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Audit of Irrelevant Troponin Levels Taken in an A&E Unit and Waste of HSE Resources as a Result

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Abstract

Aim: To outline inappropriate percentage of levels of troponin taken without clinical suspicion of ACS and the waste of resources it consequently led to.

Methods: Data was collected from admission department in A and E, Naas General Hospital, for two consecutive weeks in December 2020. 165 patients were selected from a total of 245 patients admitted. Selection criteria was based on serum troponin levels sent to the lab, clinical suspicion of ACS (analyzing symptoms, clinical examination and ECG findings from patient's charts) and further cardiac investigations carried.

Results: 75/165 of troponins (45.45%) were done with no clinical suspicion of a cardiac problem. Of these, 38/75-were positive troponins. However, only 17 patients were labeled as having ACS, subsequently giving a diagnostic yield of 10.30% of the total troponins taken.

Conclusion: 58/165 (35.15%) of investigations were totally irrelevant which is a very high worrying factor and led to further waste of resources. Investigations should only be requested when ACS is suspected and in the context of clinical history and examination.

Keywords: Irrelevant; Troponin; Acute myocardial infarction

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Introduction

Cardiac troponin is a complex protein comprising of three subunits Trop t, trop I and trop C. Currently cardiac troponins are used as the biomarkers of choice for diagnosing acute coronary syndrome. They have replaced old biomarkers of cardiac injury such as Aspartate amino transferase and creatinine kinase MB as the gold standard [1].

Acute coronary syndrome covers group of symptoms suggestive of acute myocardial ischemia and includes range of clinical conditions from unstable angina, Non ST elevation myocardial infarction and ST elevation myocardial infarction. Hence cardiac troponins should be ordered on any one presenting with signs and symptoms suggestive of ACS [2].

There is a misconception that cardiac troponin can be raised only in ACS, there are several different conditions like myocarditis, arrhythmias, acute heart failure, septic shock, pulmonary embolism, as a result of cardiotoxic drug, after coronary angiography and after therapeutic procedures like electrical cardio version [3].

Conditions that may cause troponin detection as well include tachycardia (from essentially any cause), hypotension, hypertension, strenuous exercise (e.g. marathon runners), sepsis, renal failure, pulmonary embolus, heart failure, pericarditis, polymyositis, rhabdomyolysis, burns, cardiac trauma, respiratory failure, ventricular hypertrophy, drug toxicity (including cancer chemotherapy), and neurally mediated sympathetic activation [4-7]. Advanced age may be added to this list; one recent study found that 41% of patients over age 70 years presenting to the emergency department in whom both acute coronary syndrome and other known non thrombotic coronary syndrome causes were ruled out had troponin elevations [8]. The table is complementary to the published simple and practical classification of increased cardiac troponin values and may help the clinician in formulating a differential diagnosis [9] (**Table 1**).

Table 1 Diseases which can increase cardiac troponin concentration, grouped by organ system.

Organ system	Example of a disease, currently believed to be capable of increasing troponin concentration
Cardiovascular	AMI, heart failure, myocarditis, etc.
Respiratory	Exacerbation of chronic obstructive pulmonary disease
Genitourinary	Renal failure
Gastrointestinal	Gastrointestinal bleeding
Endocrine	Hypothyroidism, diabetes mellitus
Haematopoietic	Anaemia
Nervous	cerebrovascular accident, subarachnoid bleeding
Musculoskeletal	Rheumatologic/immunologic diseases: rheumatoid arthritis, systemic vacuities

Risk scores, which are generally developed to aid the physician in making a careful and timely decision, have improved significantly over time. From the PURSUIT (Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrilin), TIMI (Thrombolysis in Myocardial Infarction), and GRACE (Global Registry of Acute Coronary Events) scores, which were more suitable for use in a coronary care unit, emergency physicians have witnessed the transition to HEART (History, Electrocardiogram, Age, Risk Factors, and Troponin), T-MACS (Troponin Only Manchester Acute Coronary Syndromes), and ADAPT (2 Hour Accelerated Diagnostic Protocol to Assess Patients with Chest Pain Symptoms Using Contemporary Troponins as the Only Biomarker), which were specifically designed to identify patients with chest pain who are at low risk for an ACS in the ED. In many countries, the HEART score is the most frequently used, sometimes combined with a second troponin assay, as advocated by Mahler et al in HEART Pathway [9].

Aims and objectives

The purpose of this audit is to check the appropriateness of ordering serum troponin levels on any patient admitted under medical team presenting to the emergency department in Naas General Hospital, and to identify where improvement can be made. In particular objective of this review is to examine the following areas.

1. Indiscriminate ordering of serum troponin levels on patients.
2. Cardiac investigation that was needed to do due to elevated troponins that could have been avoided.

Materials and Methods

Data for this audit was taken by gathering admission list for two consecutive weeks in December 2020. After examining each patient's charts 165 patients were selected. Selection criteria was based on whether serum troponin was sent or not and then analyzed by looking at the charts (symptoms, examination and ECG findings) whether it was appropriate for the patient or not.

If not appropriate, what further cardiac investigations were carried out to look for inappropriately sent troponin.

Those patients were excluded from the audit that discharged them against the medical advice not waiting for any further review and investigations.

Results

Following are the results noted in the audit on a period of 2 weeks between 7/12/2020 to 20/12/20 in Naas General Hospital, co. Kildare:

A total of 245 patients were withdrawn bloods in A and E NGH through these 2 weeks, among these 165 troponin requests were sent to the lab.

90/165 (54.54%) were for a possible cardiac symptom.

75/165 (45.45%) were done with no clinical suspicion of a cardiac problem.

Of these,

38/75-were positive troponins. However, only 17 patients were labeled as having ACS, subsequently giving a diagnostic yield of 10.30% of the total troponins taken.

37/75-were negative troponins from patients with no ACS or cardiac symptoms.

From the results above can be concluded that 58/165 (35.15%) of investigations were troponins taken totally irrelevant which is a very high worrying factor and led to further investigations that was a waste of resources for the hospital and health service executive (HSE) intervention.

Discussion

Troponin is a useful blood marker used to diagnose acute coronary syndrome (ACS), but it can be elevated in a number of clinical condition other than ACS. So, in order to diagnose ACS troponins should be elevated in the context of clinical history and examination, therefore a troponin should only be requested when ACS is suspected [10].

Concerns for potential Myocardial Infarction may be the primary reason for testing, but a minority of patients with a positive result identifies Type I Myocardial Infarction as their final diagnosis. Most common diagnoses are: congestive heart failure, infections, dysrhythmias, and blood loss. In addition, the majority of deaths are due to alternative diagnoses with most falling in the non-cardiovascular diagnostic group. This supports existing evidence that myocardial injury is a marker of increased morbidity and mortality [11].

This audit clearly demonstrated that the investigation became a part of a routine on every patient in A and E with unsure diagnosis, not just on those who present with cardiac symptoms, which is not a correct measure. It should outline the clinical thinking and should be sent as a proof of suspicion of ACS.

A strategy for improved troponin use is to perform a history (with attention to cardiac risk factors), a physical examination, and a review of the electrocardiogram in order to put abnormal troponin results in the appropriate clinical context and avoid diagnostic confusion and malfeasance. In some cases an echocardiogram to detect left ventricular wall motion abnormalities adds additional value [12].

We recommend that the blood requests should not be a part of triage in A and E, appropriate clinical staff should do that after patient assessment and evidence of investigation needed. So, general awareness and guidance should be provided in all A and E departments. Other methods of improvement in awareness when taking a troponin are: regular grand round teaching sessions, poster awareness, biochemistry decision reminding tool to be crated, 0/3 rule out protocol in unclear cases. The 0/3 h algorithm has a rule out criterion of 0 h+3 h=<14 ng/l. Its use of ruling out an AMI appears to be efficient and safe [13].

Conclusion

58/165 (35.15%) of investigations were totally irrelevant which is a very high worrying factor and led to further waste of resources. Investigations should only be requested when ACS is suspected and in the context of clinical history and examination.

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None

Conflict of Interest

Any financial interests or connections, direct or indirect, or

other situations that might raise the question bias in the work reported or the conclusions, implications or opinions stated including pertinent commercial or other sources of funding for the individual authors or for the associated departments or organizations, personal relationships, or direct academic competition.

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