PenCHORD
The Peninsula Collaboration for Health Operational Research & Development

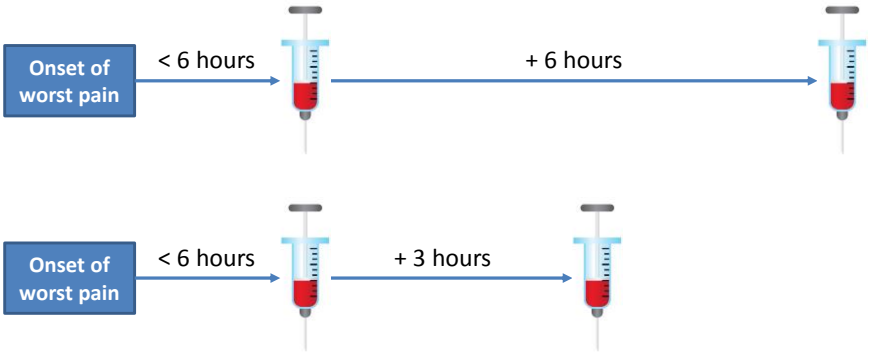
High-sensitivity troponin for the diagnosis of acute myocardial infarction in A&E – modelling impact and implementation in the South West

Summary:

This project evaluated the use of high-sensitivity cardiac troponin (hs-cTn) tests in the seven acute trusts across the South West of England. A series of two tests using hs-cTn are used to rule-out the likelihood of a heart attack for patients presenting with chest pain at accident and emergency departments (ED). The National Institute for Health and Care Excellence (NICE) recently issued guidelines for the use of hs-cTn, which recommended a reduction in the interval between samples for serial testing from six to three hours. In order to investigate the impact of this recommendation, a discrete event simulation model was developed. This model allowed us to investigate changes in key performance indicators, including the number of admissions, and the overall length of stay in ED and on short stay wards. The suggested reduction of the interval did not lead to a change in the number of admissions to short stay wards, where the second sample is usually taken. However, the overall length of stay in the ED and subsequently at short stay wards could be reduced by approximately 180 minutes. The new generation of tests also has a positive impact on the utilisation of short stay wards, which are often under the management of ED staff.

Context:

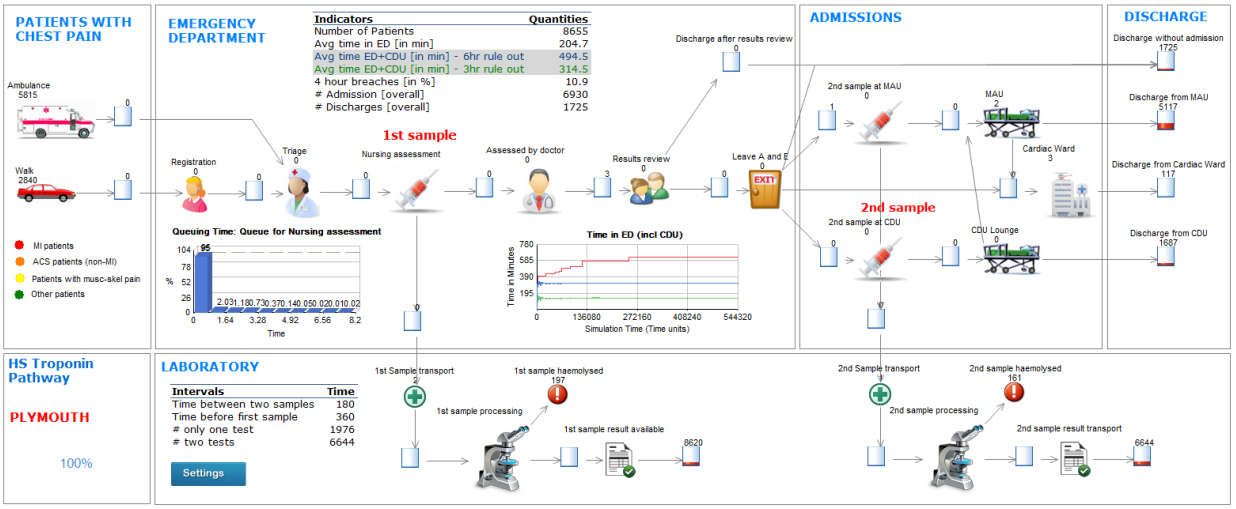
Chest pain suggestive of acute coronary syndrome (ACS) is the most common cause of emergency hospital admissions, accounting for up to 6% of all emergency attendances in the UK. In some patients, the underlying cause is an evolving acute myocardial infarction (AMI), which, if missed, may have fatal consequences, making accurate diagnosis critical. However, less than 35% of all patients with chest pain are diagnosed with ACS. This means that a significant number of patients are admitted and undergo unnecessary diagnostic procedures that could be avoided if AMI could be excluded at an earlier stage.



High-sensitivity cardiac troponin (hs-cTn) is an effective diagnostic for AMI. These tests offer the potential to speed up triage and avoid unnecessary observation and testing in hospital. Their diagnostic performance, however, is conditional on a number of factors such as positivity threshold, repeat vs. single test, time from symptom onset and patient characteristics. In October 2014, newly issued NICE guidelines suggested serial testing with at least three hours between two blood samples when using hs-cTn. At that point, many of the trusts in the South West were taking two samples that were at least 6 hours apart. Seven acute trusts in the SW participated in this project, the figures in this case study illustrate the collaborative work with Derriford Hospital, Plymouth.

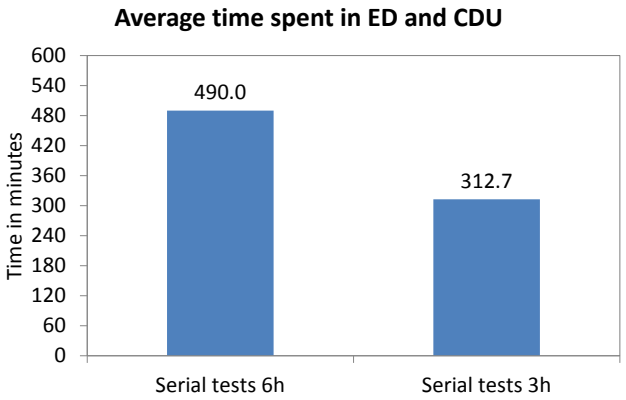
Methods:

Anonymised patient records were used to analyse process times and volume data, such as ratios of ambulance arrivals and self-presenting patients, admissions to short stay wards etc. During extensive discussions with clinicians, a pathway model was developed, which described the patient journey through ED and subsequent short stay or specialised (inpatient) hospital wards. Using the historic data sets and the pathway model, a generic discrete event simulation model (DES model) was developed and later on individualised in order to model current diagnostic pathways at different trusts. The DES model is a valuable tool to discuss options to re-designing the ACS pathway with decision makers. It enables clinicians to explore possible changes in a safe environment and may also be used to inform patients in the process of adapting current practice.



Outputs:

Two main findings could be drawn from the simulation study. Firstly, a change in the interval between taking the two samples did not affect the number of admissions to short stay wards, because patients need to be admitted in order for a second sample to be taken. However, the workload on the short stay wards could be reduced because the reduced time interval between blood samples enables decision-makers, i.e. clinicians, to decide more quickly on the most appropriate management of the patient, e.g. discharge with or without follow-up or admission to a cardiac ward.



Implementation:

The trusts in the SW have adapted their protocols for ACS according to the NICE guidelines. Further research will look at moving towards a single test strategy, if the time interval between the onset of worst pain and the blood sample is above a given threshold. Currently, a decision can be made based on a single sample if this sample is taken more than six hours from the onset of worst pain. There is evidence that this threshold can be lowered safely, which would significantly impact both the number of admissions and the total length of stay in ED and short stay wards.

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