Critical Appraisal Questions:

Point of care troponin decreases time in the emergency department for patients with possible acute coronary syndrome: a randomised controlled trial. Loten et al, Emerg Med J 2010;27:194-198.

1. Identify the study design, and is it appropriate for this type of study? List three advantages of this design and discuss their applicability to this paper.

Cluster randomised controlled trial.

The cluster design is useful when interventions may affect more than one individual within a particular group or when contamination may be an issue (i.e. the way in which the participants in one study group are treated or assessed is likely to modify the treatment or assessment of participants in other groups).

In this study, the availability of POC testing will influence the treatment of all patients in the allocated group so the cluster design may be appropriate. The authors state that they rejected individual randomisation because “it was thought to be impractical due to protocol violations” but they do not elaborate.

Advantages:

1. Random allocation to treatment groups to reduce selection bias – in this trial, randomisation was done in a cluster of weekly groups using a computer-generated 12-week allocation, depending on the availability of the POC machine. The choice to use the POC test was left to clinical staff and individual patients were not randomised.

2. All patients are treated equally except for the intervention being studied – in this cluster-design trial, specific care decisions were left to individual clinicians. Not all patients in a given cluster were investigated in the same way. Some patients have had both POC and laboratory testing and not all patients in the treatment group received point-of-care testing. There is also implication by the authors that patients who were more likely to be discharged were perceived by clinicians as less unwell and were therefore given POC testing, emphasising that not all patients within a cluster were treated equally.

3. Intention to treat analysis – in this trial, length of stay was analysed in terms of intention to treat on the basis of the clustered/week groups in which POC testing was available.

1. What is bias? What are three types of bias?

“Bias is any factor or process that tends to deviate the results or conclusions of a trial systematically away from the truth.” Sackett

Three types of bias:

Selection bias – “when the outcomes of a trial are affected by systematic differences in the way in which individuals are accepted or rejected for a trial or in the way in which the interventions are assigned to individuals once they have been accepted into a trial” Jadad

Ascertainment bias – “occurs when the results or conclusions of a trial are systematically distorted by knowledge of which intervention each participant is receiving” Jadad

Missing data bias – occurs when participants are lost to follow-up, drop out of the study or there are deviations from the protocol so data is not collected at appropriate time points.

Publication bias – “a propensity for investigators and sponsors to write and submit, and for peer-reviewers and editors to accept, manuscripts for publication depending on the direction of the findings.” Jadad i.e. Positive results are more likely to be published.

1. What selection bias is apparent in this study?

Allocation bias - not all participants in the study were given an equal opportunity to receive the intervention under study. In this trial, the weekly blocks were assigned randomly but individual patients within the blocks did not all receive or not receive the intervention. There was no blinding and individual clinicians determined which patients presenting during the POC testing weeks received the intervention.

1. What is allocation concealment?

Allocation concealment is “the procedure for protecting the randomisation process so that the treatment to be allocated is not known before the patient is entered into the study”, Forder

For example: by sequentially numbered, opaque, sealed envelopes or by off-site assignment of randomisation.

1. Have the investigators taken any steps to control for selection bias?

The blocks of POC testing were randomly generated by a computer program for each participating facility. Allocation concealment was by sealed envelopes. There have been no steps to specifically randomise individual patients or to blind the investigators.

1. Using the JADAD scoring system, score this trial’s internal validity.

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| --- | --- |
| **Jadad Score Calculation** |  |
| **Item** | **Score** |
| Was the study described as randomized (this includes words such as randomly, random, and randomization)? | 1 |
| Was the method used to generate the sequence of randomization described and appropriate (table of random numbers, computer-generated, etc)? | 0 |
| Was the study described as double blind? | 0 |
| Was the method of double blinding described and appropriate (identical placebo, active placebo, dummy, etc)? | 0 |
| Was there a description of withdrawals and dropouts? | 1 |
| Deduct one point if the method used to generate the sequence of randomization was described and it was inappropriate (patients were allocated alternately, or according to date of birth, hospital number, etc). | -1 |
| Deduct one point if the study was described as double blind but the method of blinding was inappropriate (e.g., comparison of tablet vs. injection with no double dummy). | 0 |
| Total Score | 1 |

**Score 0-5, poor quality <3**

1. How could the internal validity of this study be improved?

True randomisation of individual patients to receive POC or central laboratory troponin testing would increase internal validity. If the availability of the POC machine is the limiting factor, the study could be extended to allow each facility to enrol sufficient patients when they have access to the machine. Blinding would increase validity but is not appropriate in this study.

1. What is meant by “intention to treat analysis” and how is it applied in this study? Why is it useful?

Intention to treat analysis of results is based on the initial intention to treat. Groups are analysed as they existed on randomisation. In this study, the group considered the treatment or intervention group were all those patients who presented with possible ACS during the week randomly allocated to POC testing and who were not initially excluded. There were no drop-outs and data was analysed on the basis of intention to treat.

Intention to treat analysis prevents the introduction of bias on data analysis. There are many reasons why patient data is incomplete, some of which may be influenced by the process of the trial.

1. Name 3 specific weaknesses of this study.

Study design

Selection bias

Pooled results from significantly different sites within the trial confounds results because of performance bias eg. Lack of 24-hour laboratory services in one site

1. Is this study applicable to your practice? Why? Why not?

Applicable because:

Patients: Patients were presenting to ED

Setting: ED The study does address a common ED presentation of ACS and exclusions were appropriate.

Not applicable because:

Setting: 8 hour target vs. 4/6 hour targets

The study centres lacked coronary care units so patients remained in ED.

Lack of 24 hour lab services influenced length of stay.

POC testing may not be available