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QTc Prolongation is Associated with Hypokalemia and Hypocalcemia in Emergency Department Patients

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QTc Prolongation

× Congenital

- + Six types (LQT1-LQT6)
- + Mutations in genes encoding potassium and sodium transmembrane channel proteins

× Acquired

- + Hypokalemia, hypocalcemia, hypomagnesemia, HIV, myocardial ischemia, numerous medications and drugs (i.e. cocaine)

QTc Prolongation

- × Increased risk of cardiac arrhythmias
 - × Torsades de pointes
 - × Ventricular fibrillation
 - × Sudden cardiac death

Electrolyte Abnormalities and QTc Interval

- ✘ Multiple case reports and small studies in select populations have shown a correlation between electrolyte abnormalities and prolonged QTc interval
- ✘ Recently Golsari et al evaluated 258 medicine admit patients and did not find any association between electrolyte abnormalities and QTc interval

Methods

Retrospective chart review of all ED patients who received an ECG for any reason during the 5 month period of June 2009 – October 2009 at a large volume, tertiary care center.

Inclusion Criteria: Patients with a computer generated QTc \geq 460 ms.

Exclusion Criteria: Bradycardia (HR < 60 bpm)

Tachycardia (HR > 100 bpm)

QRS > 120 ms

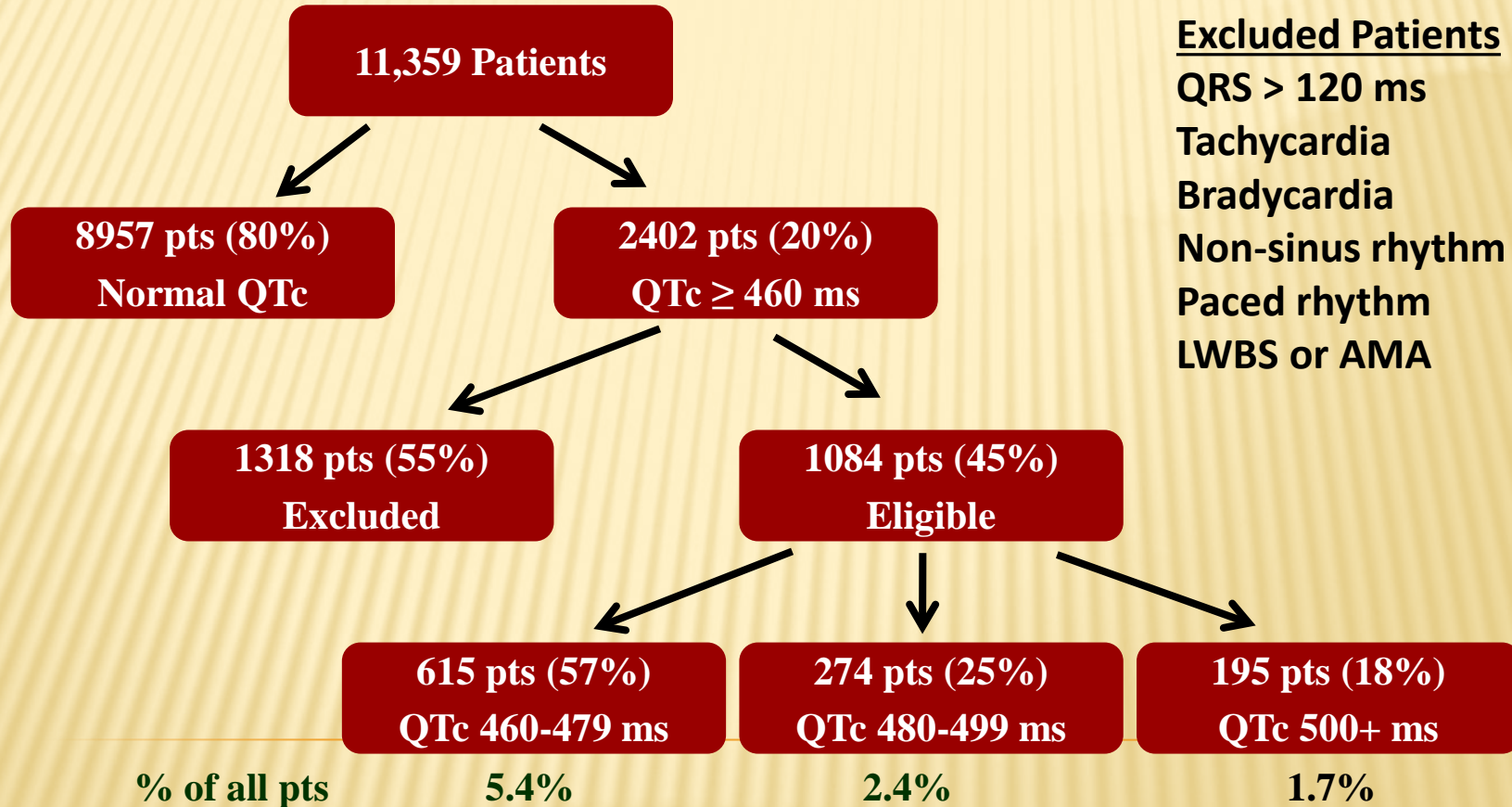
Non-sinus or paced rhythm

Patients who left without being seen or against medical advice

ED electronic medical records were reviewed for patient demographics, presenting symptoms, comorbidities, electrolyte concentrations, medication administration, and disposition.

Statistical Analysis - Data is expressed as proportion with 95% confidence intervals. Data was compared among groups using a Chi-squared test.

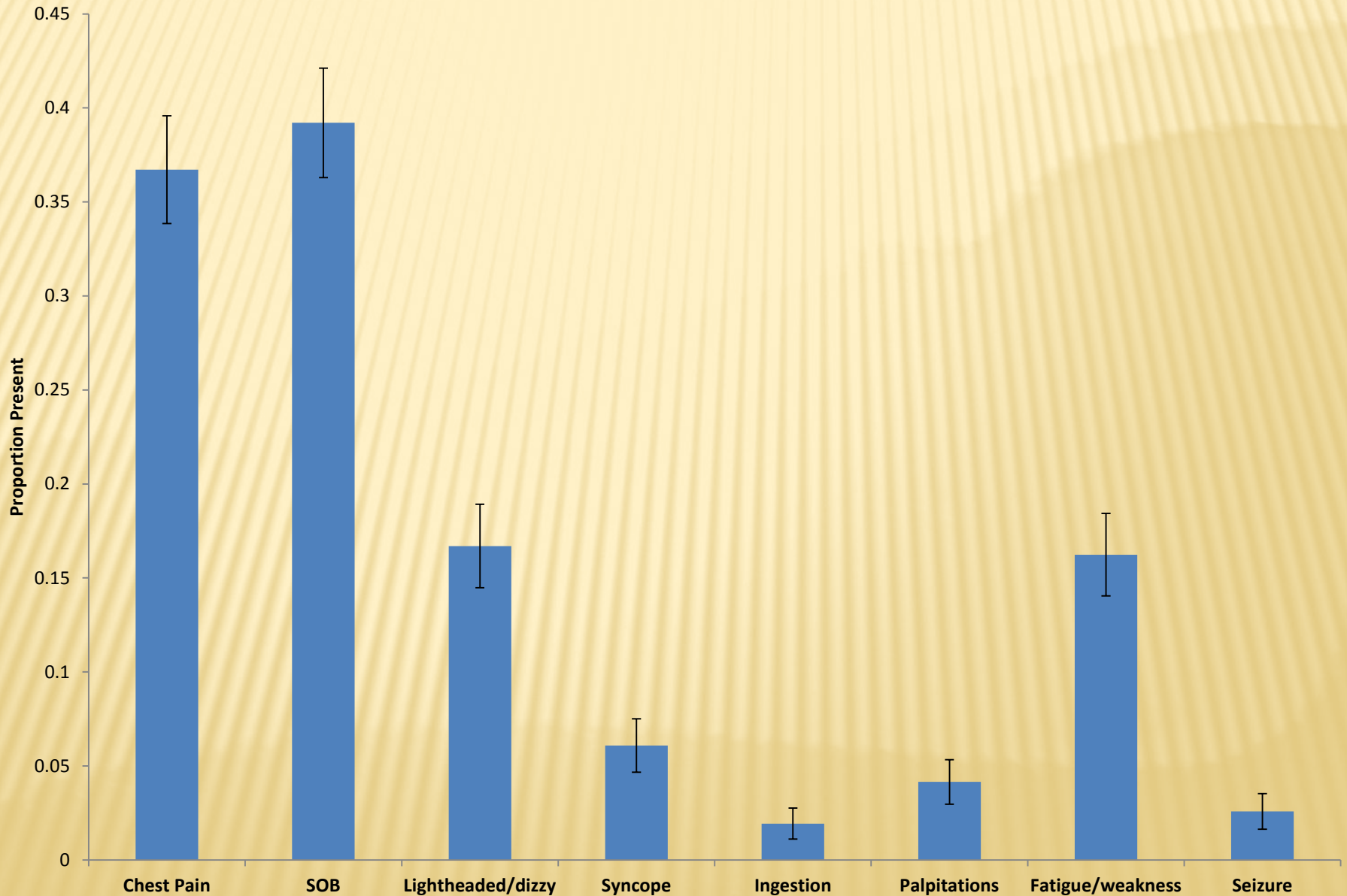
RESULTS



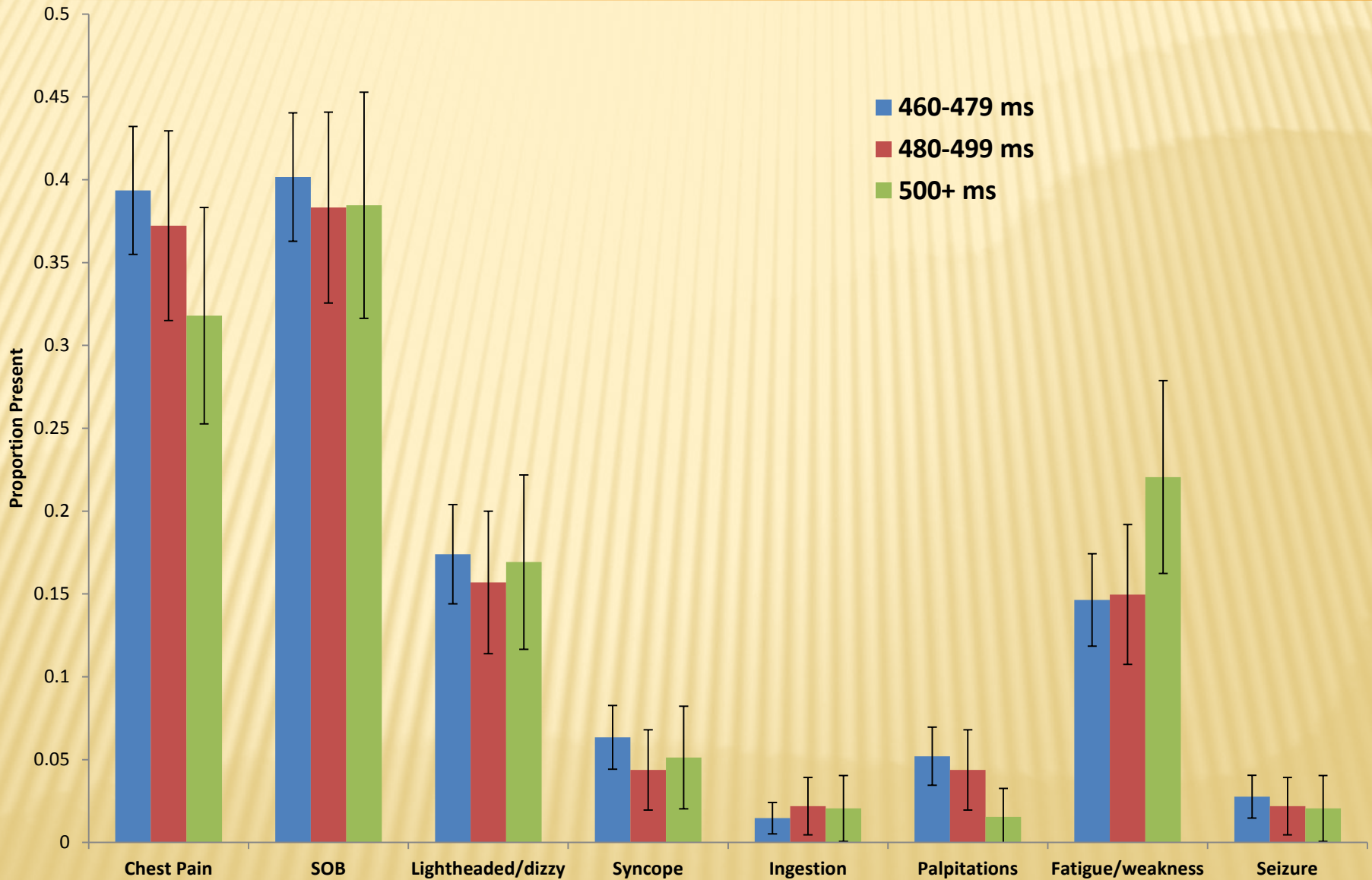
Excluded Patients

QRS > 120 ms	559 pts
Tachycardia	581 pts
Bradycardia	151 pts
Non-sinus rhythm	239 pts
Paced rhythm	182 pts
LWBS or AMA	27 pts

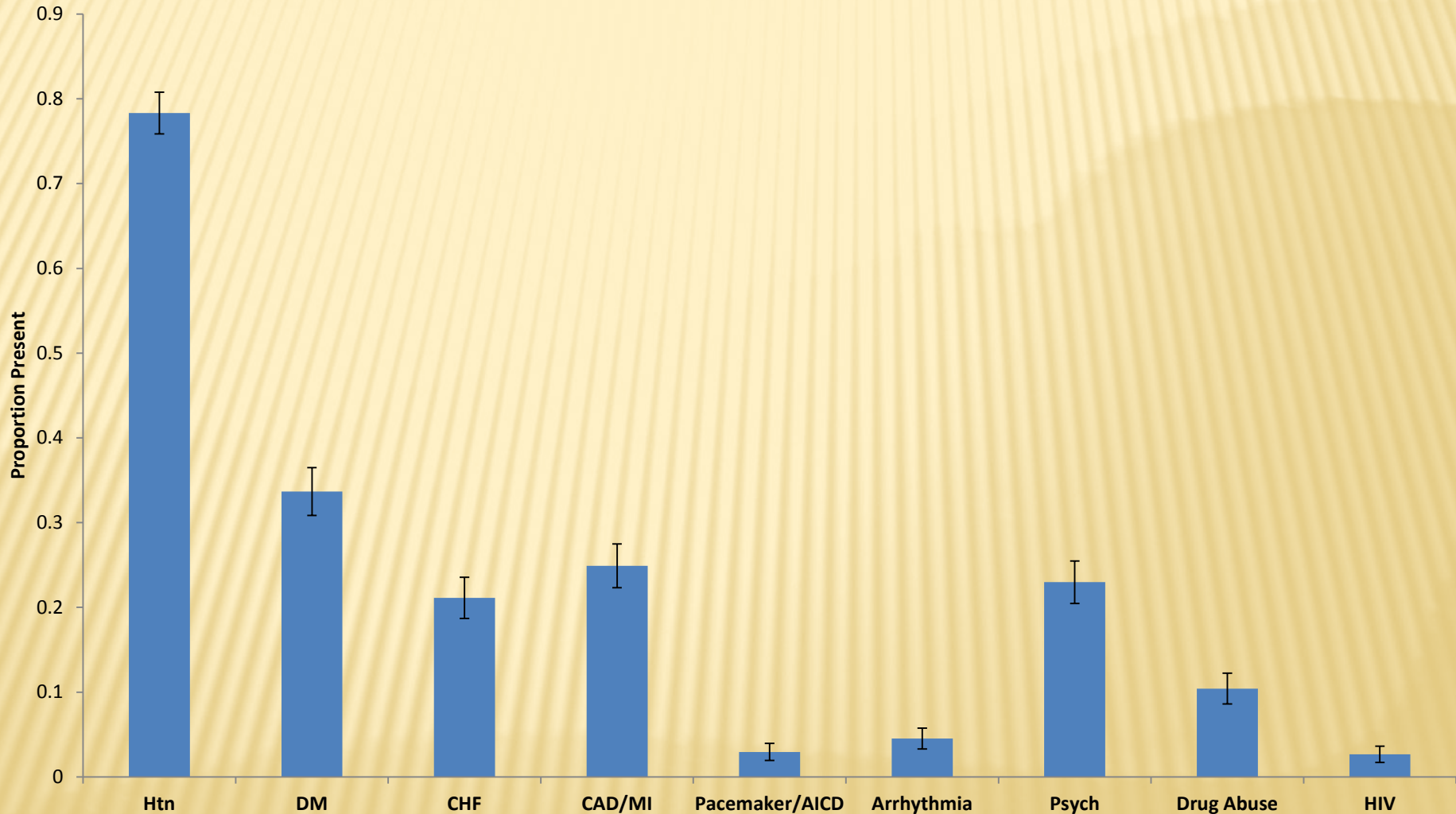
Presenting Symptoms



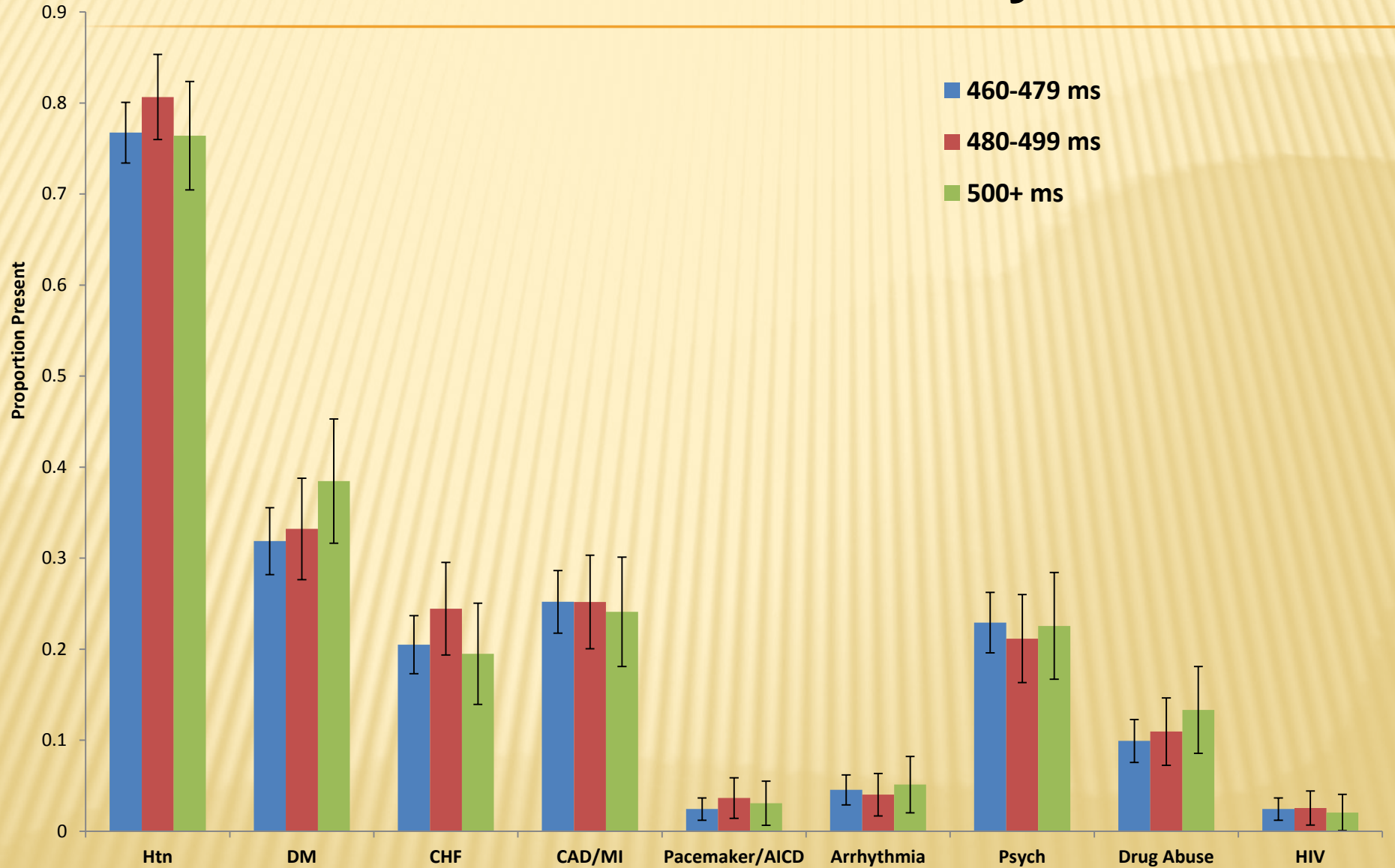
Presenting Symptoms



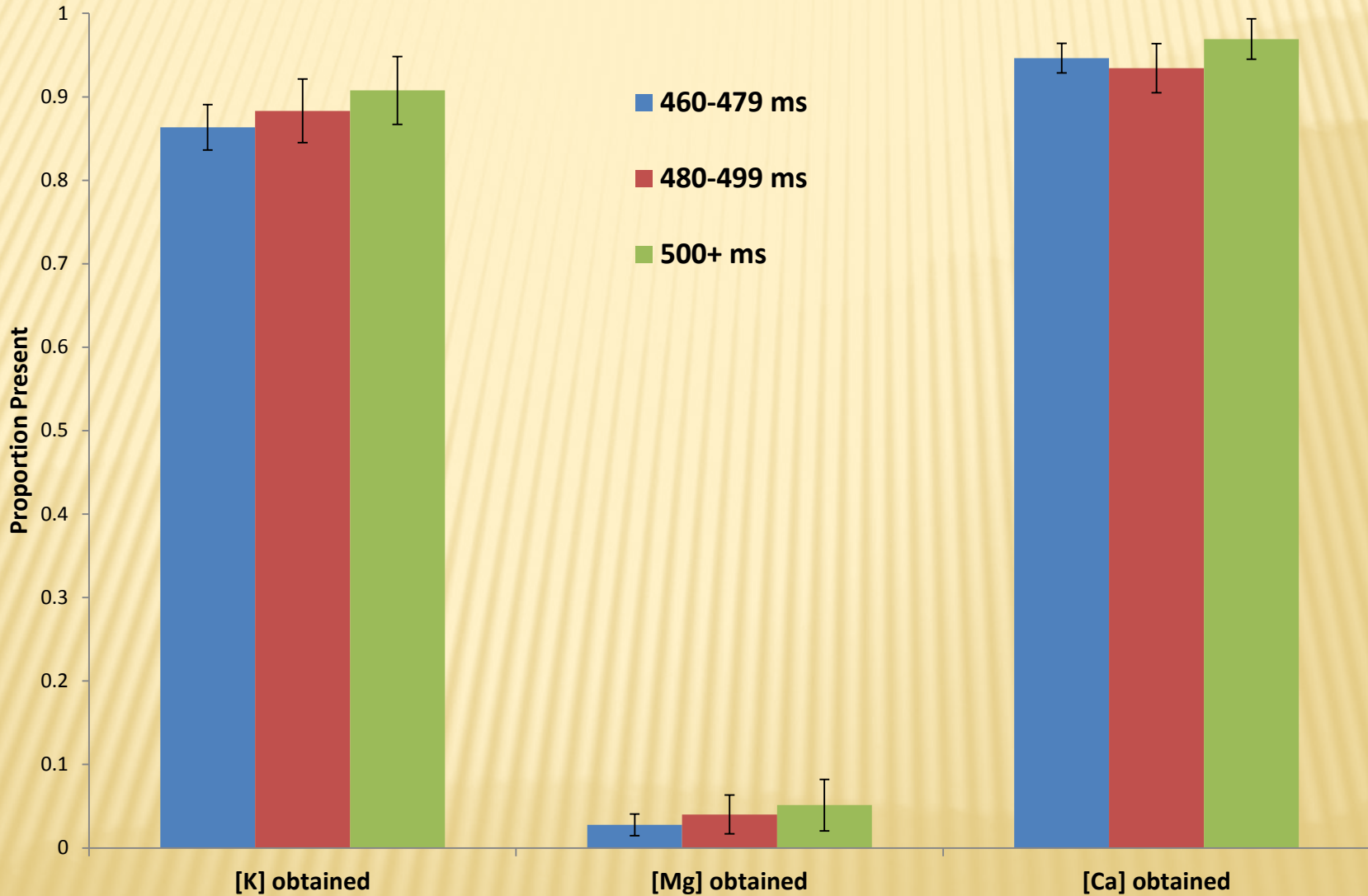
Past Medical History



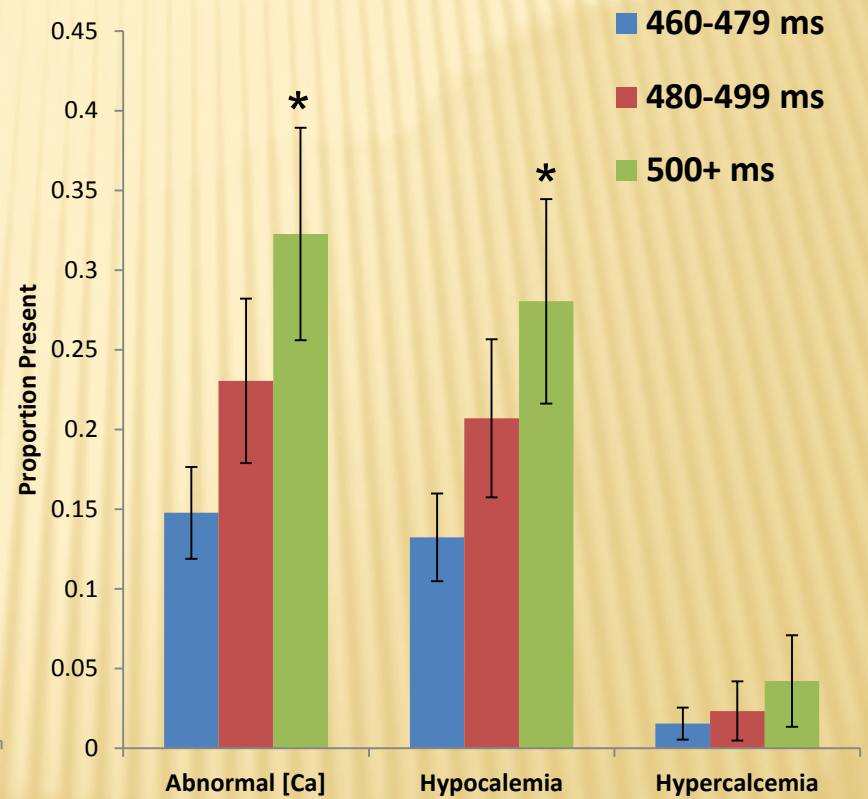
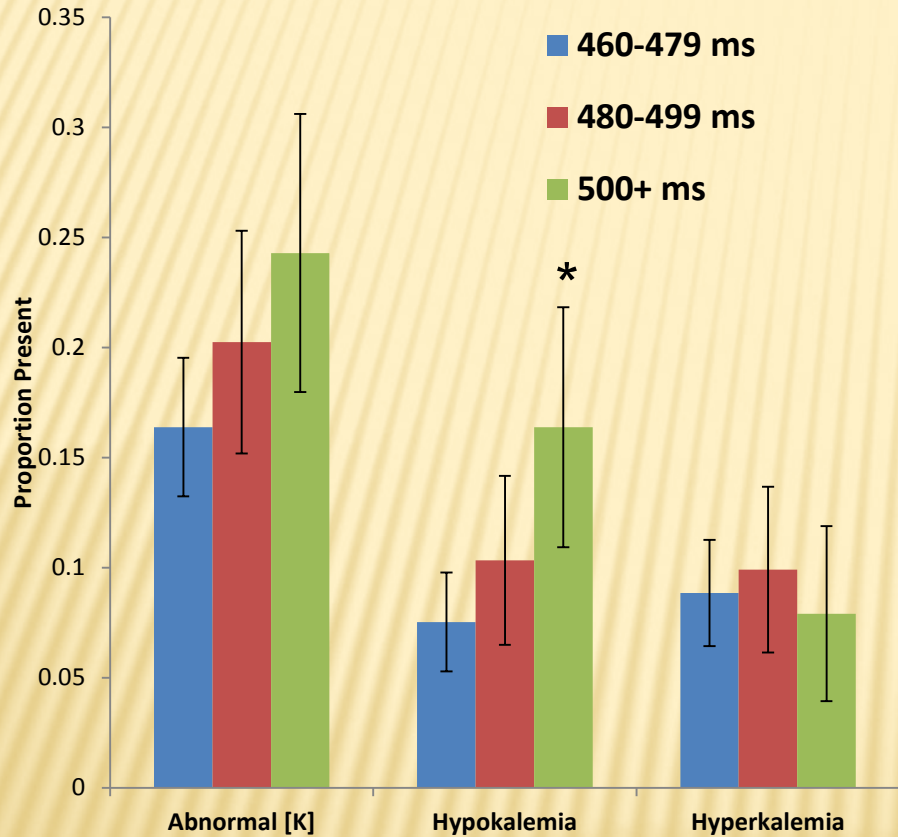
Past Medical History



Electrolytes Obtained



Electrolyte Abnormalities and association with QTc interval



* $p < 0.01$

Electrolyte Repletion

- ✘ Potassium was repleted in $66 \pm 10\%$ of patients with hypokalemia
- ✘ Calcium was repleted in $13 \pm 5\%$ of patients with hypocalcemia
- ✘ Magnesium supplementation occurred in only to $2 \pm 1\%$ of pts
 - Only $1 \pm 0.6\%$ of pts with QTc > 500 ms had magnesium supplementation

CONCLUSIONS

- ✘ QTc prolongation is associated with hypokalemia and hypocalcemia in ED patients
- ✘ The decision to replete electrolytes in the ED does not appear to be related to QTc interval
- ✘ ED patients with prolonged QTc infrequently have Mg determined and rarely receive prophylactic treatment
- ✘ Further studies necessary to determine effect of electrolyte repletion and magnesium prophylaxis in prevention of cardiac dysrhythmias in ED patients

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