Optimizing Electrocardiogram Interpretation and Catheterization Laboratory Activation in ST-Segment Elevation Myocardial Infarction: A Teaching Module for Medical Students

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Learning Objectives
1. To develop a teaching module to increase the accuracy of cardiac catheterization lab activation
2. To improve medical student and clinician electrocardiographic (ECG) diagnosis of ST-segment elevation myocardial infarctions (STEMI), their equivalents, and their mimics

Introduction
In the last 10 years, cardiovascular mortality has dropped by 30%. This results from various innovations in preventive cardiology, diagnostic testing, and a number of treatment modalities. One of the most effective interventions has been the 90-minute reperfusion strategy, the so-called “Door-to-Balloon time”. This approach has resulted in a 5% 30-day mortality for acute ST-segment elevation myocardial infarction (STEMI).

To achieve the 90-minute reperfusion goal in STEMI care, providers must diagnose STEMIs from electrocardiograms (ECGs) obtained upon emergency room arrival and appropriately activate the catheterization lab. To enhance early STEMI care, we sought to improve medical student STEMI recognition and diagnostic accuracy with a teaching module we designed and developed.

Methods- Literature and Case Review
An extensive literature review was conducted to compile evidenced-based criteria to identify the following:

• STEMIs: Classic anterior, inferior, and lateral patterns
• STEMI-equivalents: Hyperacute T-waves, STEMI with existing left bundle branch block (LBBB), and Wellens’ syndrome.
• STEMI-mimics: Known LBBB, pericarditis, ventricular aneurysm, pulmonary embolism, left ventricular hypertrophy, hyperkalemia, Brugada syndrome, early repolarization, and takotsubo cardiomyopathy.

Our literature review informed a subsequent case review of cases seen at the GW Hospital that demonstrate the identified evidence-based ECG criteria. The 24 best ECGs were compiled into the teaching module with clinical information, diagnostic ECG criteria, and imaging, including cardiac catheterization, echocardiography and computed tomography.

Methods- Validation Study
We conducted a prospective education validation trial with fourth-year medical students. We administered pre- and post-tests comprised of exemplary cases of STEMIs, STEMI-equivalents and STEMI-mimics from our case review. Participants studied the module for two weeks and received a didactic module-based lecture prior to the post-test. Students served as their own control. The primary endpoint was STEMI recognition, measured by appropriate catheterization lab activation. The secondary endpoint was correct ECG diagnosis. Paired t-tests were used to compare pre- and post-training scores.

Results
Appropriate catheterization lab activation mean score was 61% (SD 0.14) and improved to 76% on post-test (SD 0.18, p<0.0001). Accurate ECG diagnosis mean score was 59% (SD 0.14) and improved to 74% on post-test (SD 0.16, p<0.0001). A sample size of 26 achieved more than 99% power.

Conclusion
The module significantly improved student STEMI recognition, appropriate catheterization lab activation and diagnostic accuracy.

References

Disclosure of Faculty Relationships- Marco Mercader, MD: Other-Amazon, Ownership Interest/Partnership/Principal – LuxCath LLC. All others: Nothing to disclose.