



Importance of Sex-specific Biomarkers for Kidney Transplant Patients

The treating nephrologists perspective

Klemens Budde
Dept of Nephrology

CHARITÉ
UNIVERSITÄTSMEDIZIN BERLIN

Disclosures

Klemens Budde, MD
Charité Universitätsmedizin Berlin
Berlin, Germany

I have received research funds and/or honoraria from:

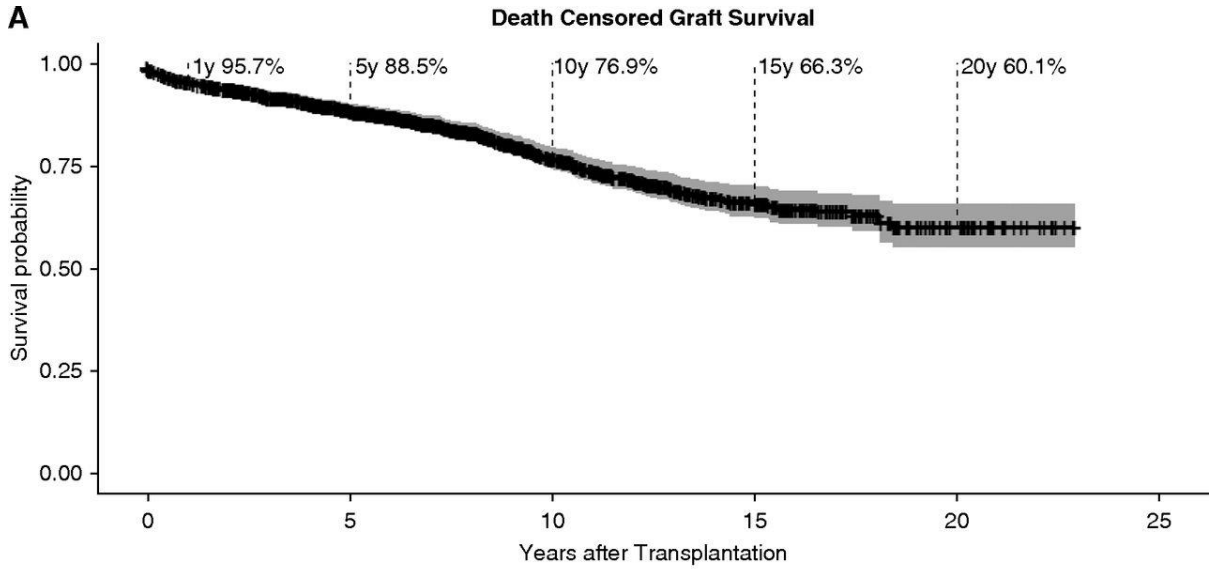
Aicuris, Alexion, Astellas, AstraZeneca, Biohope, Carealytics, CareDx, Chiesi, CSL Behring, DTB GmbH, Eledon, HiBio, MSD, Natera, Neovii, Oncocyte, Oska, Otsuka, Paladin, Pfizer, Pirche, Sanofi, smart care solutions, Stada, Takeda, Veloxis, Vifor and Xenothera

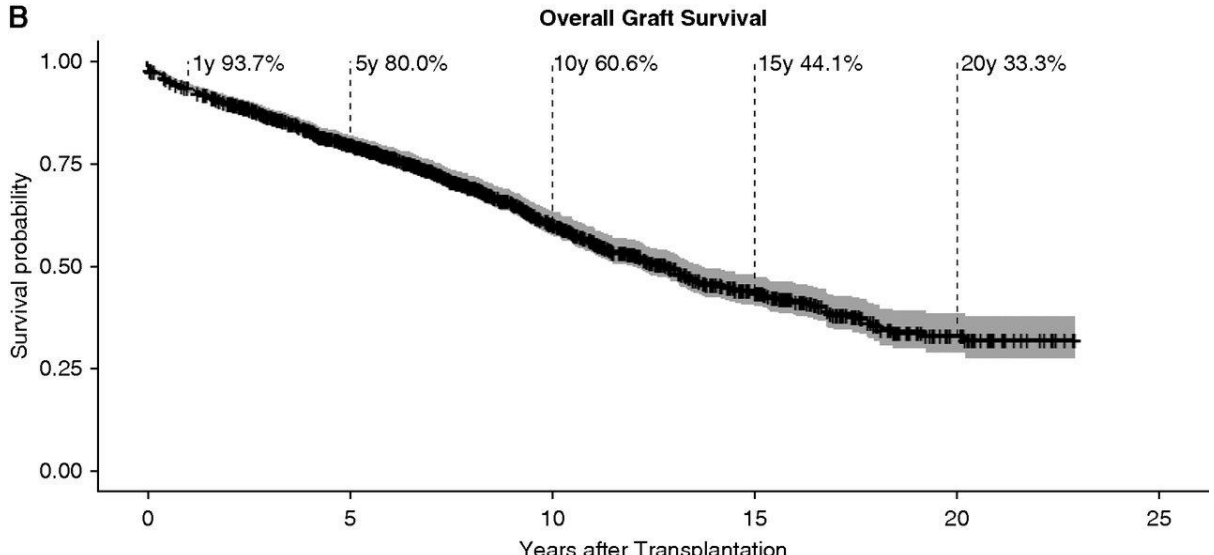
Kidney transplantation (KTx)

- Alternative to dialysis
- All age groups, from children to seniors
- Rare disease: ca. 2000 KTx/year, around 25.000 patients in Germany
- Numbers depend on organ availability / organ shortage
- Living donation as alternative (Germany 30%)
- Complex posttransplant care with need for lifelong immunosuppression
- Numerous side effects of treatment
- Non-adherence documented in 20% of graft losses
- Need for patient empowerment

Compared to dialysis: longer life expectancy, better rehabilitation and quality of life at lower costs

Unmet needs: suboptimal longterm outcomes constant 2-3%/year attrition of patients and grafts



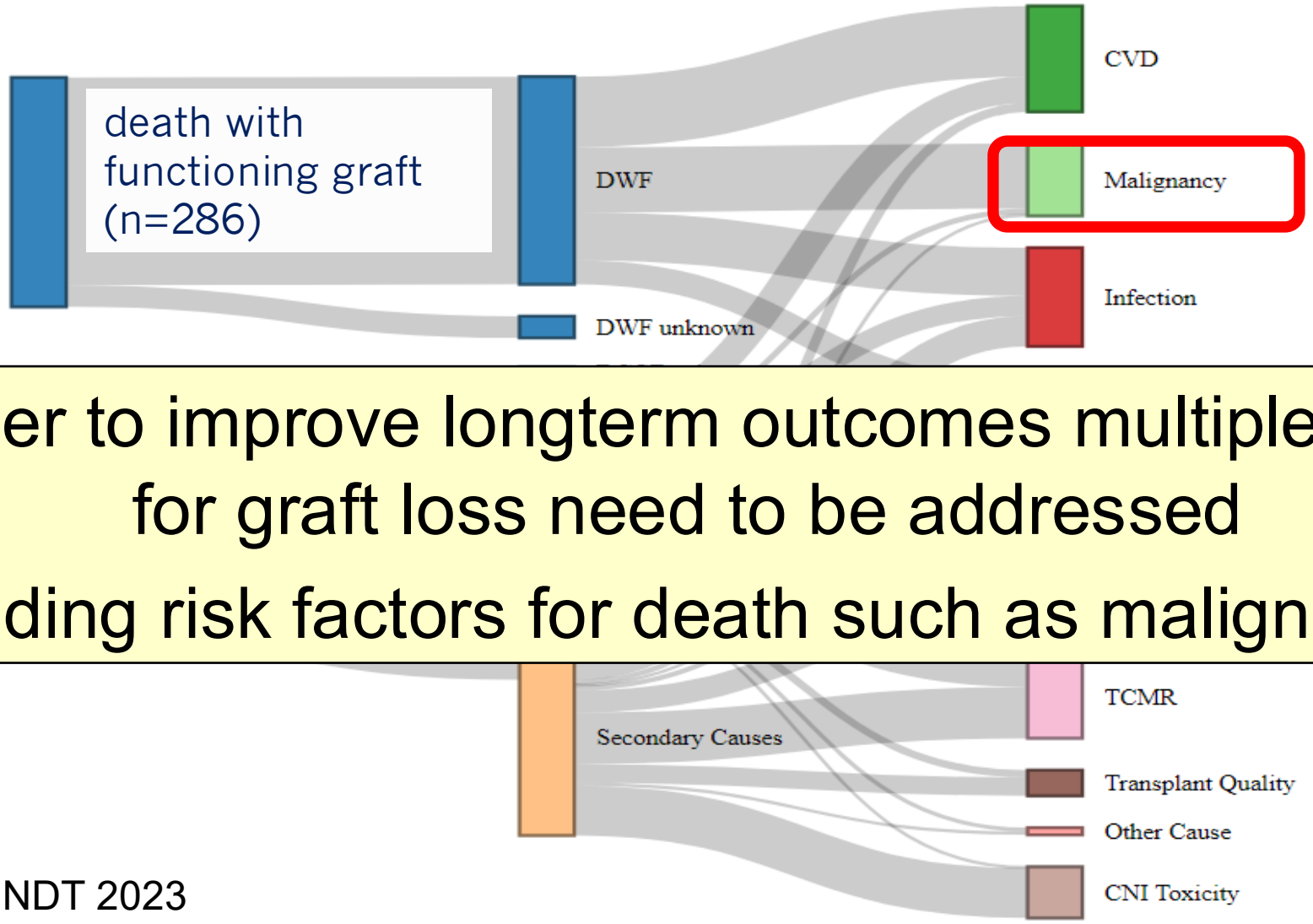


Charité, CCM: Kaplan-Meier estimates for graft survival in all 1477 adult kidney transplant recipients 1997-2017

Manuel Mayrdorfer et al.
JASN 2021;32:1513-1526

JASN
JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY

updated view on graft loss:
complex and multifactorial

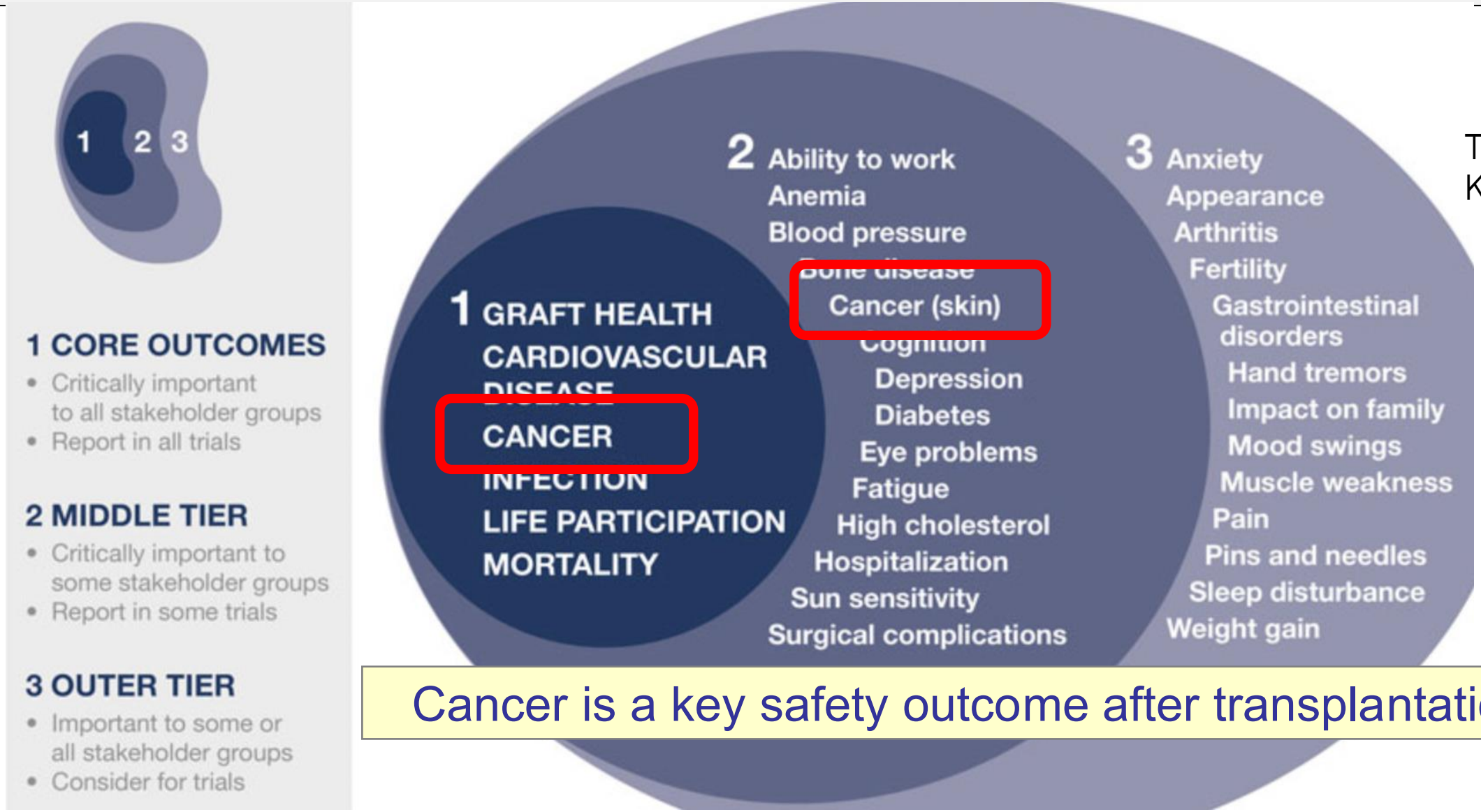


In order to improve longterm outcomes multiple factors for graft loss need to be addressed

including risk factors for death such as malignancies

Mayrdorfer M. et al. NDT 2023

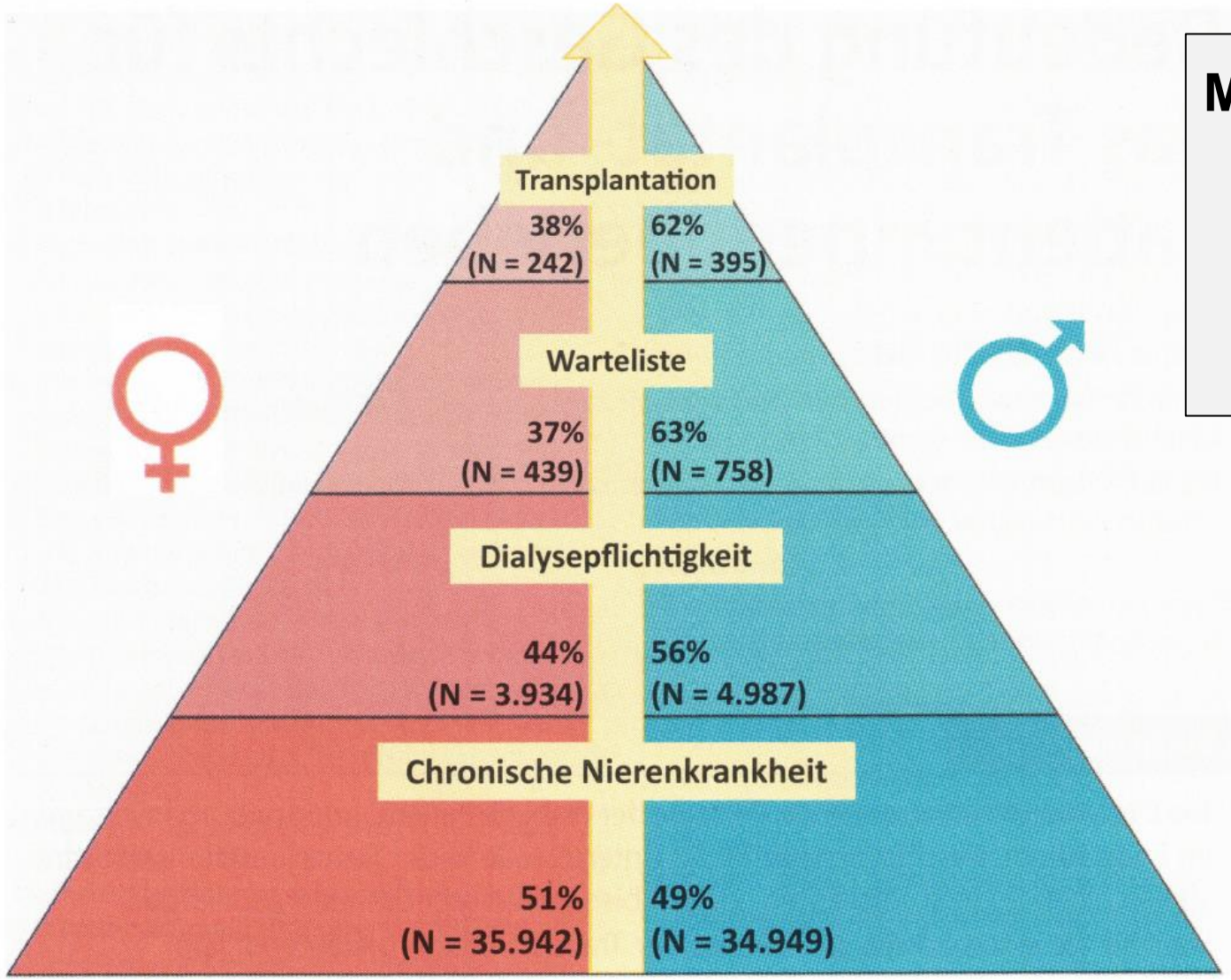
patient-centered outcomes



Tong A et al
Kidney Int. 2018

Cancer is a key safety outcome after transplantation

Problem:
gender imbalance on waiting list and after transplantation



More males progress to

dialysis (56%)

waitlist (63%)

and transplantation (62%)

Data from AOK Germany 2005-2013
Tian Z, Melk A.
Inn Med (Heidelb). 2025 Sep;66(9):909-916.

Problem:
Sensitization through pregnancy

Impact of sensitization on waiting time prior to kidney transplantation in Germany



6533 patients on the waiting list
140 in AM
296 with vPRA > 85% not in AM



donor pool restriction by vPRA



transplant probability during 24 months

3 Eurotransplant allocation programs:
Standard (ETKAS), acceptable mismatch (AM) and Senior (ESP) program



ETKAS

vPRA	HR	Female
>0-50%	**0.95** (0.8-1.12)	47%
>50-85%	**0.91** (0.76-1.08)	61%
>85-95%	**0.58** (0.44-0.76)	68%
>95%	**0.35** (0.25-0.49)	67%
AM	**1.34** (1.09-1.65)	55%

Conclusion: Highly-sensitized patients in ETKAS not listed in the AM program should benefit from better compensation. In the ESP, sensitization is a major barrier to transplantation.

More sensitized females on the waitlist resulting in longer waiting times

Zecher et al. *Transplantation*. 2022

@TransplantJrnl

Transplantation

Bildschirmfoto

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Gender imbalances in transplantation: differences in outcome

First author	Journal	Year	Patient numbers	Age	Outcome measure	Sex-related finding	HR/OR/RR (95% confidence interval)	P
Kidney transplantation								
Meier-Kriesche[40]	*Transplantation*	2001	73477	Adult	Acute rejection	Higher for female recipients	OR 1.10 (1.02–1.12)	0.001
					Chronic allograft failure	Better for female recipients	aHR 0.90 (0.85–0.96)	0.006
					Death-censored graft failure	No difference		n/a
Zeier[75]	*JASN*	2002	124911	>16 y	Death-censored graft survival	Worse for FF vs MF	aHR 1.15 (1.07–1.23)	<0.0001
						Worse for FM vs MM	aHR 1.22 (1.16–1.29)	<0.0001
Keith[38]	*Transpl Int*	2006	37708	Adult and pediatric	Death-censored graft survival	Worse for female recipients	Female vs male: aHR 1.07 (1.00–1.14)	0.048
					Graft loss due to chronic allograft nephropathy	Worse for female recipients	aHR 1.12 (1.03–1.23)	0.011
Kim[41]	*JASN*	2009	117877	Adult	10-y mortality	Better for female recipients	aHR 0.89 (0.85–0.93)	n/a
						Worse for female donors	aHR 1.04 (1.00–1.07)	n/a
Foster[181]	*AJT*	2011	18911	<21 y	All-cause mortality	Better for male recipients	aHR 0.92 (0.85–1.01)	0.06
					Cardiovascular mortality	Better for male recipients	aHR 0.85 (0.73–0.98)	0.02
					Infection-related mortality	Better for male recipients	aHR 0.73 (0.59–0.90)	0.003
Van Arendonk[43]	*Pediatrics*	2014	17446	Pediatric	Improvement in graft survival between 1987–2011	Worse for female recipients	n/a	
Bobanga[42]	*J Pediatr Surg*	2015	73	Pediatric	Graft loss	Worse for female recipients	aHR 9.0 (1.9–43.0)	0.006
Kaboré[39]	*Transplantation*	2017	5983	<30 y	Graft failure or death	Worse for female recipients	Female vs male: HR 1.13 (1.01–1.27)	0.043
Lepeytre[44]	*JASN*	2017	159417	Adult and pediatric	Death-censored graft failure	Impact of sex is age dependent	See Table 1	

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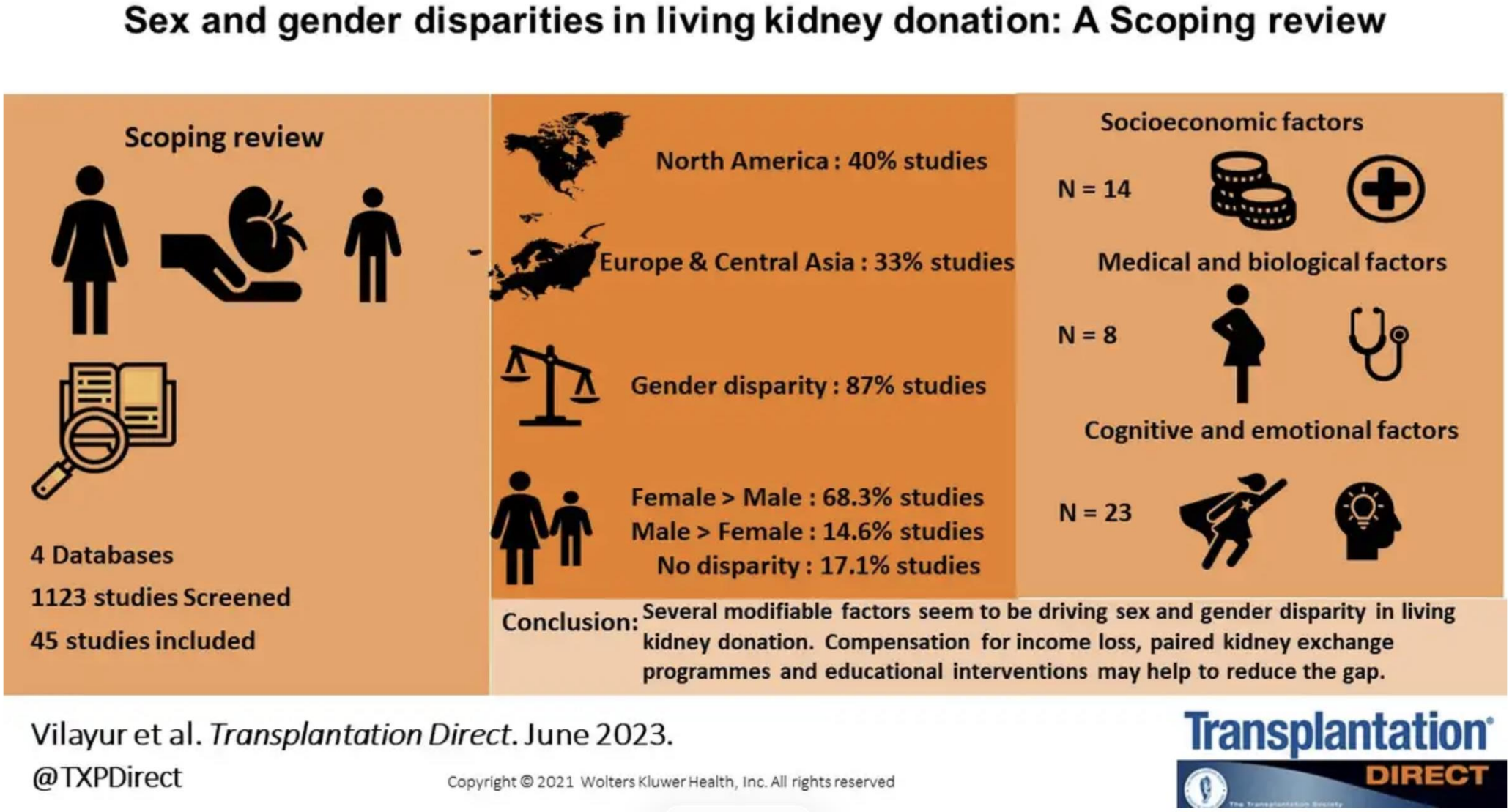
Potential reasons:

- sensitization via pregnancy
- sex hormones
- immune reactivity
- pharamcology
- metabolsiom
- behaviour / adherence
- .....

Melk et al. Transplantation 2019

Gender imbalances in transplantation
More female living donors



Vilayur et al. *Transplantation Direct*. June 2023.

@TXPDirect

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Transplantation DIRECT

Conclusion:

Need for research in the interaction between sex / gender and transplantation

TABLE 1.

Future research areas in transplantation medicine as outlined for each dimension of biology (sex), psychosocial and cultural (gender), and the interaction of both

Cells/tissues/organs	Organism/individual	Population
Basic/clinical research	**Clinical/observational/qualitative research**	**Observational/qualitative research**
Sex as biologic factor	Interaction/combined contribution of sex and gender	Gender as psychosocial, cultural, economic factor
Sex differences in cell repair and	Identifying differences in graft and patient	Understanding reasons for differences in donation



Biological aspects (SEX)

Basic/clinical research

Interaction / combined contribution of SEX and GENDER

Clinical/observational/qualitative research

Psychosocial-cultural, economic aspects (GENDER)

Observational/qualitative research

Rizky Indrameikha Sugianto et al. Transplantation 2023

Team Digital Nephrology



Thank you for your attention!

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Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages

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AOK Die Gesundheitskasse.

Techniker Krankenkasse

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European Commission