CHALLENGES WITH "DESTINATION THERAPY" IN CANADA

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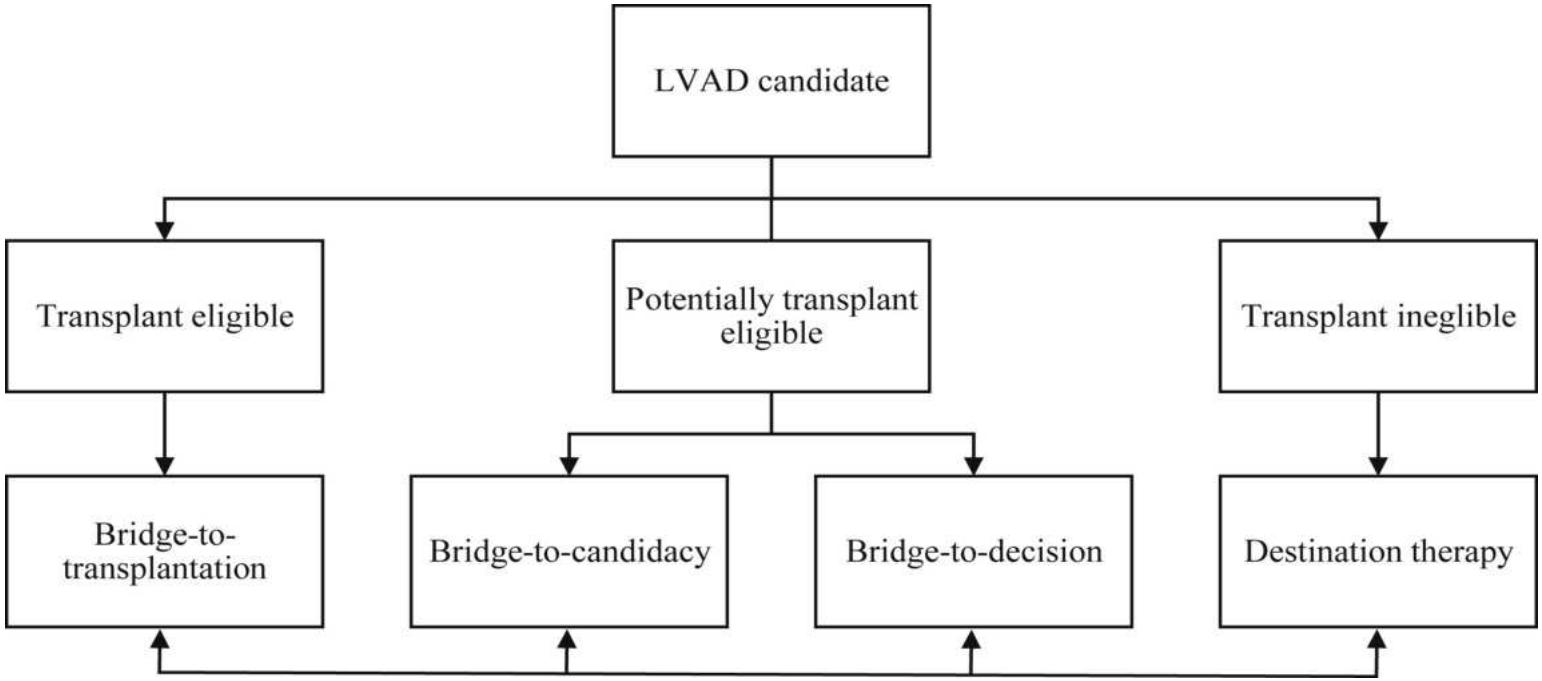
DISCLOSURES

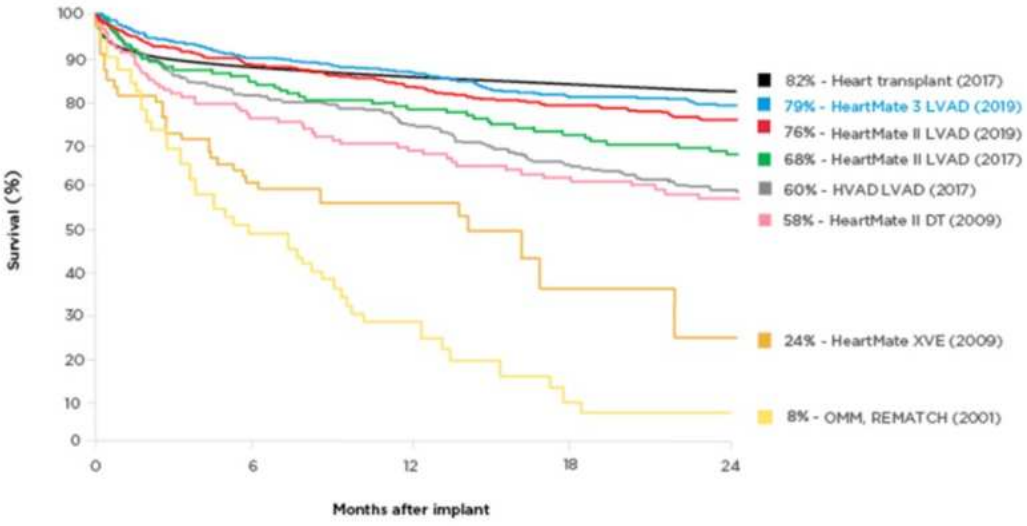
- None

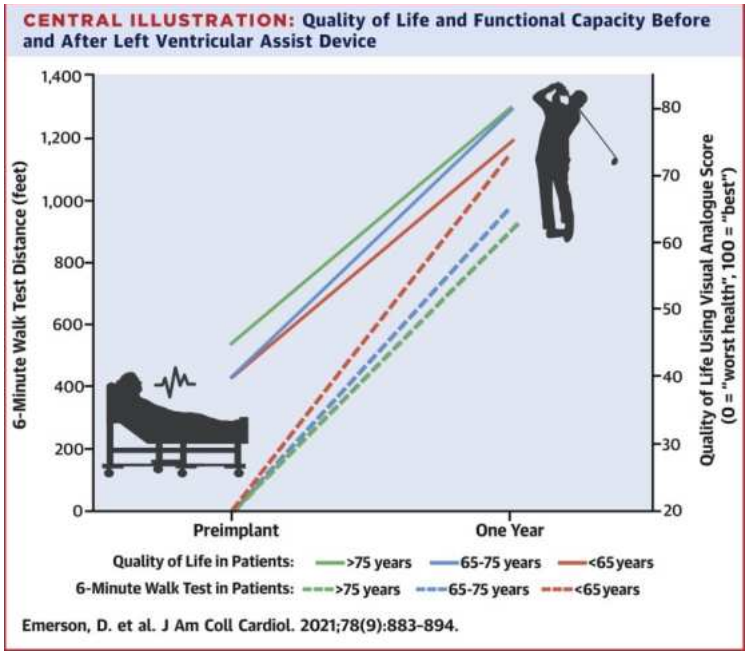
Describe	Describe the current landscape in North America (Canada) for Destination therapy
Identify	Identify the ‘‘right’’ patients for this approach
Evaluate	Evaluate the potential for remote monitoring/follow up at non implant centers in DT (or any LVAD)

DEFINITION



Canadian Journal of Cardiology 2020 36205-215DOI: (10.1016/j.cjca.2019.09.020)

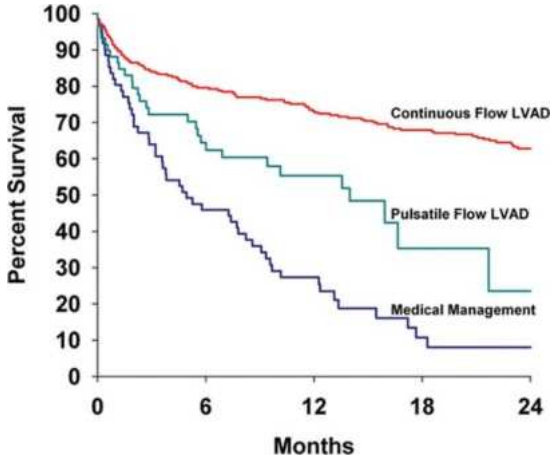


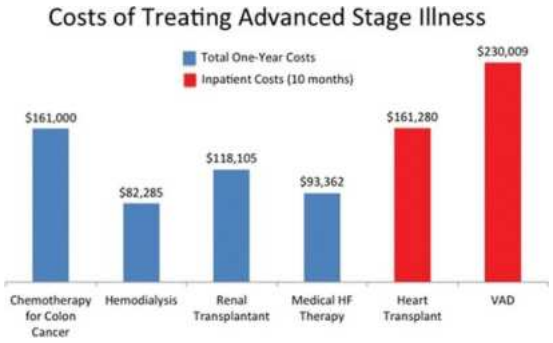


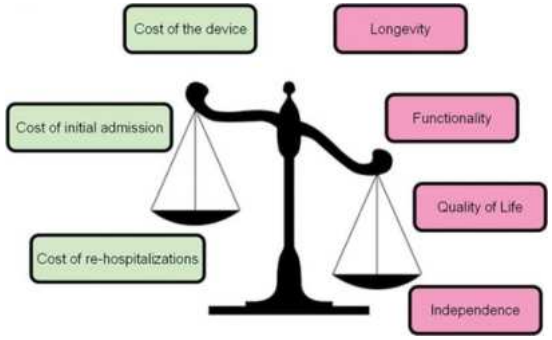
WHY IMPLANT ?

- Better functional capacity
- Increased quality of life metrics
- Improved device design
- Less adverse events
- Longer event free survival

"The time is always right to do what is right."
– Martin Luther King Jr (1929–1968)







LIFE HANGS IN THE BALANCE

- Leslie W. Miller. Circulation. Cost of Ventricular Assist Devices, Volume: 127, Issue: 6, Pages: 743-748, DOI: (10.1161/CIRCULATIONAHA.112.139824)

THE DEVIL IS IN THE DETAILS

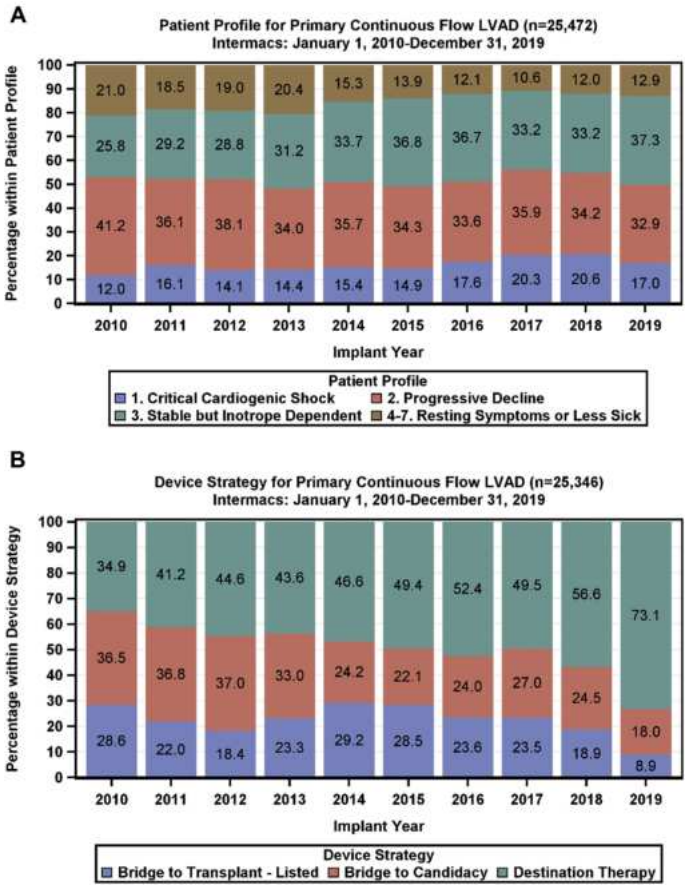
- The implantation of the HeartWare™ HVAD™ System in patients ineligible for cardiac transplantation as DT is a cost-effective therapy in the NHS England healthcare system under the end-of-life willingness-to-pay threshold of £50 000/QALY, which applies for VAD patients.
- A scenario analysis using contemporary survival data resulted in a cost per QALY gained of $125,936. When applying contemporary LVAD survival trends, the model showed that the cost of initial LVAD implantation needed to be less than $123,000 to be considered cost-effective.
- The incremental cost per QALY for destination therapy CF-LVADs is predicted to be above usual thresholds for funding in Canada. In some plausible scenarios, its cost-effectiveness is similar to dialysis for kidney failure, a therapy that is also immediately life-saving. Because of this, there will be likely ongoing pressure to fund CF-LVADs for a subset of patients ineligible for transplantation.

SC Heart Fail 2021 Aug;8(4):3049-3057.doi: 10.1002/ehf2.13401. Epub 2021 May 27
Candian J Cardiol2017 Oct;33(10):1283-1291.doi: 10.1016/j.cjca.2017.07.012.

ESTIMATED ANNUAL VOLUMES PER PROGRAM- CANADIAN PERSPECTIVE

(15 participating centers)

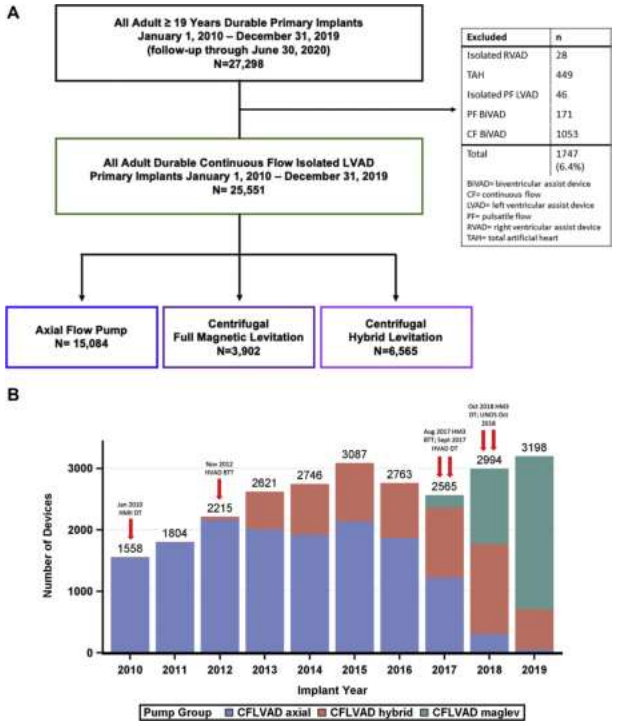
Annual volume	Durable VADs	Temporary MCS	VA-ECMO	Impella	TandemHeart
None	1		0	2	11
< 5	-	-	0	8	3
<10	5	0	7	1	1
10-20	7	2		4	0
20-30	1	12	8	0	0
30-40	1	1	0	0	0
>40	0	0	0	0	0
Estimated range	**150 - 240**	**270 - 400**	**180 - 340**	**40 - 160**	**0-25**



UP NOT DOWN

- Data collected through INTEMACS shows that the growth of destination therapy has continued
- Early Canadian estimations (currently being collected through a CCTN registry) show that the incidence of DT in Canada could be between 85-136 up to 110-173.
- With continued growth and need DT will be a major driver of cost and will hopefully improve QoL

The Annals of Thoracic Surgery 2021 111778-792DOI: (10.1016/j.athoracsur.2020.12.038)

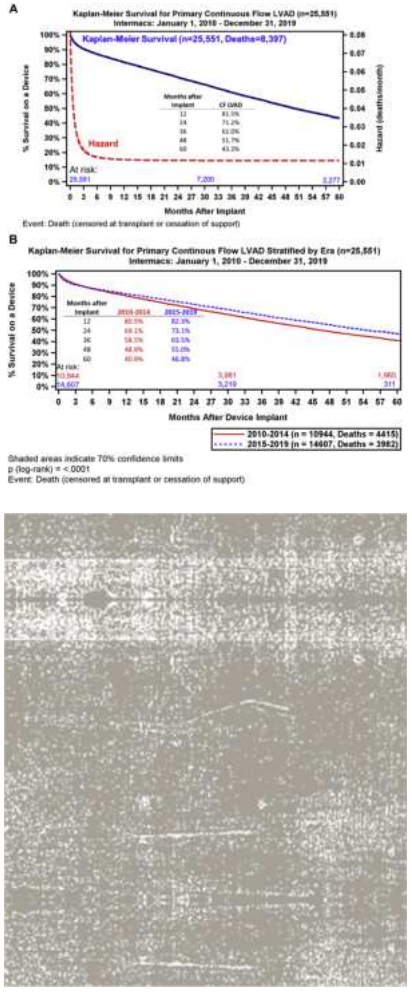


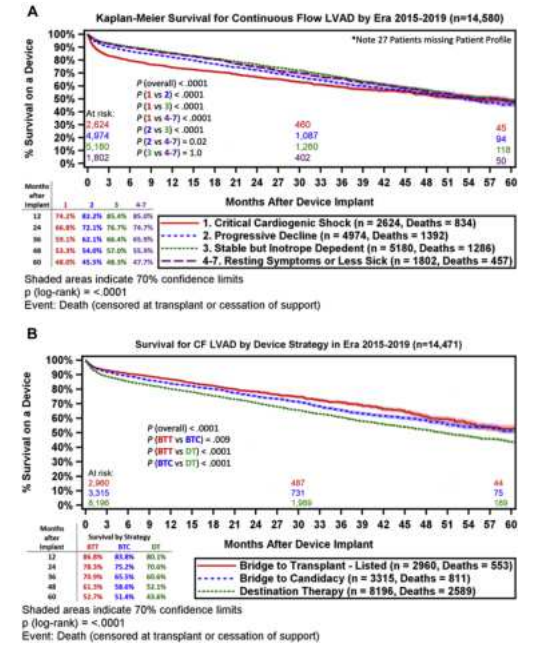
- As indications increase – its use will follow
- DT is a phenomenon of the last 5 yrs.

The Annals of Thoracic Surgery 2021 111778-792DOI: (10.1016/j.athoracsur.2020.12.038)

THE BEAT GOES ON

- Regardless of :
  - Strategy
  - Critical illness level
  - Device
- Survival advantage over time has been seen
- Destination therapy patients have a slight survival disadvantage but are catching up in time
- Impossible to argue the use of LVAD in the right DT patient





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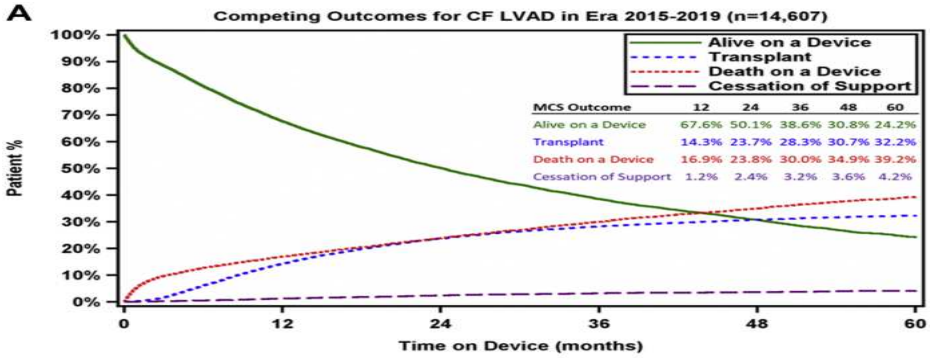

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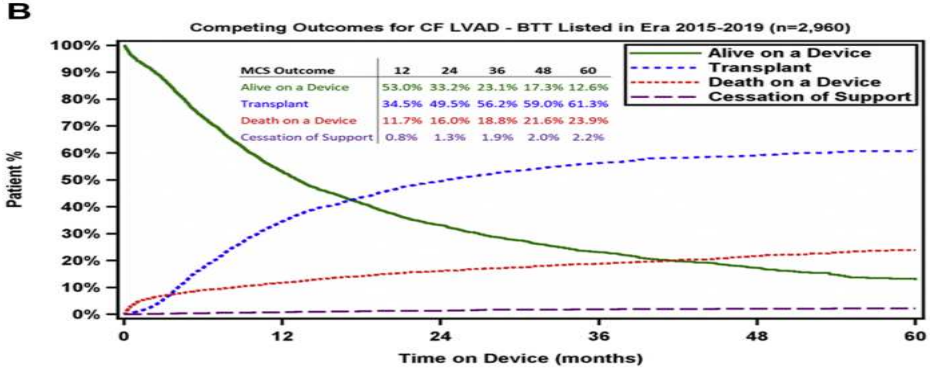

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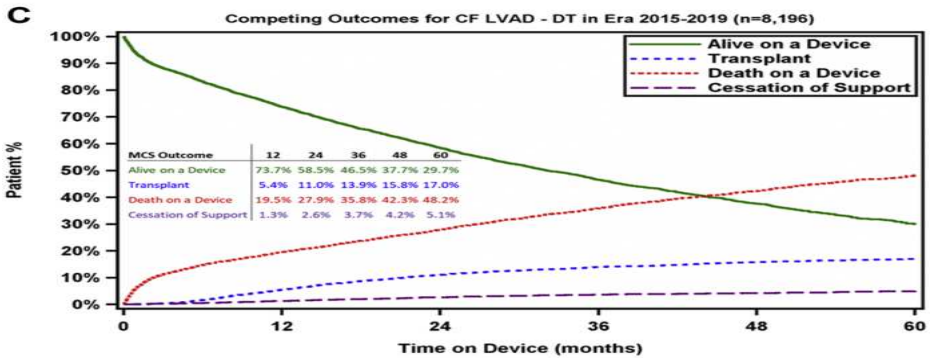
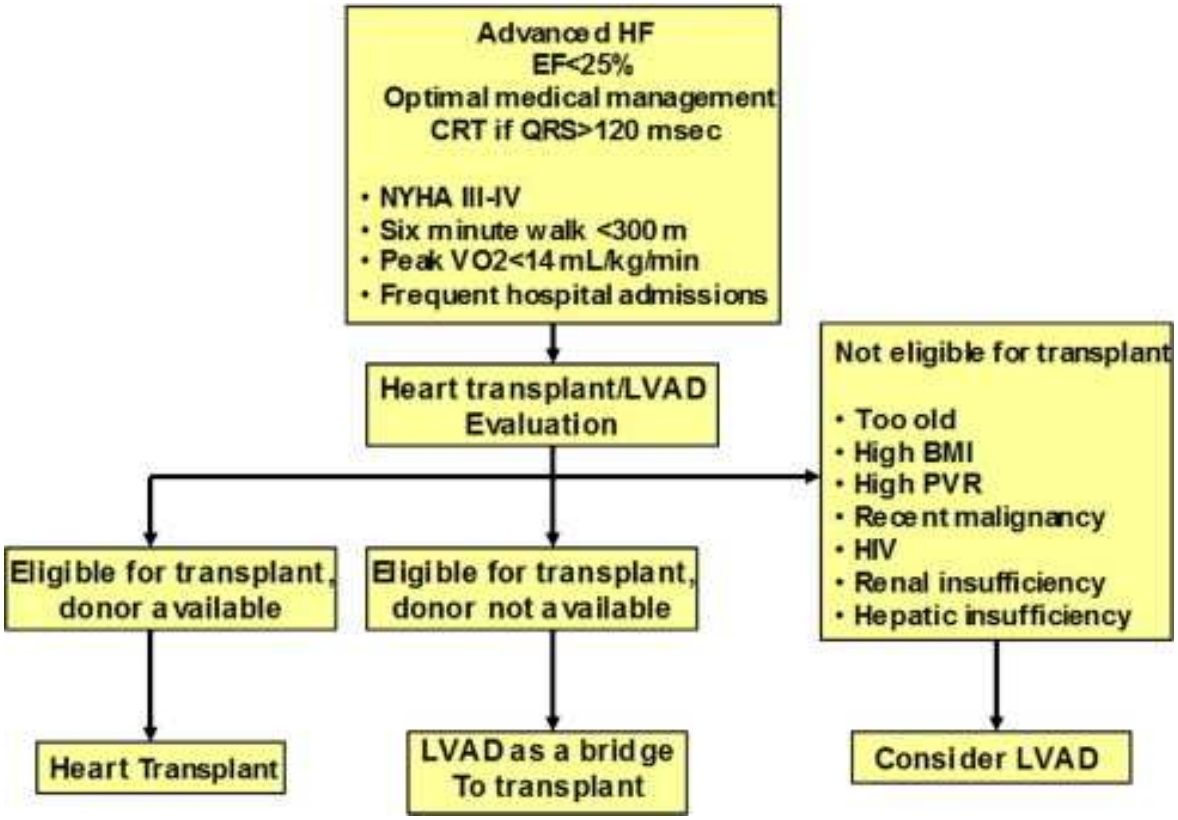


ALL GOOD THINGS COME TO AN END

- The early survival benefit is not usual sustained
- Higher age
- Increased risk for infection and GI bleed
- More co morbidities

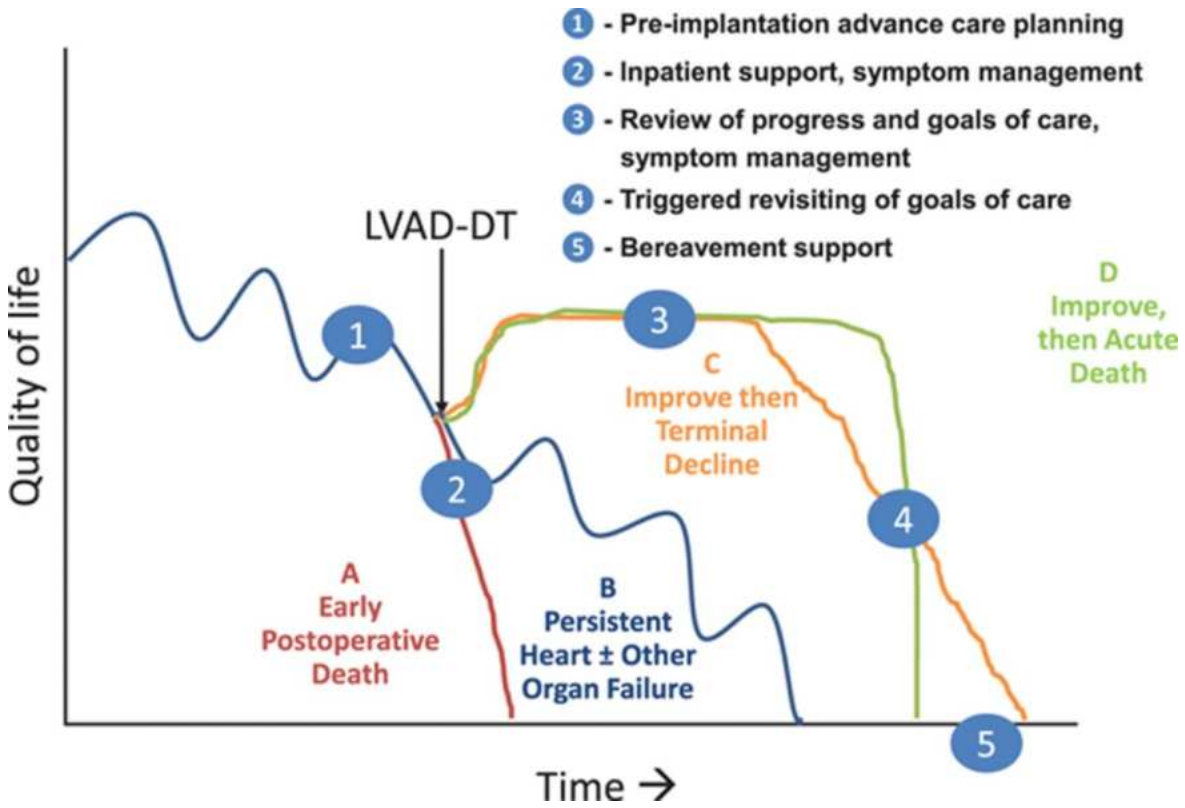


https://doi.org/10.1161/CIRCHEARTFAILURE.115.002800Circulation: Heart Failure. 2016;9:e002800

WHAT IS THE IDEAL CANDIDATE?

- Beyond the contraindications for cardiac transplant, DT patients tend to be older with increased risks of their own
- The ideal candidate should have an acceptable 1 yr. survival without contraindications to surgery or recovery both cardiac and non cardiac.
- However, because these are DT patients, centers can think out side the box when it comes to patient selection (i.e. cancer, hx of drug abuse, patient preference, etc.)

THE GOAL



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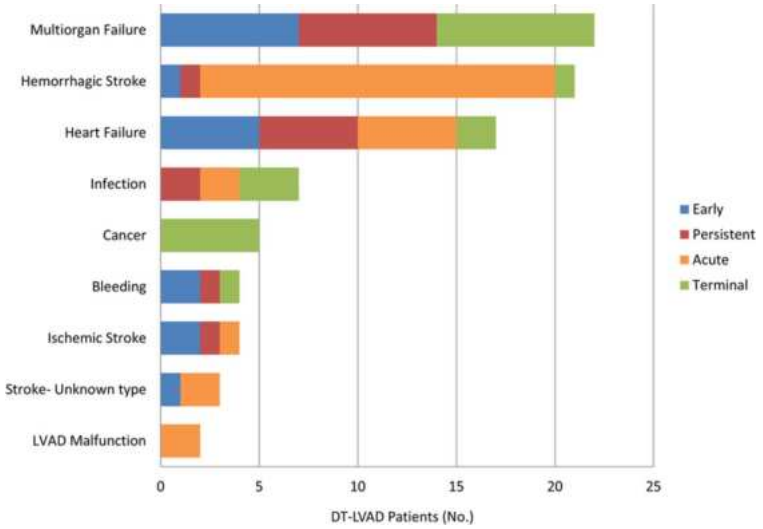
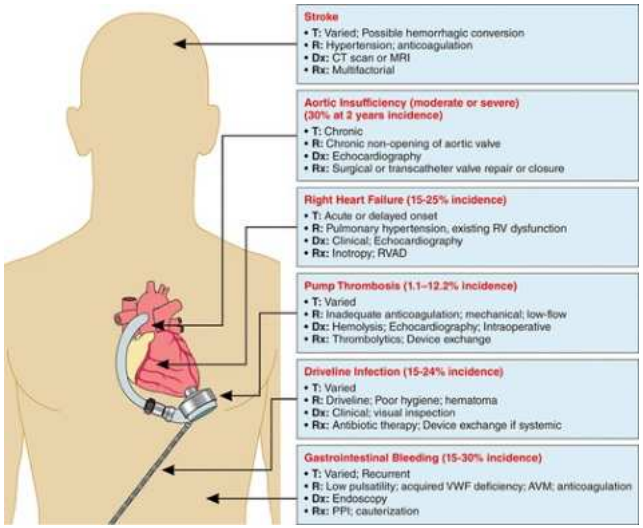
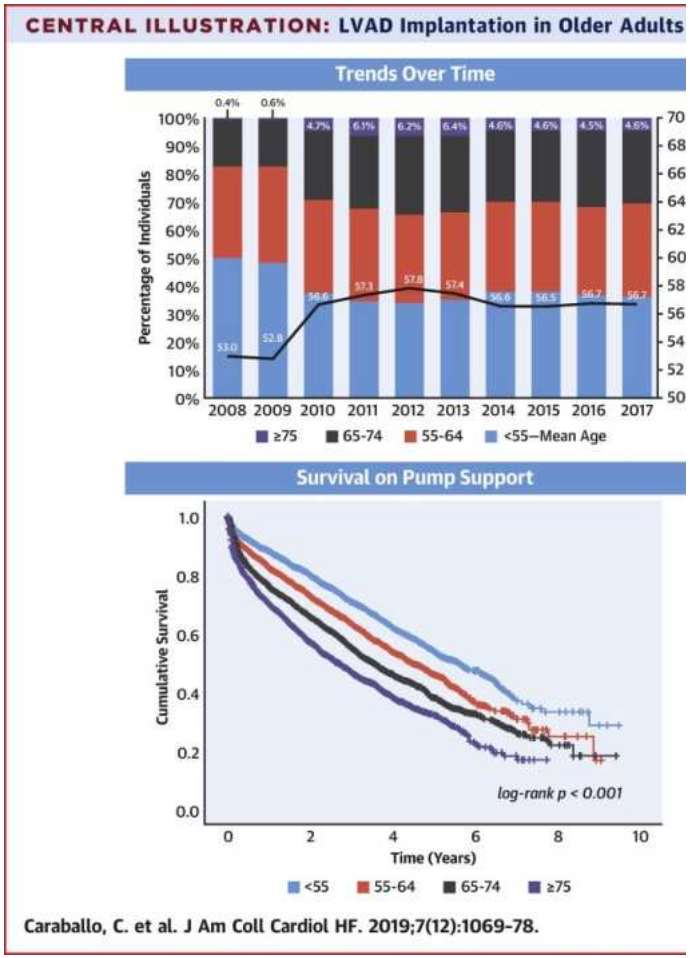




THE RISK IN DT LVAD

https://doi.org/10.1161/CIRCHEARTFAILURE.115.002800Circulation: Heart Failure. 2016;9:e002800



WHAT IS THE IDEAL PATIENT- IS THERE CONCERN OVER AGE?

- Older adults undergoing LVAD implantation have fewer concomitant conditions than younger patients yet still have increased mortality

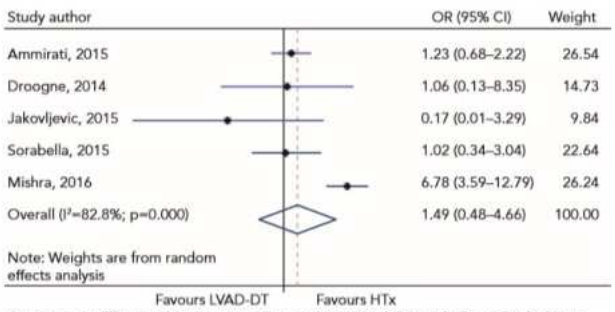
- Older patients with LVADs have higher bleeding risk but lower risk for device thrombosis;

- Increased need for rehabilitation post-discharge in older adults receiving LVADs

- Malnutrition, poor functional capacity, and need for RVAD support are predictors of early adverse outcomes in older adults

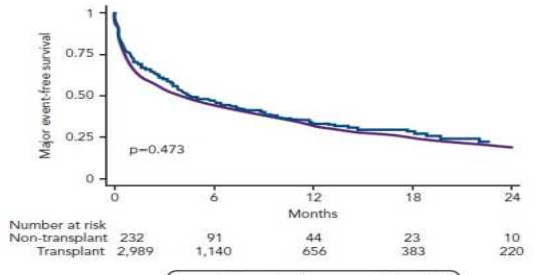
- Taken together, these findings suggest that carefully selected patients with advanced HF who are 75 years of age or older could be successfully supported with this life-saving technology with acceptable mortality rate and complication profile.

Figure 1: Forest Plot of the Odds Ratios for 1-year Mortality Between Cardiac Transplant and Left Ventricular Assist Device Destination Therapy



There was no difference in 1-year mortality rates between left ventricular assist device as destination therapy (LVAD-DT) and cardiac transplant (HTx) among the five studies. Source: Theochari et al. 2018.[13] Reproduced with permission from AME Publishing Company.

Figure 2: Kaplan–Meier Analysis of Freedom from Death or Major Adverse Events at Transplant and Non-transplant Centres



Follow-up	Non-transplant	Transplant
1 month	66.1% (71.9–60.4)	60.6% (62.3–58.9)
3 months	53.6% (59.7–47.4)	48.8% (50.5–47.1)
6 months	42.0% (48.1–35.8)	40.0% (41.7–38.3)
12 months	29.8% (36.0–23.6)	17.2% (30.6–27.3)
24 months	20.0% (27.0–13.0)	17.2% (18.8–15.6)

Major adverse events included death, stroke, major bleeding, pump exchange, device infection, device malfunction and right heart failure. Source: Brinkley et al. 2018.[15] Reproduced with permission from Wolters Kluwer Health.

BENEFIT BEYOND DESTINATION

- Transplant site vs non
- DT still has a major role to play
- HF team required
- More experience = better outcomes

European Cardiology Review 2020;15:e19. https://doi.org/10.15420/ecr.2019.29.2

REMOTE MONITORING

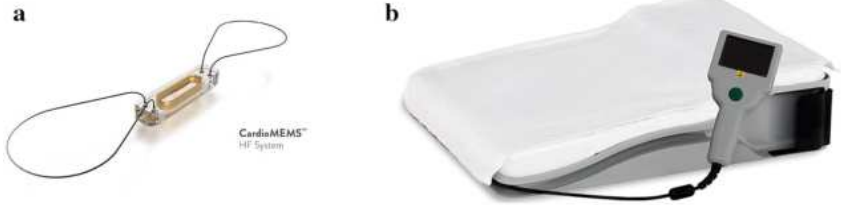
- New ways to improve LVAD care both from the side of the patient and the physician are warranted.
- Geographically beneficial for sites with patients travelling long distances
- Remote monitoring could be a tool to tailor treatment in these patients, as no feedback exists at all about patient functioning on top of the static pump parameters.
- Helps in cases when difficult to assess worsening HF

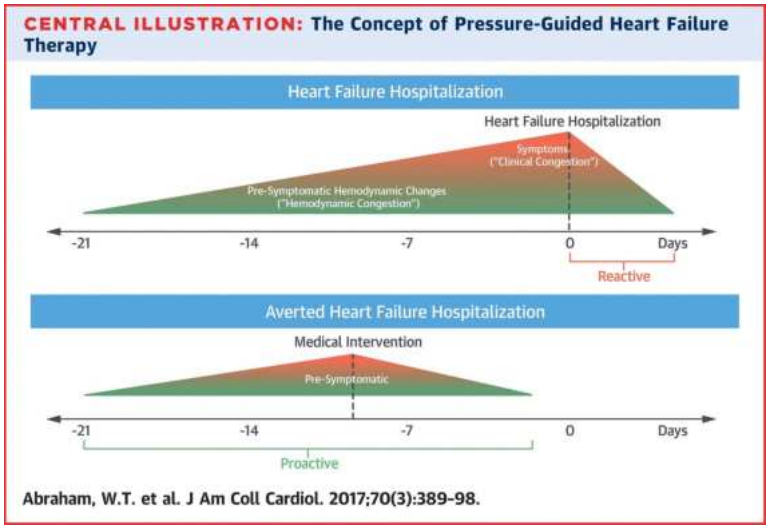
Gen Thorac Cardiovasc Surg. 2020 Mar;68(3):209-218.

CURRENT STRATEGIES

	Number of patients	Main findings
Non-invasive remote monitoring		
Schloglhöfer et al.	96	At 2 years of follow-up, using bi-weekly telephone calls (consisting of an inquiry about LVAD parameters, alarms, blood pressure, INR, body weight, temperature, driveline exit status, symptoms and presence of edema), the overall survival was significantly better compared to standard care (89% vs. 57%, $p=0.027$); but no significant difference in time free of readmission
Remote antithrombotic monitoring		
Dionizovik-Dimanovski et al.	50	Moderate correlation between INR measured using a POC device and in a central laboratory(correlation coefficient of 0.83)
Joshi et al.	41 samples	Good correlation between INR measured by a POC device and in a central laboratory(correlation coefficient of 0.96)
Bishop et al.	11	Using a POC-INR measurement device at home leads patients to be more often within therapeutic range compared with regular INR measurements at a central laboratory (44% vs. 31%, $p=0.026$)
Gavalas et al.	956 samples	The statistical performance of positive urine hemoglobin to predict LDH ≥ 600 IU/L is: sensitivity 60.4%; specificity 85.5%; PPV 42.7%; NPV 92.4%
Remote pump monitoring		
Pektok et al.	5	Demonstrates the feasibility of remote pump parameter monitoring, providing additional information to the treating clinicians
Kawahito		Adding a vibration sensor to an LVAD could adequately detect pieces of silicone, acting like thrombi, at the four most common thrombus locations
Bishop et al.	6	In patients with no or minimal AoV regurgitation, adding a specific algorithm could adequately predict AoV opening
Intrathoracic impedance		
Bartoli et al.	1	Demonstrates the potential utility of intrathoracic impedance measurements in a patient with an LVAD, with an increased intrathoracic impedance preceded intravascular volume depletion and dangerous LVAD dysfunction
Implantable hemodynamic monitoring devices		
Feldman et al.	27	Using remote monitored PAP, by the CardioMEMS, leads to a large reduction of PAP and an optimized timing of LVAD implantation compared to those receiving standard care
Hubert et al.	4	Significant correlation between left atrial pressure sensor, and pump speed, LV and LA size and pulmonary capillary wedge pressure ($r=0.92–0.99$, $p<0.05$)

POC point-of-care, *LDH* lactate dehydrogenase, *PPV* positive predicting value, *NPV* negative predicting value, *AoV* aortic valve, *LVAD* left ventricular assist device, *PAP* pulmonary artery pressure, *LV* left ventricle, *LA* left atrial





CARDIOMEMS, AT HOME IN THESE PATIENTS COULD BE THE NEXT STEP TO IMPROVE CARE.

Gen Thorac Cardiovasc Surg. 2020 Mar;68(3):209-218.

THE NEW APPROACH

- Combination of in hospital assessment
- Telehealth (Zoom, MS teams, etc.)
- POC devices
- Remote monitoring devices

TAKE HOME POINTS

- DT is increasing rapidly and will continue to do so
- Quality of life is very important as most patients are elderly
- Cost is a societal issue but should not be a patient issue
- It doesn't last forever
- Different profile risks are seen with DT as one ages
- Remote and Tele monitoring will enhance the care you provide

THANK YOU