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VALIDITY OF SELECTED WHITE BLOOD CELLS (WBC) DIFFERENTIAL FLAGS OF SYSMEX XE-2100 IN HOSPITAL SELAYANG

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ABSTRACT

Automated white blood cells (WBC) differential counts are widely accepted in routine practice, as the accuracy and clinical usefulness have been validated in numerous studies. However, many laboratories still reflexively perform manual WBC differential counts based solely on instrument "flags". Haematology laboratory of Selayang Hospital has been using a set of criteria for peripheral blood film (PBF) review, which are adapted from international consensus guidelines (2005) but with modification of several parameters, established by our expert opinion by taking into account our local requirements, and our criteria do not include the analyser's flags. In this study, we determined the validity of selected 5 most common WBC differential related flags in automated full blood count (FBC) analyser Sysmex XE-2100 by correlating the flags with PBF to verify the safety of our PBF review criteria.

Overall, 422 flagged samples were selected during the period of study. The results of both automated and manual counting and scanning of the samples were carefully studied and compared. A total of 538 flags were identified, which consist of 216 atypical lymphocyte flags, 196 blasts flags, 48 WBC AbN scattergram flags, 39 NRBC flags, and 39 monocytosis flags.

Qualitatively, there was statistically significant towards negative PBF findings for blasts flags in both age group, and monocytosis flags in the children sample, while the flag of atypical lymphocyte in the children's age group was statistically significant towards positive findings. Quantitatively, there was a statistically significant difference in the mean of automated and manual monocyte counts in both age groups. The underlying disorders of all these true positive and false-positive flags are heterogeneously varied and they were rather inconsistent and inefficient with low specificity.

Based on these findings, we agreed to ignore all the flags and report the FBC using the automated count. Although the atypical lymphocyte flag of the paediatric group was statistically significant towards positive PBF findings, we also ignored this flag as the results did not greatly affect the clinical management of the patients.

Facing over-flagging of specimens from an automated FBC analyser is a problem in the haematology laboratory, as a flag requires a time-consuming microscopic review of the specimen, which increases the workload of the laboratory personnel, while they constantly under pressure to provide accurate test results to clinicians promptly. Our goal was to develop a system that directed the use of automated and manual WBC differential assessment towards the greatest clinical gain and increased the efficiency of laboratory operations and enabling laboratory personnel to concentrate on tasks that are no achievable through automated methods. Therefore, in the background of our local patient population, we proposed that there is no clinical rationale for reflex manual PBF examination based on instrument flags, and our current criteria for blood smear review are adequate and safe.

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CHAPTER ONE
INTRODUCTION

1.1 General introduction

White blood cells (WBC) play an integral role in defence against attacking pathogens, their toxins and foreign invaders, in identification and elimination of neoplastic cells, in acute and chronic inflammatory reactions, tissue repair and remodelling, and additionally in cellular and humoral immunity, and allergic responses (Hoffbrand et al., 2016). WBC values yield important information about the blood and the bone marrow, which is the blood-forming tissue, as well as the body (Muturi et al., 2008).

The full blood count (FBC) with WBC differential count conducted using automated analyser is an essential investigation for the screening, establishment of diagnosis or prognosis of a variety of diseases, in the surveillance of the patient's condition and the effects of therapy in numerous medical disorders (Roussel et al., 2010; Jung et al., 2010). The automated analyser has more advantages over the manual microscope method in terms of shorter turn-around time (TAT), considerably lesser labour expenses, reduction of inter-observer variation, and subsequently leads to higher statistical validity (Sireci et al., 2010).

The term 'flagging' described an alert or an indicator that the samples being examined may have a considerable deviation, as the instrument encountered unexpected features that may interfere with the blood cell measurements. It may be due to one or more of the blood count variables are outside defined limits, or there is a potential qualitative aberrancy that needs a quality control check and/or further investigation (i.e., microscopic assessment of peripheral blood film (PBF) (Sireci et al., 2010; Jung et al., 2010; Bain et al., 2012; Joubert et al., 2014). This flagging signal generated electronic or printed alerts or "flags" to inform the user regarding both potential quantitative inaccuracy of the blood cell enumeration, as well as suspected qualitative abnormalities in the sample (for example, abnormal cell types such as blast cell) (Sireci et al., 2010; Bain et al., 2012; Joubert et al., 2014).

Morphological examination under a microscope is an essential part of FBC reporting that produces essential information besides cell enumerations (Asad et al.,