



Simulation vs reality: 250NM as first unit of lung allocation

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Introduction

- On November 24, 2017, the OPTN Executive Committee enacted an emergency policy change removing donation service area (DSA) as the first unit of allocation for deceased donor lungs.
- DSA was replaced by a circle of radius 250 nautical miles (NM) from the donor hospital.
- SRTR used thoracic simulated allocation model (TSAM) software to predict waitlist outcomes using 250NM rules.
- We compared predicted waitlist outcomes with those observed in the first year after the 250NM policy was implemented.

Methods

- The study used SRTR data.
- The TSAM cohort included adult candidates and recipients and all donors, July 1, 2009-June 30, 2011.
- TSAM simulated match runs according to 250NM lung policy.
- Observed data included adult candidates and recipients December 1, 2017-November 30, 2018.

Methods (cont'd)

- We computed simulated and observed transplant and waitlist mortality (WLM) counts and rates, overall and by lung allocation score (LAS).
- We compared baseline characteristics of adults in the older TSAM cohort with the newer observed cohort using chi-squared tests for difference in distribution.

Results

- From the TSAM to observed cohorts, lung candidates became older and sicker (Table 1).
- In the newer observed cohort, 31.3% of candidates were aged ≥ 65 years, compared with 18.5% in the older TSAM cohort; the proportion with LAS ≥ 50 increased to 18.1% in the observed cohort, compared with 13.5% in the TSAM cohort.
- Overall observed transplant rates were 1.5 times higher than predicted, 202 transplants per 100 waitlist years compared with 137 (Fig 1). This increase was expected, as increased donor supply has been increasing transplant rates for all organs.

Results (cont'd)

- WLM rates were 1.3 times higher than predicted, reflecting the increased illness severity of the waitlist population in the recent cohort.
- Although rates were not the same, the pattern of higher transplant and WLM rates at higher LAS was similar.
- For candidates with LAS ≥ 40 , predicted transplant rates were 5- to 13-fold higher than for candidates with LAS < 35 ; in the observed cohort, transplant rates were 2.2- to 8.5-fold higher (Table 2).
- For candidates with LAS ≥ 50 , predicted WLM rates were 8- to 39-fold higher than for candidates with LAS < 35 ; in the observed cohort, WLM rates were 8- to 60-fold higher.
- The LAS < 35 group had higher predicted WLM rates than was observed, and the number of deaths relative to the total was larger (27% vs. 10% of the total deaths). This is likely due to the larger proportion of LAS < 35 candidates in the TSAM cohort (46.5% vs. 24.5%).

Table 1: Characteristics of TSAM and observed candidate cohorts

Characteristic	Level	TSAM 7/1/09-6/30/11		Observed 12/1/17-11/30/18		P-value
		N	%	N	%	
All		6386	100	4613	100	
Age (years)	18-34	866	13.6	420	9.1	<.0001
	35-49	1149	18.0	628	13.6	
	50-64	3191	50.0	2120	46.0	
	≥ 65	1180	18.5	1445	31.3	
Sex	Female	3180	49.8	2234	48.3	0.24
	Male	3206	50.2	2379	51.6	
Race/eth	White	5185	81.2	3483	75.5	<.0001
	Black	635	9.9	507	11.0	
	Hispanic	397	6.2	446	9.7	
	Asian	124	1.9	141	3.1	
	Other	45	0.7	36	0.8	
Diagnosis	COPD	2324	36.4	1360	29.5	<.0001
	iPAH	537	8.4	368	8.0	
	CF	748	11.7	396	8.6	
	IPF	2777	43.5	2489	54.0	
Initial LAS	<35	2969	46.5	1592	34.5	<.0001
	35-<40	1489	23.3	1271	27.6	
	40-<50	1069	16.7	913	19.8	
	50-<60	319	5.0	305	6.6	
	≥ 60	540	8.5	532	11.5	

Figure 1: Waitlist outcomes for TSAM vs. observed candidate cohorts, by LAS

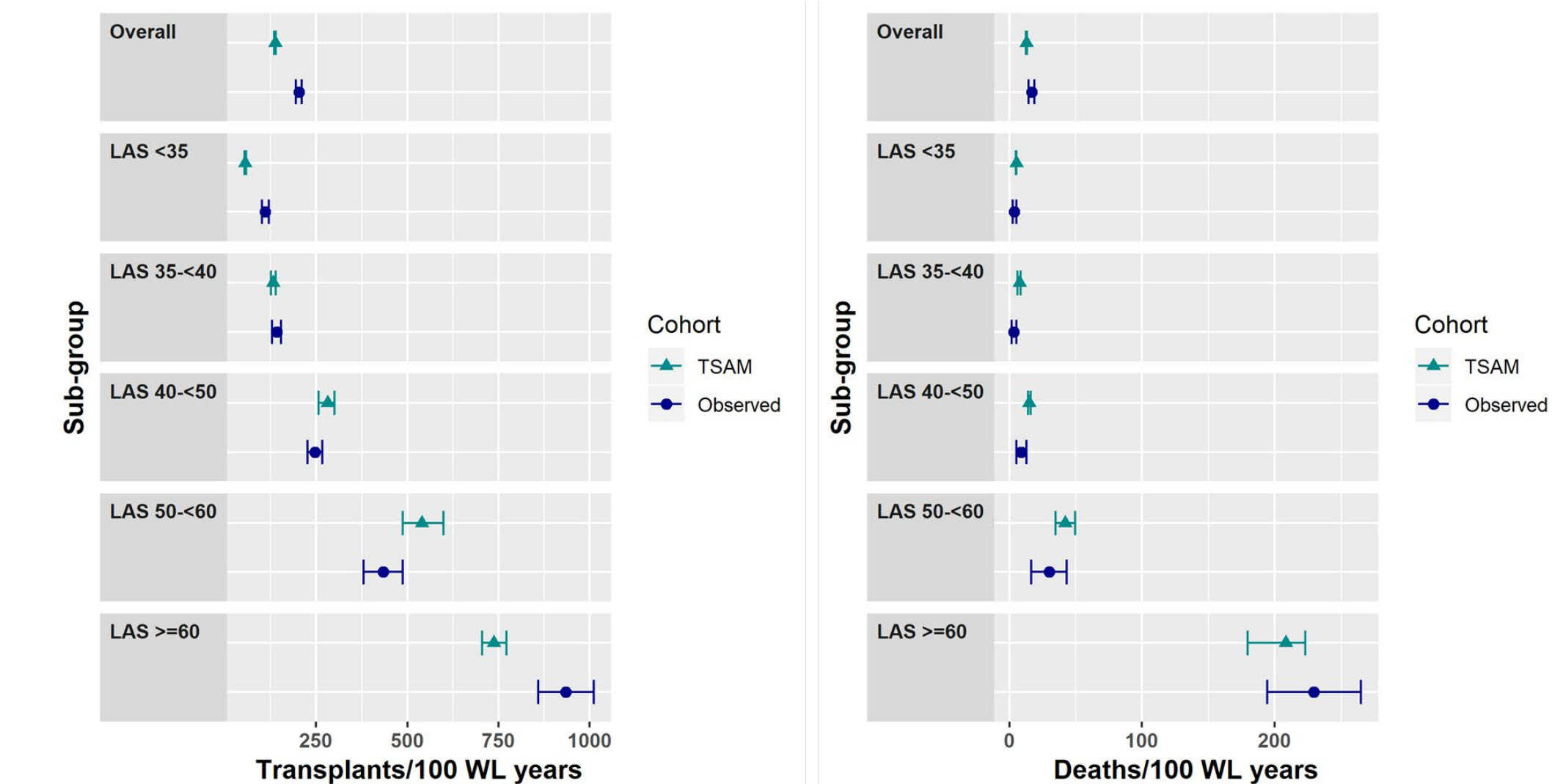


Table 2: Transplant and waitlist mortality (WLM) counts and rates by cohort and LAS group

Subgroup	TSAM				Observed			
	N	Transplant	WLM	Rate	N	Transplant	WLM	Rate
All	3327	137	437	12.8	2509	202	244	16.7
LAS <35	770	55	119	5.3	554	110	25	3.8
LAS 35-<40	761	131	51	7.9	538	141	14	3.4
LAS 40-<50	900	282	52	14.9	583	247	23	9.1
LAS 50-<60	367	539	32	42.0	254	433	19	29.9
LAS ≥ 60	529	737	184	208.2	580	934	163	229.5

Summary and Conclusions

- Although exact predicted transplant and waitlist mortality rates were not the same, the relative outcomes patterns by LAS were similar.
- High-LAS groups had high predicted and observed transplant and WLM rates compared with low-LAS groups.
- Some differences in magnitude of these rates may be attributable to changes in the lung waitlist population, although imperfections in simulation also contribute.
- As a tool for predicting expected change in waitlist outcomes due to change in allocation rules, TSAM remains valuable, but updates to the cohort and models are needed.