

**Akute & chronische Herzinsuffizienz
aus der Sicht des HTX & VAD Teams.
Wie vorbereiten, wann vorstellen?
HTX**

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**Andreas Zuckermann
Dept. of Cardiac Surgery**

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Factors for Patient Selection

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- Age: 0-70 Year
- Physical condition (BMI)
- Pulmonary vascular resistance (<3.5 Wood, TPG <15, sysPAP<60)
- Renal function (>40 CreaCl, or HNTX)
- Active Infection (Sepsis)
- Diabetes (cave end-organ damage)
- Peripheral vessels (cAVD, pAVD)
- Lung function (restriction, obstruction)
- Liver function (Cirrhosis!!)
- Viral serology (HIV, Hep B&C, CMV)
- Psychosocial factors (smoking, Alcohol)

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Checkliste HTX I

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CHECKLISTE HTX

Tel: +43-1-40400-6946 / 5643 Fax: +43-1-40400-5642
Dr. T. Haberl (Koordination) Fr. H. Koller (Sekretariat)
Postadresse: AKH Wien HTX Sekretariat Ebene 9F
Währinger Gürtel 18-20, 1090 Wien
Univ. Prof. Dr. A. Zuckermann, Univ. Prof. Dr. G. Wiesenthaler, Doz. Dr. D. Zimpfer,
Doz. S. Sandner, Dr. A. Alabadi, Dr. T. Haberl

Patientenname: _____

Zuweiser: _____

Zuständiger Kardiologe: _____

Blutbefunde:

Komplettes Labor (inkl. TSH, NT-ProBNP)	<input type="radio"/>
Blutzuckerbestimmung (Auskrenzbefund)	<input type="radio"/>
Coagulaseprüfung (HLA)	<input type="radio"/>
PRAS (Lymphozytotox. Antikörper)	<input type="radio"/>
Lueserologie	<input type="radio"/>
Borreliaburgdorferi Serologie	<input type="radio"/>
Toxoplasmosis	<input type="radio"/>

Virologie:

HIV 1/2	<input type="radio"/>
HBV, EBV, HSV	<input type="radio"/>
Hepatitis A, B, C	<input type="radio"/>

Harnbefund:

Harnbefund (Protein-Kreatinin-Index)	<input type="radio"/>
Kreatinin - Clearance (aus 24 h Harn)	<input type="radio"/>

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Checkliste HTX II



Herzkatheter:	Rechtsherzkatheter < 6 Monate PAP, PCWP, HZV, Wood Einheiten, vasodynamisch wenn möglich	<input type="radio"/>
Herzecho:	Kompletter Befund LVEDD mm LVEF % (ev. RNV, LHK) MI, TI, Card. Output, ev. PAP syst. gesch. Funktion rechter Ventrikel!!!!!!	<input type="radio"/>
EKG:	normales EKG 24 Stunden EKG (Holter EKG)	<input type="radio"/>
Gefäßstatus:	Carotis - Doppler (< 6 Monate)	<input type="radio"/>
	Peripher - klin. u. Doppler Index	<input type="radio"/>
Lungenfunktion:		<input type="radio"/>
Thorax-CT, Tumorsuche:	Zahnstatus	<input type="radio"/>
Fokussuche:	NNH Röntgen	<input type="radio"/>
Abdomen-Sono:	Niere Oberbauch	<input type="radio"/>
Tumorsuche >50a:	Gastroskopie Dermatologiekonsil (Melanom) Koloskopie	<input type="radio"/>
	PSA	<input type="radio"/>
	Gyn Status	<input type="radio"/>
Knochendichtemessung > 50a:		<input type="radio"/>
Voroperationen am Herzen:	alter OP Bericht und CT-CD	<input type="radio"/>

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Checkliste HTX II

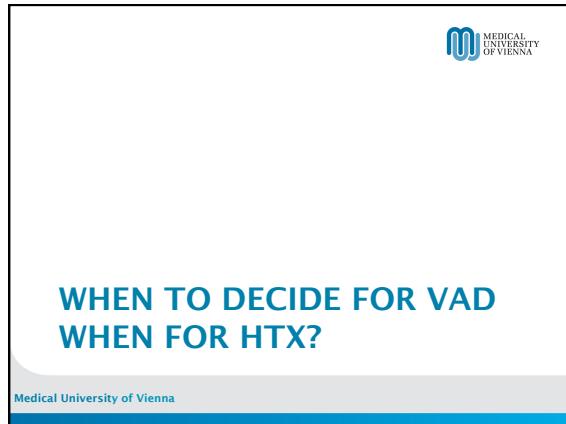


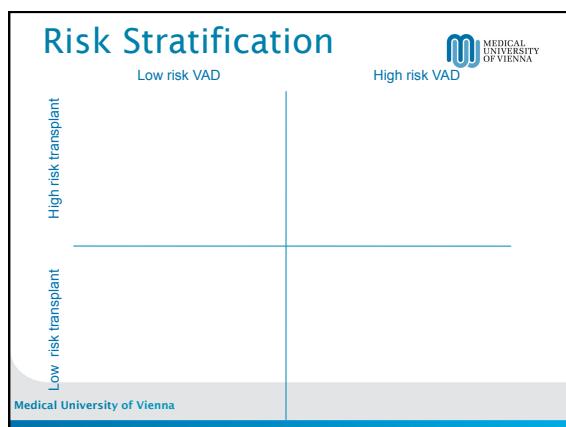
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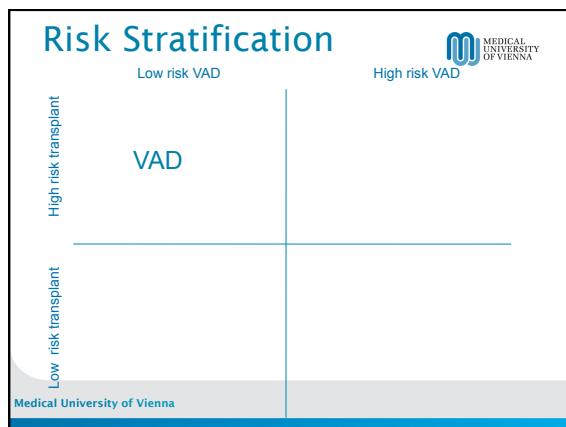
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older	New Waiting List			sicker
	84 - 91	02 - 11	p - Value	
Age	42±12	50±15	.0001	
Re-OP %	28	50	.025	
DM %	7	35	.032	
Creatinine mg/dl	1.32	1.45	0.065	
CI	2,3	2,1	.068	
sPAP	48	54	.076	
ACE-Inhib. %	50	95	.0001	
Beta-Blocker %	15	84	.0001	
heart rate	90	65	.0001	
Bridge %	20	68	.002	
VAD %	2	25	0.05	
Hospital/ICU %	28/21	9/8	0.001	

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Therapy for Pulmonary Hypertension (the Vienna Model)

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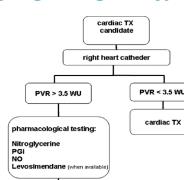


Figure 1. Pharmacological testing decision-making tree. TX: Transplant; PVR: pulmonary vascular resistance; WU: Wood units; PG: prostaglandin; NO: nitric oxide; LVAD, left ventricular assist device.

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TABLE 2. Data from right-sided heart catheterization

Variables	All patients	P value*
n	35	
p _{ao}		
Baseline	5.1 ± 2.6	—
3-d FUP	2.9 ± 1.3	<.0001
6-wk FUP	2.0 ± 0.8	<.0001
After testing	4.5 ± 2.1	—
p _{aO2}		
Baseline	63.2 ± 5.3	
3-d FUP	59.8 ± 5.8	<.0001
6-wk FUP	58.7 ± 3.6	<.0001
After testing	56.5 ± 10.2	—
p _{aCO2}		
Baseline	44.0 ± 6.2	—
3-d FUP	28.6 ± 7.3	<.0001
6-wk FUP	30.4 ± 4.2	<.0001
After testing	30.2 ± 6.8	—
p _{CO2}		
Baseline	28.1 ± 6.0	—
3-d FUP	12.0 ± 5.7	<.0001
6-wk FUP	10.0 ± 3.6	<.0001
After testing	13.8 ± 6.6	—
CO		
Baseline	2.1 ± 0.8	
3-d FUP	2.5 ± 0.7	<.0001
6-wk FUP	4.0 ± 0.9	.002
After testing	3.2 ± 7	—

Zimpfer, J Thorac Cardiovasc Surg 07:133-189

Risk Stratification

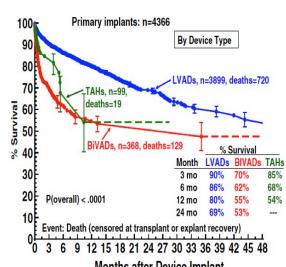
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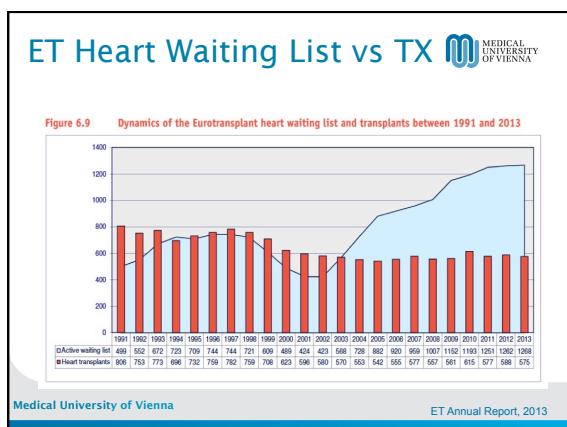
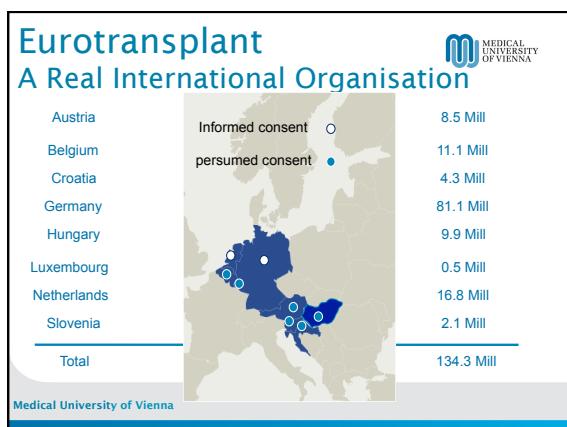
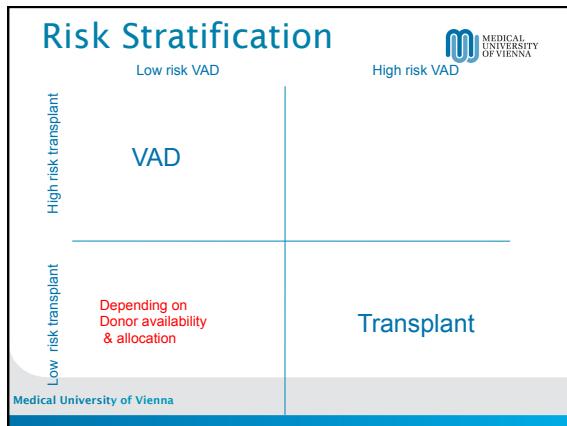
Survival after BiVAD or TAH

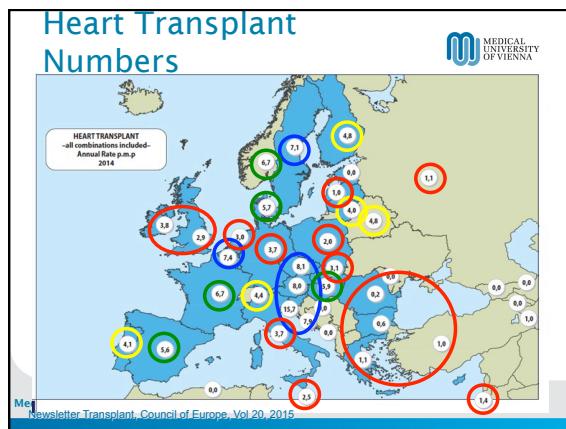
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Kirklin, JHLTX 12; 31: 117





High Urgency

- 2 HU statuses: assessed by treating physician
 - National HU status:
 - granted according national policies (not in Germany)
 - International HU status:
 - Assigned by independent team of auditors
 - Guided by well defined criteria
 - Granted for 8 weeks, renewal possible
 - Re-submission after rejection possible after 1 week (auditors are informed about earlier decision)

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High Urgency definition

- Inotropic therapy ≥48h:
 - RHC (<2.2Cl, Svo2 <55%, PCWP: ≥10)
 - Dobutamine >7.5 µg/kg/min ± milrinone >0.5 µg/kg/min
 - Signs of beginning end-organ failure
 - Na <136, Crea, transaminases, symptomatic cerebral perfusion deficit (neurological report)
- VAD complication:
 - Life threatening technical malfunction or VAD complications
 - VAD infection, pos blood culture (driveline excluded)
 - Repeated VAD-related cerebral events (but TX candidate)
- Re-TX within 1 week due to PGF

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HU Contraindications



- Multi organ failure
- Emergency indication without preceding evaluation after:
 - Cardiac surgery
 - Large MCI
 - Fulminant myocarditis
- Acute Re-TX other than PGD
- VAD complication 1-2 weeks after implantation without prior stabilisation of patient
- Recipient >65 years

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Mandatory Data



- Current treatment data
- Current RHC data (not older than 5 days)
- Blood gas analysis
- Current laboratory data
- Echocardiography
- If applicable: respiratory parameters

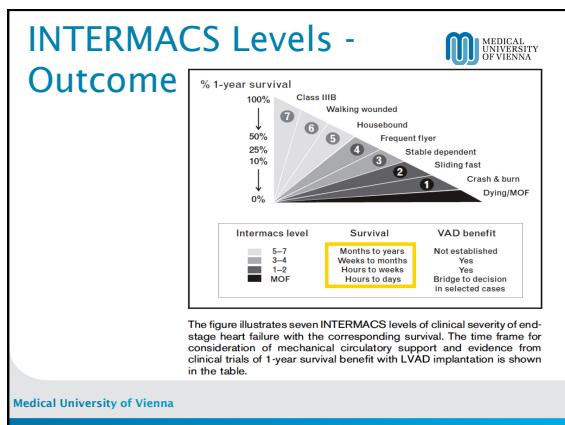
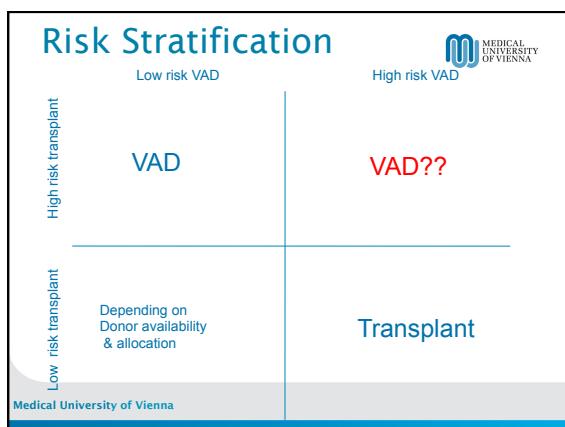
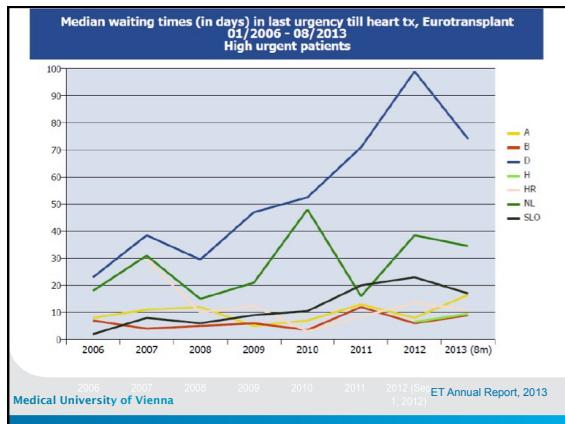
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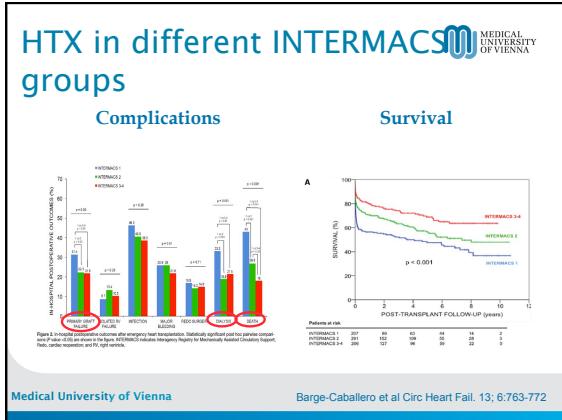
HU Audit



- Mandatory data + request sent to ET
- Complete Data forwarded to Audit Committee
 - 3 independent, blinded experts (1 week on call)
 - Answer must be sent within 6-8 hours
 - Accepted, rejected, further questions
 - Majority rule
- Center has right to object rejected HU request once
 - 2nd decision of auditors is final
 - 80% of requests accepted
 - Any deviation is reported to national authorities and chair of Thoracic advisory committee

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Risk Factors for Death after VAD Implant

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Table 3 Risk Factors for Death in 4,366 Primary Implant Patients: June 2006 to June 2011

Risk factors	Early hazard		Constant hazard	
	HR	p-value	HR	p-value
Age, older	1.64*	<0.0001	1.30*	0.0001
BSA, larger	1.48*	<0.0001		
Female			1.36	0.01
History of:				
CV	1.84	<0.0001		
Valve surgery	1.81	0.0007		
CV + valve	1.74	0.0005		
Bilirubin, higher	1.10*	<0.0001		
Creatinine, higher	1.16*	0.01		
BUN, higher	1.14*	<0.0001		
RA pressure, higher	1.21*	0.0004	1.08*	0.001
Allometric	1.55	0.007		
Pulmonary hypertension			1.49	0.03
INTERMACS Level:				
Level 1	2.87	<0.0001	1.35	0.01
Level 2	1.84	0.001		
Destined for coronary			1.38	0.009
Pulsatile-flow LVAD			3.01	<0.0001
BIVAD	3.27	<0.0001		
Concomitant surgery	1.36	0.01		

BIVAD, biventricular assist device; BSA, body surface area; BUN, blood urea nitrogen; CV, cardiovascular; HR, hazard ratio; INTERMACS, Interagency Registry for Mechanically Assisted Circulatory Support; LVAD, left ventricular assist device. The hazard ratio denotes the increased risk: *from an increase 70 to 80% of a 0.2-unit increase in age; **from an increase 10 to 12% of a 1.0-unit increase in creatinine; *of a 10-unit increase in BUN; and *of a 5.0-mmHg increase in RA pressure.

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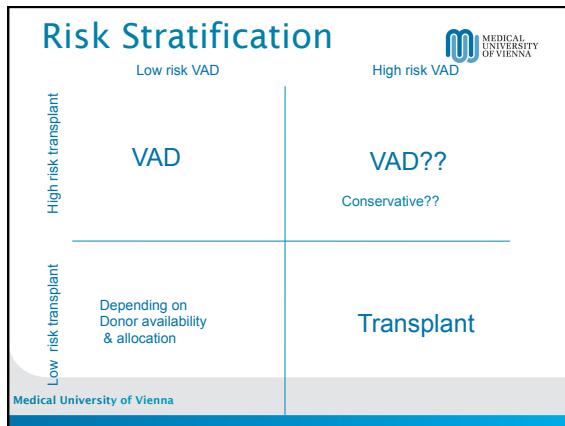
INTERMACS Levels & VAD Strategy

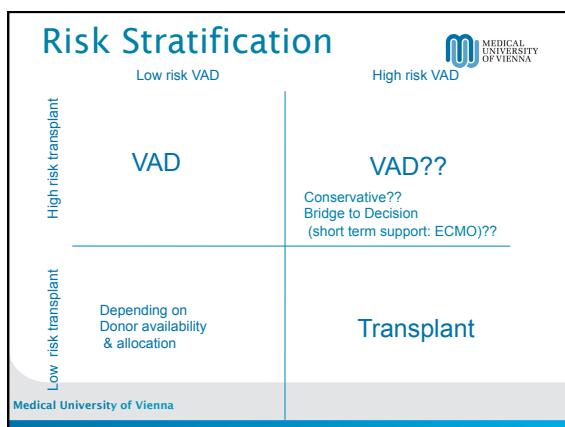
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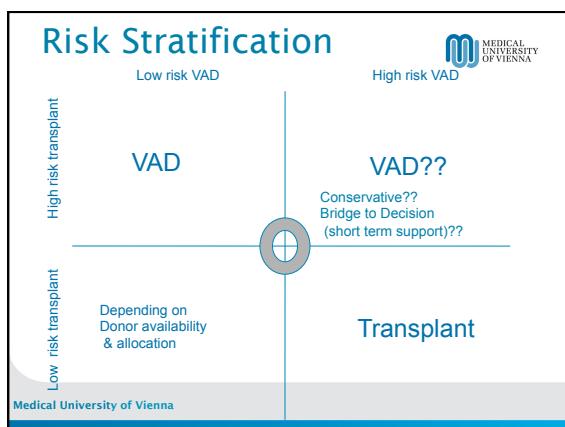
Year/Level	<2010	2010-2011	2012-2015	± 06-15
Patients	2183 (16%)	3570(25%)	8286(59%)	14039(100%)
1	29%	15%	15%	-15%
2	43%	39%	35%	-8%
3	15%	27%	31%	+16%
4	9%	13%	14%	+5%
5	2%	3%	3%	+1%
6	1%	2%	1%	0%
7	1%	1%	1%	0%

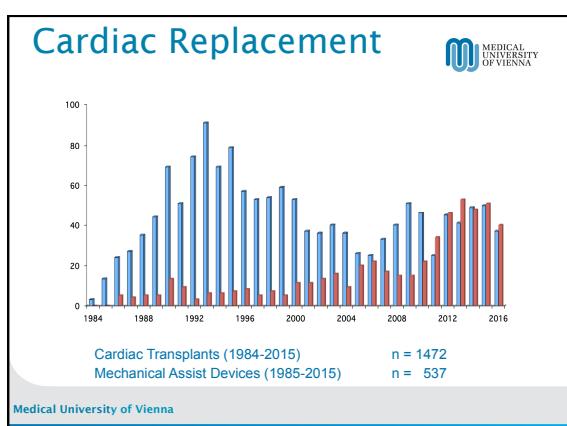
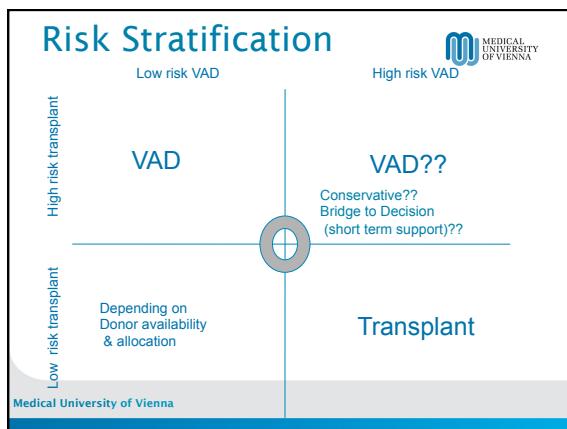
≥30% **≥15%**

Intermacs quarterly statistical report, 1st Quarter 2015









Bridge to Transplant



- Patient approved and listed for transplant
- Patients who are unable to survive until transplantation without VAD
- Patients who might profit from VAD therapy (rehabilitation)
- Mostly Intermacs 1,2,3

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Bridge to Candidacy



- Patients who might become candidates for TX
- Patients who have modifiable contraindications for TX
 - Pulmonary hypertension
 - Obesity
 - Active smoking
 - Cancer within last 5 years
- BTT likely, moderate, unlikely
- Time for decision can be months to years

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Problems of Waiting time



Median Waiting time
<1991: 35 Days
91-96: 90 Days
>1997: 142 Days
HU status: 11 Days

More Recipients than Donors

Waiting time ↑

bridging: 28%

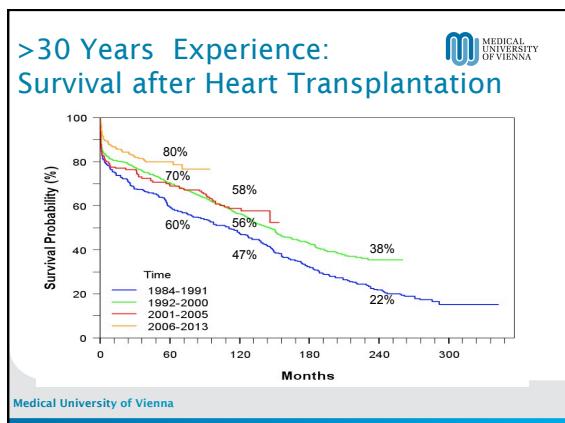
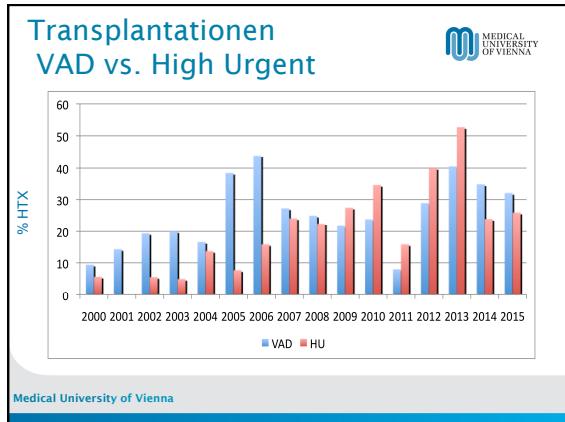
Mortality on Waiting list: 28% !!!

Optimal bridging

Bridging: 68%

ICD,CRT (95%)
Pharmakologische bridging (60%)
HU (High urgency) ca 20%
VAD (25%)
Mortality on Waiting list 8%

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- Zusammenfassung**
- Multidisziplinäre Kooperation ist die wichtigste Entwicklung auch bei ICU Patienten (Advanced Heart Failure Team)
 - Herztransplantation ist die beste therapeutische Option für Herzinsuffizienz im Endstadium.
 - Transplantation kann nicht alle Patienten versorgen (Spendermangel)
 - VAD's werden erfolgreich als Überbrückung und Destination verwendet
 - The Balance zwischen VAD und HTX bei ICU Patienten ist abhängig von
 - der Infrastruktur des Zentrums
 - dem TX Gesetz (Spenderregelung) und
 - dem individuellen Risiko für einen Patienten
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