Non-Doctoral Technical Staff-Performed Virtual Crossmatches and Deceased Donor Outcomes

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INTRODUCTION

Virtual crossmatch (VXM) is an in-silico review of a transplant candidate's current HLA antibody profile in the context of a potential donor's HLA genotype.

VXM is suitable as the final pre-transplant determinate of HLA compatibility, but there is no national consensus regarding whether VXM can be performed by trained, non-doctoral technical staff or should be limited to doctoral-level clinical consultants.
Our high-volume HLA laboratory regularly performs VXM as the sole arbiter of compatibility for deceased donor transplants. All VXM are performed by trained technical staff with availability of clinical consultant input.

No published data has analyzed the clinical outcomes of programs utilizing VXM as the final crossmatch performed by trained high complexity testing technical staff. Herein we display the outcomes for the four deceased donor heart and kidney transplant programs we serve using this VXM performance model.

MATERIALS & METHODS

For the time period, 01/01/2022 to 06/30/2024, the 1-year survival with a functioning deceased donor graft data was obtained from the SRTR (Scientific Registry of Transplant Recipients) Database.

Transplants: 1/01/2022 – 6/30/2024
Follow-up through 12/31/2024

Program specific estimated probability of surviving with a functioning graft at 1 year [both adjusted (adj) and unadjusted (unadj) for patient & donor characteristics] were compared to the relevant adult vs. pediatric U.S. performance averages.

Both kidney and cardiac transplant programs were evaluated.

Estimated Probability Of Surviving With A Functioning Graft At 1 Year

KIDNEY

	Center			U.S. Average	
Txp Center	(unadj)	(adj)	No. Txps	(unadj)	No. Txps
A	96.33%	94.06%	429	94.09%	46918
B	94.25%	95.08%	87	94.09%	46918
C	100.00%	96.94%	34	96.55%	1538
D	98.05%	95.22%	154	94.09%	46918

HEART

	Center			U.S. Average	
Txp Center	(unadj)	(adj)	No. Txps	(unadj)	No. Txps
A	93.75%	93.33%	16	92.20%	8450
B	96.77%	92.73%	31	92.20%	8450
C	93.10%	92.60%	29	92.47%	1281
D	91.45%	92.92%	61	92.20%	8450

VXM Case #1

Deceased Donor Crossmatch Report

Donor Name: [redacted] ABO/Rh: AB UNOS #: [redacted] Sample Date:

A*	B*	C*	DRB1*	(DR 52) DRB3*	(DR53) DRB4*	(DR51) DRB5*	DQA1*	DQB1*	DPA1*	DPB1*(P group)
02	18	07	04		01	01	01	06	01	04:01
02	60	10	15				03	08	01	16:01

Seq# Score	Name / SSN / Category	ABO	Hosp	T#	A*	B*	C*	DRB1*	DRB3/4/5*	DQA1*	DQB1*	DPA1*	DPB1* (P group)	cPRA (Peak)
1 4.60507	[redacted]	A1B		0	01:01	15:01(62)	03:03(9)	04:01	DRB4*01:03	03:01	03:02(8)	01:03	02:01	0
					24:02	39:01	07:02	04:04		03:01	03:02(8)	01:03	04:01	

Specificity:

Virtual XM: Serum Date 09/03/2025, Result

Flow XM: Serum Date, T/B Result, MCS

VXM Case #2

Deceased Donor Crossmatch Report

Donor Name: [redacted] ABO/Rh: O UNOS #: [redacted] Sample Date:

A*	B*	C*	DRB1*	(DR 52) DRB3*	(DR53) DRB4*	(DR51) DRB5*	DQA1*	DQB1*	DPA1*	DPB1*(P group)
03	38	04	07	01	01		01	02	01	04:01
26	44	12	13				02	06	02	05:01

Seq# Score	Name / SSN / Category	ABO	Hosp	T#	A*	B*	C*	DRB1*	DRB3/4/5*	DQA1*	DQB1*	DPA1*	DPB1* (P group)	cPRA (Peak)
1 211.862	[redacted]	O		1	01:01	08:01	07:01	01:01	DRB3*03:01	01:01	05:01	01:03	04:01P	98
					68:01	44:02	07:04	13:02		01:02	06:04	01:03	04:02P	

Specificity:
A:2 23 24 25 29 31 32 33 43 6602 69
B:13 18 27 35 37 39 41 42 46 47 48 49 50 51 53 54 55 56 57 58 60 61 62 63 67 7 71 72 73 75 77 78 81 82
Cw:10 9
DR:11 12 1303 8
DQ:4 7 8 9
DQA:05 06

Virtual XM: Serum Date 07/23/2025, Result

Flow XM: Serum Date, T/B Result, MCS

RESULTS

In this time period, 3,560 virtual crossmatches were performed by non-doctoral technical staff for the four represented programs for deceased donor transplant offers.

Center-specific kidney and heart data , both adjusted and unadjusted for patient & donor characteristics, is presented in the table alongside U.S. averages.

Two Virtual Crossmatch Case Examples (VXM Cases #1 and #2) are also presented for discussion.

Trained technical staff follow developed Standard Operating Procedures (SOPs) to determine VXM results.

CONCLUSIONS

Comparison of center-specific outcomes to U.S. models show results consistent with or exceeding national averages. Per the unadjusted data, 4 of 4 programs for kidney and 3 of 4 programs for heart outperformed the US benchmark suggesting non-inferiority of a trained technical staff approach.

In our laboratory, trained technical staff use developed Standard Operating Procedures (SOPs) to determine VXM results with outcomes comparable to U.S. National data.

This high-level review of transplant outcomes is correlative and does not account for patient and transplant-center specific protocol differences; however, this information may be helpful when discussing feasibility and safety of trained technical staff –performed VXM which abides by the current regulatory requirements and offers an alternative to director-only (doctoral-level) performed VXM approaches.