Introduction

Full blood count testing is the backbone of the haematology laboratory, with results used to indicate additional reflex testing, and highlighting a variety of disorders (including iron deficiency). Delayed processing of samples in rural areas can lead to sample degradation, false elevation of MCV and generation of analyser “flags” which require manual blood film review [1]. In rural Scotland, samples are transported under non controlled temperature conditions which can affect the number and morphology of white and red blood cells and therefore impact on the interpretation of the blood test results and disease diagnosis [2]. Therefore, it is important to establish a reliable way of interpreting delayed blood samples that are safe and consistent to release to GPs, thereby reducing the need to re bleed patients unnecessarily, and reduce the cost of repeating the blood testing.

Aims

To investigate how temperature variations over time affect full blood count parameters and develop approaches that can be implemented to improve quality of results given.

Methodology

Forty-two whole blood samples were processed using the Unicel DxH 800 full blood count analyser (Beckman Coulter, California). Samples were anonymised then separated into three aliquots each of which was stored at different temperatures (2-6°C, 18-25°C, 35-37°C). Aliquots were retested at 24h, 48h, 72h, and 96h using the manual sample mode on the DxH 800. Statistical analysis was performed using IBM SPSS Statistics (version 29) (IBM, US).

Results/Discussion (cont.)

As the analyser struggles to differentiate between cell types there is a significant increase in the number of flags seen compared with time=0 (p<.001). This is significant to this laboratory as presence of analyser flags is a criterion for blood film referral, so comparing the analyser flags seen to the date of sample collection may reduce the number of blood films requiring review by laboratory staff.

There was a significant reduction in the platelet count when samples were stored at 2-6°C compared with those stored at 18-25°C (p=.012) over time. This suggests that if processing is to be delayed and TTP/HUS is suspected, samples should be stored at room temperature. Statistical analysis revealed a large significant difference in MCV given between time points, and different temperatures (p<.001) (Figure 2).

Results were also used to develop a predictive model (Tables 1 and 2) which could be used to interpret the MCV results for samples delayed in transit and avoid overlooking potential iron deficiency patients (BSH guidelines for laboratory diagnosis of Iron deficiency [3] recommend requesting iron studies when MCV <76fL is initially identified in a patient).

Conclusion

Isolated communities face significant challenges accessing medical care, and sample stability may be impacted by factors out with NHS control (e.g. weather and mechanical disruption to sailing times). There is increasing pressure on laboratories to process delayed samples, whilst still providing meaningful results to clinicians. This study shows that with controlled storage of samples (at 2-6°C), most haematology parameters can be considered stable for longer when compared to uncontrolled storage. We have highlighted recommend adjustments for the MCV which can be used to interpret the MCV results for samples delayed in transit and avoid overlooking iron deficiency, as well as identifying several analyser flags which were present solely due to sample degradation, reducing unnecessary blood film referral. Present implementation of temperature-monitored rural transport boxes, or use of sample drones to cut transport times may be possible solutions for these remote island communities, allowing improved sample quality, reliable interpretation of results, and reduce in repeat testing for patients.

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References