost-to-follow up scenarios among acutely ill patients.

Acknowledgements

This project would not have been possible if not for the guidance and mentorship I have received from the GME research department. My appreciation to the many hardworking individuals at GME for the opportunity to showcase our findings. Lastly, a special thanks to the Cardiology and Emergency Departments for giving me exposure in their respective fields.

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