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HLA Technologists Can Perform Preliminary Virtual Crossmatches to be Reviewed and Verified by a Director

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ABSTRACT

Aim: To determine how often HLA Directors change the data in preliminary Virtual Crossmatches (VXM) made by HLA Technologists, in order to determine whether HLA Technologists can provide preliminary results to be subsequently reviewed and verified by a Director, similar to the manner in which Fluorescence Cytometric Crossmatches (FCXM) are performed.

Methods: VXM performed by HLA Technologist from July 1, 2024, through April 14, 2026, were reviewed. Changes in the donor typing and the final interpretation by a Director were ascertained.

Results: 2844 VXM were performed on 935 donors. 3 (0.1%) VXM were changed from "Compatible" to "Not Compatible"; 5 (0.18%) VXM were changed from "Not Compatible" to Compatible". 92 (9.8%) donor-typing changes were made, but these did not affect the overall interpretation of the VXM (Table 1). Technologist's problems with the interpretation of donor typing reports were primarily with DQ7. There was difficulty with DRB4 null alleles, and homozygosity. None of these resulted in adverse patient outcomes. In our HLA laboratory, only 9% of patients who have VXM performed proceed with FCXM and transplantation.

Conclusions: With training, HLA Technologists are highly capable of performing a preliminary VXM to be reviewed and verified by a Director.

BACKGROUND

In many HLA laboratories, the Directors are responsible for completing all VXM; however Technologists are capable of completing accurate and timely VXM, as this study demonstrates. This can reduce the burden placed on the Directors for completing all VXM. In our HLA laboratory, an average of 1600 VXM are completed each year.

Technologists are trained to perform VXM using Mtilda VXM software. The Technologists use patient antibody history to look for Donor-Specific Antibody (DSA). Using Mean fluorescent intensity (MFI) values for each HLA locus, the Technologists determine the result of the VXM. While errors do occur with Technologists-performed VXM, this study aimed to show that errors did not result in adverse outcomes and that Directors do not need to be the only ones performing VXM in the laboratory.

METHODS

VXM in our HLA Laboratory are performed using donor typing results obtained from an OPO, these are either serological or molecular. Technologists input donor typing into Mtilda VXM software for analysis against patient antibody history. A report is generated showing any potential DSA over a 1000 MFI, and a conclusion is made as to whether the patient and donor are "Compatible", "Not Compatible" or "Not Interpretable".

RESULTS

- Out of the 2844 VXM performed between July 2024 and April 2026, only 8 (0.28%) VXM had an interpretation change
- Out of the 935 donors typing completed, only 92 (9.8 %) changes were made; specific allele numbers are listed in Table 1
- Technologists seemed to struggle with several concepts when completing VXM analysis and donor typing
  - HLA-DQ7 was the allele most often misrepresented
  - Technologists used DQA*05:01 instead of DQA1*05:05 or DQA1*05:03 to pair with HLA-DQB1*03:01
  - HLA-DRB345 alleles were often missed when homozygous, and Null alleles were not included in the typing, specifically DRB4*01:03N
  - Homozygosity of alleles caused the Technologists to either under- or overcalculate MFI for DSA

Table 1 Total typing errors by HLA locus between July 2024 and April 2026

HLA -LOCUS	Number of Typing errors
HLA-A	13
HLA-B	4
HLA-C	4
HLA-DRB1	6
HLA-DQ	26
HLA-DP	12
HLA-DRB3	13
HLA-DRB4	9
HLA-DRB5	5

CONCLUSIONS

This study demonstrates HLA Technologists are capable of performing VXM with the proper training and education. The ability of Technologists to perform VXM can reduce the burden on the Directors and allow for quicker turnaround times, which leads to better patient outcomes for transplantation.