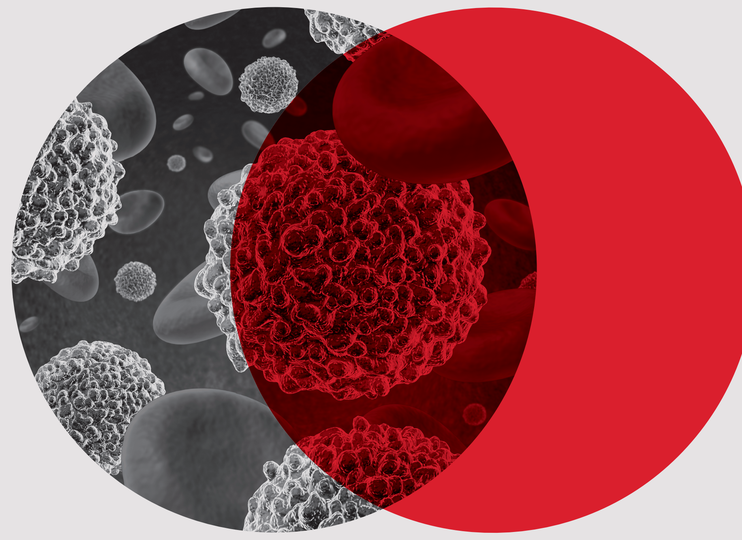
Single vs Dual platform: CD34+ External Quality Assurance Program, a five year review



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Introduction

Hematopoietic stem cell transplantation (HSC) has been a successful treatment of hematological diseases and CD34+ cells have been a surrogate marker for a successful engraftment. Flow cytometric analysis accurately measure the qualitative (viability) and quantitative (absolute number) properties of CD34+ cells[1,2]. Single or Dual platforms are routinely in use to determine the absolute CD34+ count in Haematology or in Bone Marrow Transplant units. The value of a stable whole blood external quality assurance (EQA) program to guide on reducing interlaboratory variation has been previously demonstrated[3]. The Royal College of Pathologists of Australasia quality assurance program (RCPAQAP) provides an external quality assurance (EQA) program for the estimation of CD34+ cells. This poster reviews the performance of the single and dual platform in the estimation of the total CD34+ cells from 2014-2018.

Method

The EQA consists of 3 surveys per year and 2 samples per survey. The samples are a commercially sourced stabilised whole blood "CD Chex CD34TM" manufactured by Streck. The certificate of analysis (CoA) for CD Chex CD34 indicates the white blood cell count, percent CD34+ and total CD34+ cells u/L were determined by BD FACSCanto II, FC 500 and Coulter LH750/780. The final concentrations after processing by RCPAQAP ranged from 10.0 to 57.5 cells u/L. Results from and average of 71 participants for 30 challenges were analysed from 2014 to 2018.

Participants were asked to submit a total WCC, percent CD34+ and total CD34+ cells u/L. The total WCC could be performed on either a haematology instrument and or a flow cytometer. Peer group comparisons were based on the measurement system used by laboratories, using analytical performance specifications to assess participant performance of the total CD34+.

Results and Discussion

Figure 1 outlines the all method medians and CVs for the 30 challenges from 2014-2018. The all results CVs ranged from 3.4 to 6.3% over the 5 year period, indicating acceptable overall precision for both haematology analysers and or flow cytometers, to determine the total white blood cell count. The average number of participants over the 5 years was 71.

The single platform has been recommended by the International Society of Hematotherapy and Graft Engineering (ISHAGE) as the preferred methodology in determining the presence of CD34+ cells[1,4]. There was an average 4 fold higher number of participants using the single platform compared to the dual platform (Figure 3). Further, the relative ratio of single to dual users remained relatively constant over the 5 year period.

A good predictor of a successful engraftment relies on an accurate CD34+ cells enumeration, and the single platform has been recognised as providing better reproducibility[1]. Our review demonstrates an overall lower CV for single (12.6%) vs dual (15%).

While the performance of both platforms for CD34+ cell counts was acceptable, viability is not evaluated with our whole blood material. It would be of benefit to review relative precision for viable CD34+ cells[4], however, currently, the option to provide a stable EQA material for this purpose remains logistically challenging.

Conclusion

This review indicates that the single platform provides lower CVs than the dual platform, in the majority of survey samples, thus supporting the recommendation by the ISHAGE for preference in using the single platform for the quantitation of CD34+ cells.

Figure 1. Medians and CV's% for total WCC over the 5 year study period (2014-2018).

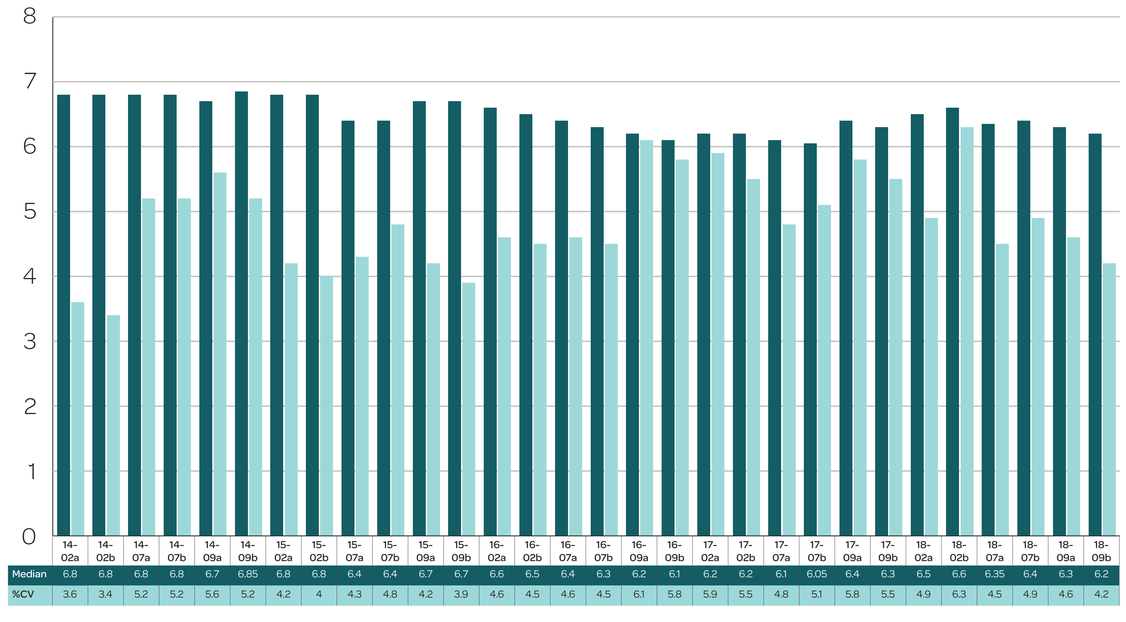


Figure 3. Total CD34+ cells u/L – number of participants using single and dual platform (2014-2018).

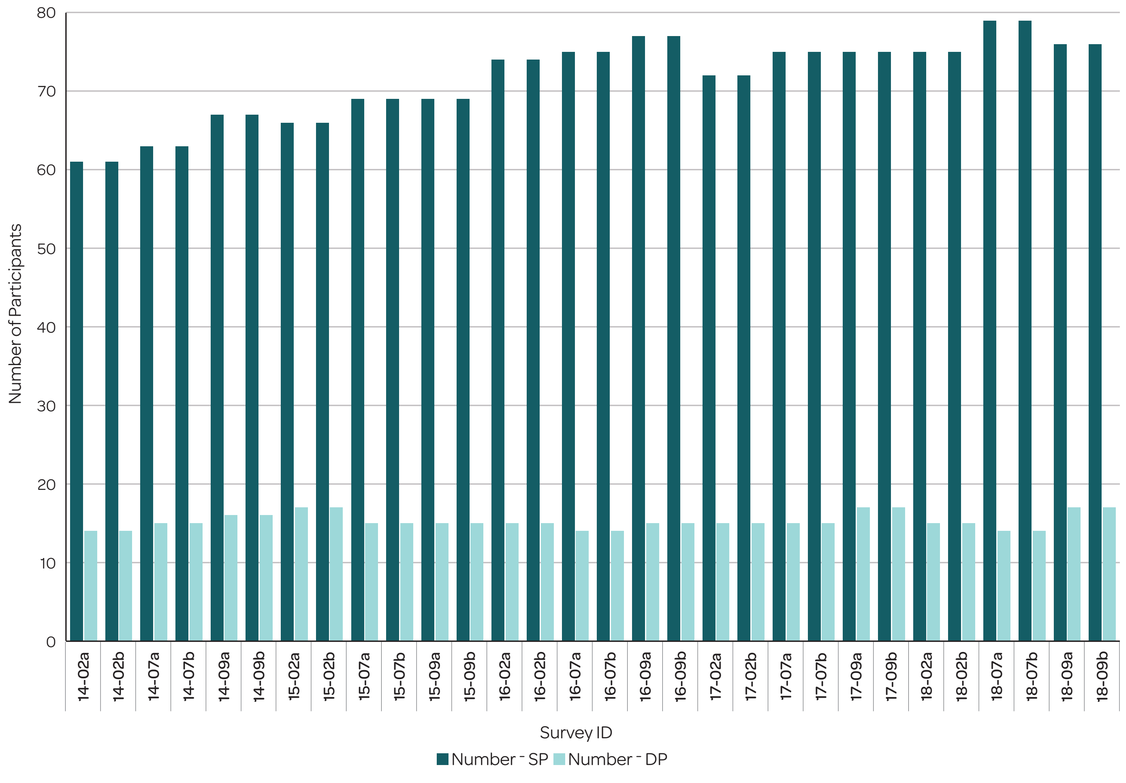
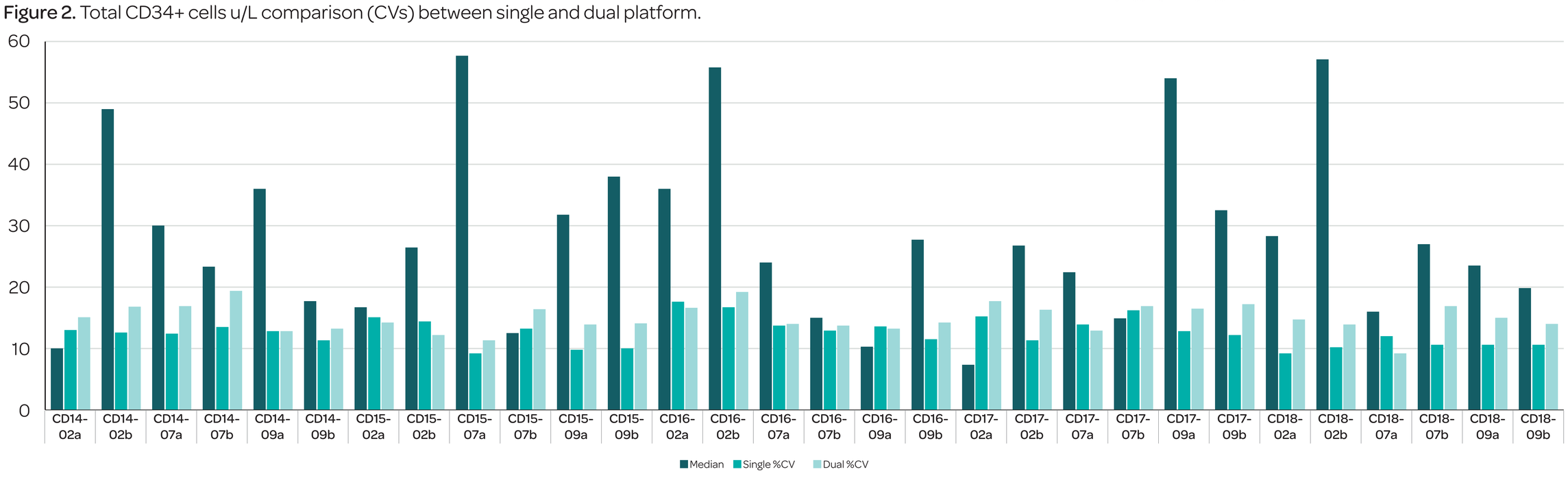


Figure 2. Total CD34+ cells u/L comparison (CVs) between single and dual platform.



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