

# Patients with Continuous Flow Ventricular Assist Devices Have Improved Wait-List Survival

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I have no financial relationships to disclose within the past 12 months relevant to my presentation

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# Background

- Prevalence of ventricular assist devices(VADs) among wait-list candidates increased to 24% between 2001 and 2011
- 1-year survival of heart transplant candidates with continuous flow VAD 85%-95%
- Evolving LVAD technology has resulted in improved outcomes and fewer device-related complications
- Broad spectrum of clinical profiles of heart transplant candidates
- Current allocation policy may not adequately prioritize candidates in the current era



# Objectives

- To determine the impact of durable (long-term) VADs on wait-list outcomes
- To determine the impact of VADs among those listed as Status 1A
- To compare outcomes among wait-list candidates with durable VADs and without VADs
- To determine risk factors associated with wait-list mortality

# Methods

- Scientific Registry of Transplant Recipients standard analytic files
- Heart transplant wait-list candidates between 2000 and 2010
- N=27,893
- $\geq 18$  years old
- Total artificial hearts excluded
- Cox proportional hazards model used to estimate survival
- Multivariate analysis with backwards selection used to evaluate risk factors for mortality ( $\alpha=0.10$ )
- Follow-up censored at transplant, death, or September 31, 2011

# VAD Categories

- Initial analysis performed categorizing VADs based on technology: continuous-flow vs. pulsatile
- Final analysis categorized VADs as durable (long-term) vs. nondurable (short-term) in order to compare “stable” VAD wait-list candidates to non-VAD candidates
- Based on manufacturers’ indications
- Candidates with both durable and non-durable VADs listed were classified as durable

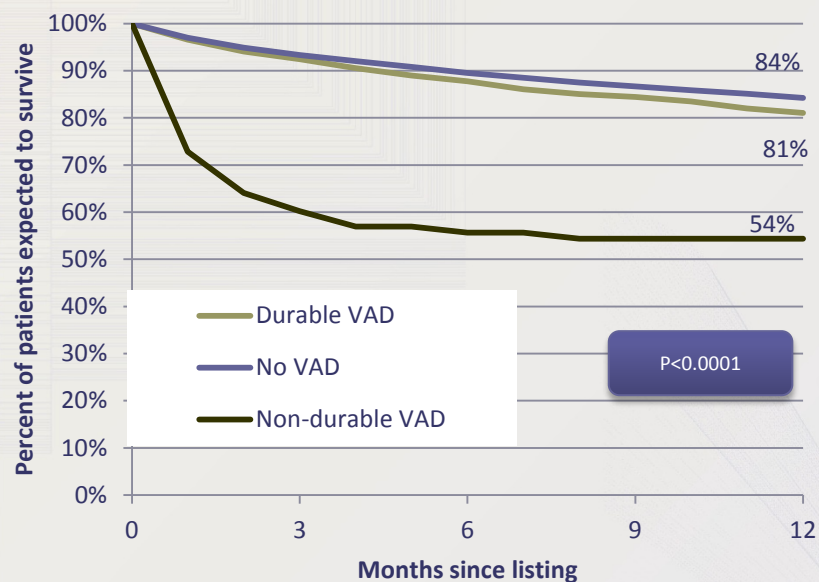


# Demographics of Candidates by VAD Type

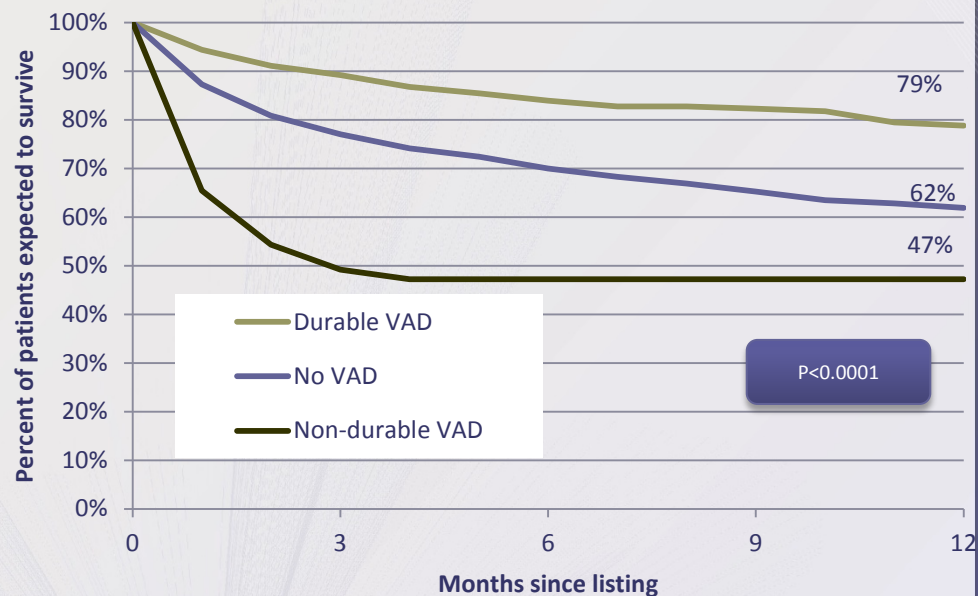
	No VAD (n=21101)	Non-durable VAD(n=224)	Durable VAD (n=2290)	
	Mean ± SD or percent	Mean ± SD or percent	Mean ± SD or percent	<i>p</i>
Age at listing	51.6 ± 12.29	48.6 ± 13.05	50.6 ± 12.36	<0.0001
BMI(kg/m <sup>2</sup> )	27.6 ± 36	27.2 ± 5	28.0 ± 5.39	NS
Cardiac output (L/min)	4.3 ± 1.39	4.4 ± 1.81	4.5 ± 1.55	<0.0001
Creatinine	1.4 ± 0.97	1.5 ± 1.17	1.3 ± 0.70	<0.0001
PCW mean (mmHg)	19.9 ± 8.49	24.0 ± 8.80	21.0 ± 9.75	<0.0001
Mean PA pressure (mmHg)	29.6 ± 10.25	30.4 ± 10.10	30.6 ± 11	NS
Total serum albumin	3.8 ± 0.72	2.8 ± 0.72	3.4 ± 0.78	<0.0001
Gender				
Male	75%	71%	79%	<0.0001
Race				
White	72%	75%	69%	<0.0001
Etiology of HF				
CAD	42%	60%	47%	<0.0001
CM	49%	33%	50%	
Listing status				
1A	12%	70%	41%	
1B	27%	21%	43%	<0.0001
2	59%	3%	8%	

# Wait-list Survival by VAD type (Durable vs. Nondurable)

**Patient survival on the wait-list by VAD status**  
All status

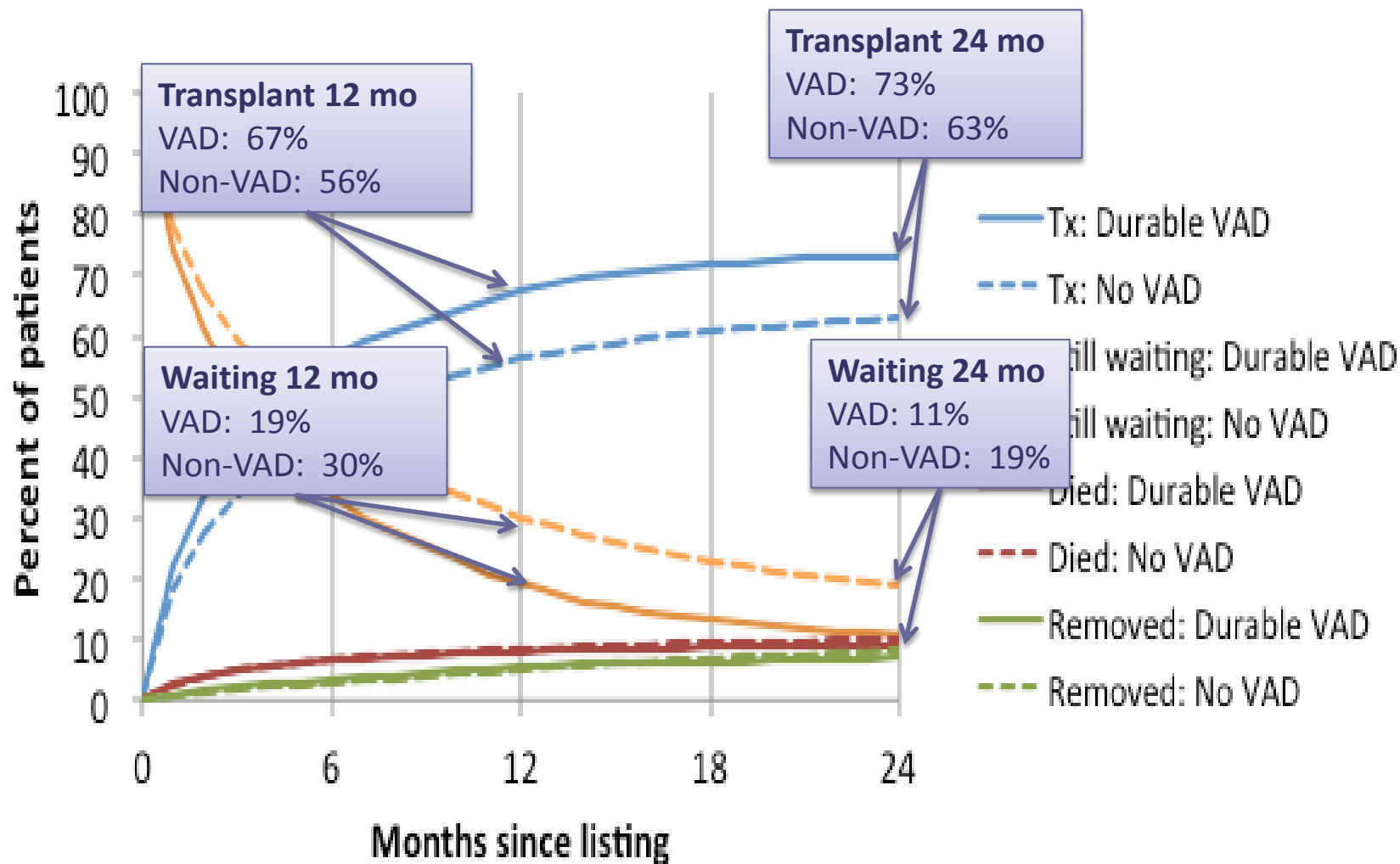


**Patient survival on the waiting list by VAD status**  
Status 1A patients only

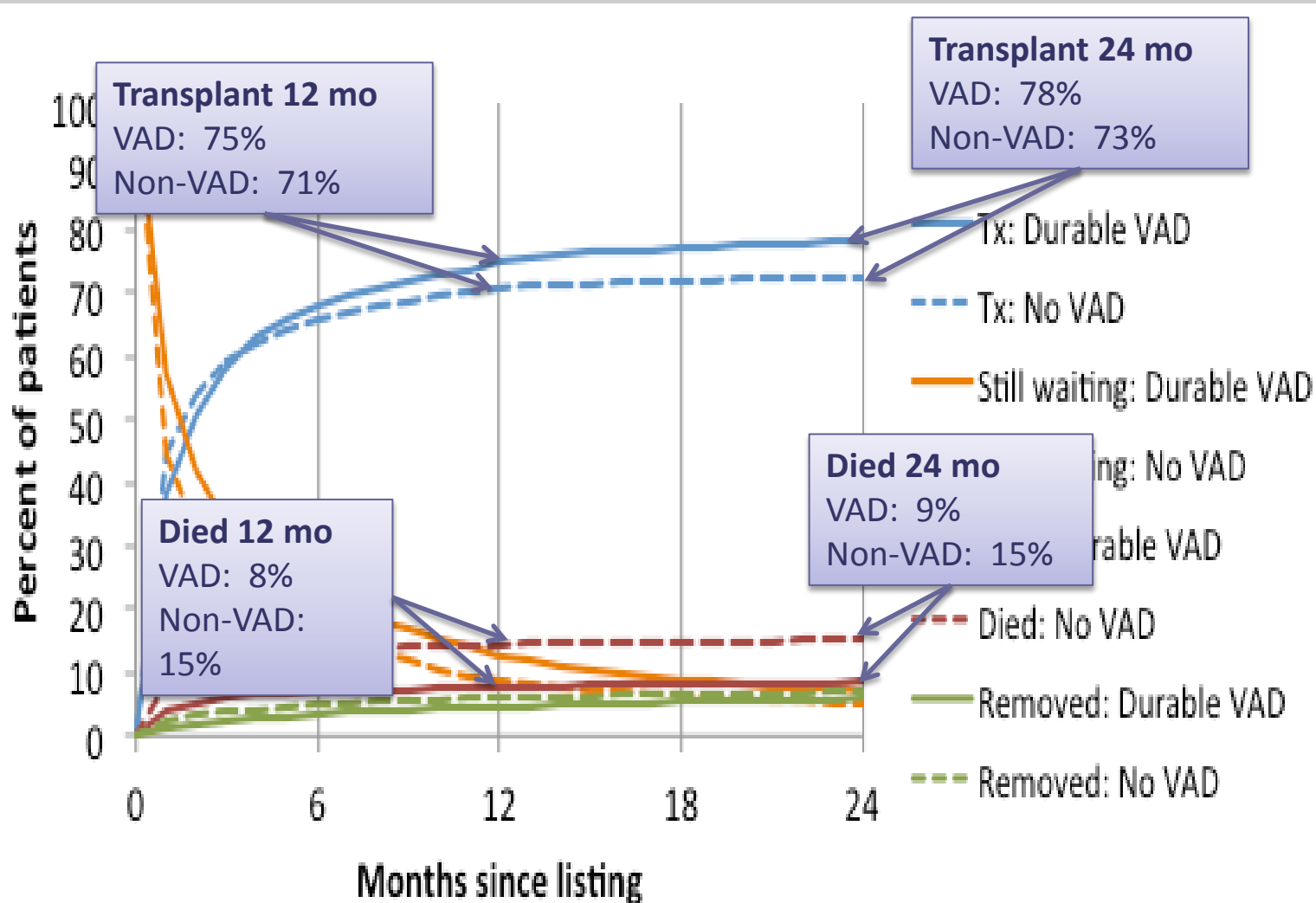




# Waiting List Competing Outcomes, All Status Categories



# Waiting List Competing Outcomes, Status 1A



# Determinants of Wait-List Mortality

Variable	Level	Hazard Ratio	<i>p</i>
VAD type (ref=No VAD)	Non-durable VAD	0.675	<.0001
	Durable VAD	1.428	0.1764
	VAD status unknown	0.881	0.0969
	VAD type unknown (but they did have a VAD)	1.723	0.2275
Age (ref = 35 - 49)	18-34	0.837	0.0449
	50-64	1.275	<.0001
	65+	1.651	<.0001
PCOD (ref=Cardiomyopathy)	CAD	1.01	0.8473
	Congenital Heart Disease	1.266	0.1944
	Valvular Heart Disease	1.309	0.0541
	Other/unknown	2.037	<.0001
ABO type (ref=O)	A	1.009	0.86
	B	0.917	0.245
	AB	1.322	0.0256
Last status (ref=2)	1A	2.165	<.0001
	1B	1.631	<.0001
Dialysis (ref=No)	Yes	1.258	0.082
Medical condition (ref=Not hospitalized)	In ICU	1.865	<.0001
	Hospitalized not in ICU	1.286	0.0065
Functional Status (ref=Normal)	Performs activities of daily living with SOME assistance.	1.187	0.0188
	Performs activities of daily living with TOTAL assistance.	1.366	0.0004



# Summary

- Wait-list survival of heart transplant candidates with durable VADs is comparable to that of candidates without VADs
- Among Status 1A candidates, those with durable VADs have better survival on the wait-list compared to those without VADs and those with nondurable VADs
- In general, transplant occurred more frequently among candidates with durable VADs than among candidates without VADs.
- Among Status 1A candidates, frequency of transplant was similar between durable VADs and nonVADs, however among those not transplanted, those without VADs died more frequently than those with durable VADs

# Limitations

- Inherent limitations of registry data
- Biventricular assist devices were not excluded
- Possible misclassification among those listed as having second VAD

# Conclusions

- Candidates with durable VADs have comparable or greater wait-list survival compared to non-VAD candidates
- These data suggest need for characterization of non-VAD transplant candidates to facilitate the development of allocation policies that better prioritize heart transplant candidates
- Allocation policies that account for improved VAD technology and survival may improve the distribution of organs to patients who will derive the greatest benefit