Troponin Testing and the Tyranny of Distance

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Chest pain is a frequent cause of hospitalization and comprises a significant proportion of the acute medical workload in the western world. This issue is compounded for those living in regional or remote communities due to limited access to pathology services and tertiary-referral institutions.

Evidence suggests that the replacement of traditional laboratory-based testing for cardiac troponin with a point-of-care test is associated with improved clinical management of patients presenting with chest pain and leads to a significant and sizeable reduction in duration of stay for these patients. Minimizing the in-hospital stay of patients with chest pain, within safe limits, is crucial in reducing the cost of health care.

Chest pain is a frequent cause of hospitalization and comprises a significant proportion of the acute medical workload in the Western world.

Additionally, in Australia, a country which is over 7.5 million km² in size, distance from—and therefore limited access to—pathology services and tertiary-referral institutions, serves only to compound this issue for those living in rural and remote regions.

Two-thirds of all cases presenting with chest pain are found not to be of cardiac origin [1]. One-third to one-half have a probability of acute myocardial infarction (AMI) that is low but not sufficiently low to permit discharge from the emergency department [2] and more than 40 % of these patients require hospital admission [3].

Triage and evaluation of these patients generally comes at a high cost. Minimizing the in-hospital stay of patients with chest pain, within safe limits, is crucial in reducing the cost of health care.

A standard approach to ruling out myocardial infarction relies upon the use of serial electrocardiography that is deemed negative for myocardial ischaemia and demonstrates the absence of any evidence of myocardial necrosis as assessed with biochemical markers of cardiac injury.

With its improved sensitivity and specificity for myocardial cell necrosis the measurement of cardiac-specific serum troponins has become the mainstay in the biochemical diagnosis of cardiac injury.

The absence of an elevation in serum troponin 12 hours or more after an episode of chest pain excludes myocardial infarction and predicts a very low risk of short-term adverse events. These measurements are usually performed in a central laboratory, generally located at a regional hub.

When these analyses are required in regional or remote locations, delivery of the sample to the laboratory, sample analysis and reporting of results to clinical staff, could easily take up to 24 hours.

The net effect is likely to delay patient discharge and extend the length of the hospital stay. Most physicians would be reluctant to discharge patients without a negative cardiac troponin result.

In recent times, point-of-care assays for troponins and other cardiac markers have become available, and in contrast to laboratory based analysis, this point-of-care testing is performed in the clinical area where the patient is situated. Results are usually available within 15 minutes, are increasingly of laboratory quality and can be communicated easily to the clinical team.

These point-of-care devices would therefore allow regional and remote locations access to immediate and accurate troponin testing.

One study showed that the replacement of traditional laboratory-based testing for cardiac troponin with a point-of-care test was associated with a significant and sizeable reduction in duration of stay for patients presenting with chest pain who are deemed to be at low risk of major cardiac adverse events.

The mean reduction of stay in this study was almost 13 hours, a major efficiency saving for many hospitals [4]. There are the usual and unavoidable resource implications associated with the use of point-of-care testing.

A point-of-care assay might cost, per sample, 3–4 times more than a laboratory-based assay. There might also be capital and ongoing costs associated with the purchase and maintenance of the assay station. However, the significant reduction in length of hospital stay that would be expected should more than offset these costs and cannot be understated.

One additional factor of great importance in combating the issues associated with distance is connectivity. The Internet and high-speed broadband connections have, more than any other factor, greatly contributed to the ability of rural and remote communities to access a wide variety of information and public services previously not easily or readily available to them.

This e-health revolution has given emergency physicians the ability to refer results to cardiac specialists located in metropolitan centers for real-time review of patients who exhibit confusing or complicated clinical presentations.

Interfacing the assay station with the Laboratory Information System (LIS) to allow for seamless data transfer to the individual patient record is therefore an incredibly important feature. This means that any patient undergoing point-of-care testing has a permanent and accurate record of that testing in their patient record, and allows for any remote consultation to be as informed and detailed as possible.

Connectivity also allows for traceability. Traceability of patient ID, user ID, reagent lot information, calibration data and quality control data are required by ISO regulations. This then allows the institution the possibility to bill for tests performed and thereby recoup some of the ongoing cost of the instrumentation.

In conclusion, there is overwhelming evidence showing that the use of point-of-care testing for troponin will not only improve the management of patients presenting with chest pain, but also see a significant reduction in costs associated with these patients.

This is most relevant and particularly pertinent to patients living in regional or remote communities. This

does not mean that any system is suitable, and for most institutions it is for them to determine what is or is not suitable.

Most would agree however that the assay system would need to be user friendly, have the ability to be bi-directionally interfaced with a Hospital Information System/LIS and be able to perform testing of whole blood samples with minimal maintenance requirements.

The assay itself would need to be of laboratory quality with proven high degrees of sensitivity, specificity and clinical concordance when compared with clinically accepted troponin assays.

If all of these features are present, the system will—as previously noted—not only improve the clinical management of patients presenting with chest pain, but also result in significant reductions in costs that will hopefully contribute to defeating the tyranny of distance associated with those patients living in regional and remote communities.

References

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