Renal function and clinical outcomes of patients undergoing ICD and CRTD implantation- Data from the Israeli ICD Registry

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ISRAEL HEART SOCIETY

Disclosures - None

Background

- Heart failure (HF) and chronic kidney disease (CKD) are associated with increased morbidity and mortality and the combination of both, augment the risk substanially.
- Implantable cardioverter defibrillators (ICDs) and cardiac resynchronization therapy (CRT) reduce mortality in patients with HF and left ventricular dysfunction.

Background

- Most studies that demonstrated the benefits of these device therapies in HF have limited data regarding patients with CKD.
- Due to sparse data, the impact of CKD on clinical outcomes in patients undergoing ICD and CRT implantation is controversial, as is the influence of device therapy on renal function.

Aim

- To examine the association between renal function and clinical outcomes in patients undergoing ICD and CRTD implantation

Methods

- Data were collected from the Israeli ICD registry.
- July 2010- October 2012 in 21 implanting centers in Israel .
- Glomerular filtration rate (eGFR) was assessed using the MDRD formula.
- Baseline renal function was defined as the eGFR during the initial hospitalization of device implantation.
- Mean follow up- 353 days.

Outcomes

- **Primary outcome:** all cause mortality.
- **Secondary outcomes:**

1) Combined end point of death or ventricular arrhythmias.
2) Combined end point of death or hospitalization due to HF.
3) Appropriate ICD therapy of ventricular tachyarrhythmia.
4) Inappropriate ICD shocks.

Results

- A total of 2811 patients were included in the registry:

  - GFR<30 ml/min/1.73m²- 173 patients (6.1%)
  - 60>GFR>30 ml/min/1.73m²- 820 patients (29.2%)
  - GFR>60 ml/min/1.73m²- 1818 patients (64.7%)

Follow-up was available for 1148 patients and these patients were included in our study

Baseline characteristics

	ICD group (n=704) eGFR (ml/min/1.73m²)			P value	CRTD group (n=444) eGFR (ml/min/1.73m²)			P value
	<30 (n=26)	30-60 (n=178)	>60 (n=500)		<30 (n=28)	30-60 (n=162)	>60 (n=254)	
Male	20 (77.0)	140 (78.6)	442 (88.4)	<0.001	22 (78.6)	137 (84.6)	194 (76.4)	NS
Age (mean±SD)	70.6 ± 11.5	69.1 ± 9.9	61.4 ± 12.7	<0.001	70.7 ±7.6	70.1 ±9.0	63.2 ±11.0	<0.001
Hypertension	18(69.2)	112 (62.9)	264 (52.8)	<0.001	21 (75.0)	118 (72.8)	154 (60.6)	0.03
Diabetes	10 (38.5)	76 (42.7)	145 (29.0)	0.05	21 (75.0)	89 (54.9)	103 (40.6)	<0.001
Atrial Fibrillation	8 (30.7)	49 (27.5)	77 (15.4)	<0.001	6 (21.4)	61 (37.7)	42 (16.5)	<0.001
NYHA II,III	19 (73.1)	110 61.8)	249 (49.8)	<0.001	23 (85.2)	158 (97.5)	243 (95.7)	NS
IHD	24 (92.3)	158 (88.7)	397 (79.4)	0.02	23 (82.1)	132 (81.5)	161 (63.4)	<0.001
Prior CABG	12 (46.1)	78 (43.8)	143 (28.6)	0.008	11 (39.2)	61 (37.7)	75 (29.5)	NS
EF<30%	15 (57.7)	74 (41.6)	196 (39.2)	0.06	18 (66.7)	129 (79.6)	210 (82.7)	NS
Prior HF	22 (84.6)	130 (73.0)	318 (63.6)	0.01	27 (96.4)	160 (98.7)	250 (98.4)	NS
Non ischemic CM	4 (15.4)	28 (15.7)	86 (17.2)	NS	3(10.7)	39 (24.1)	104 (40.9)	<0.001

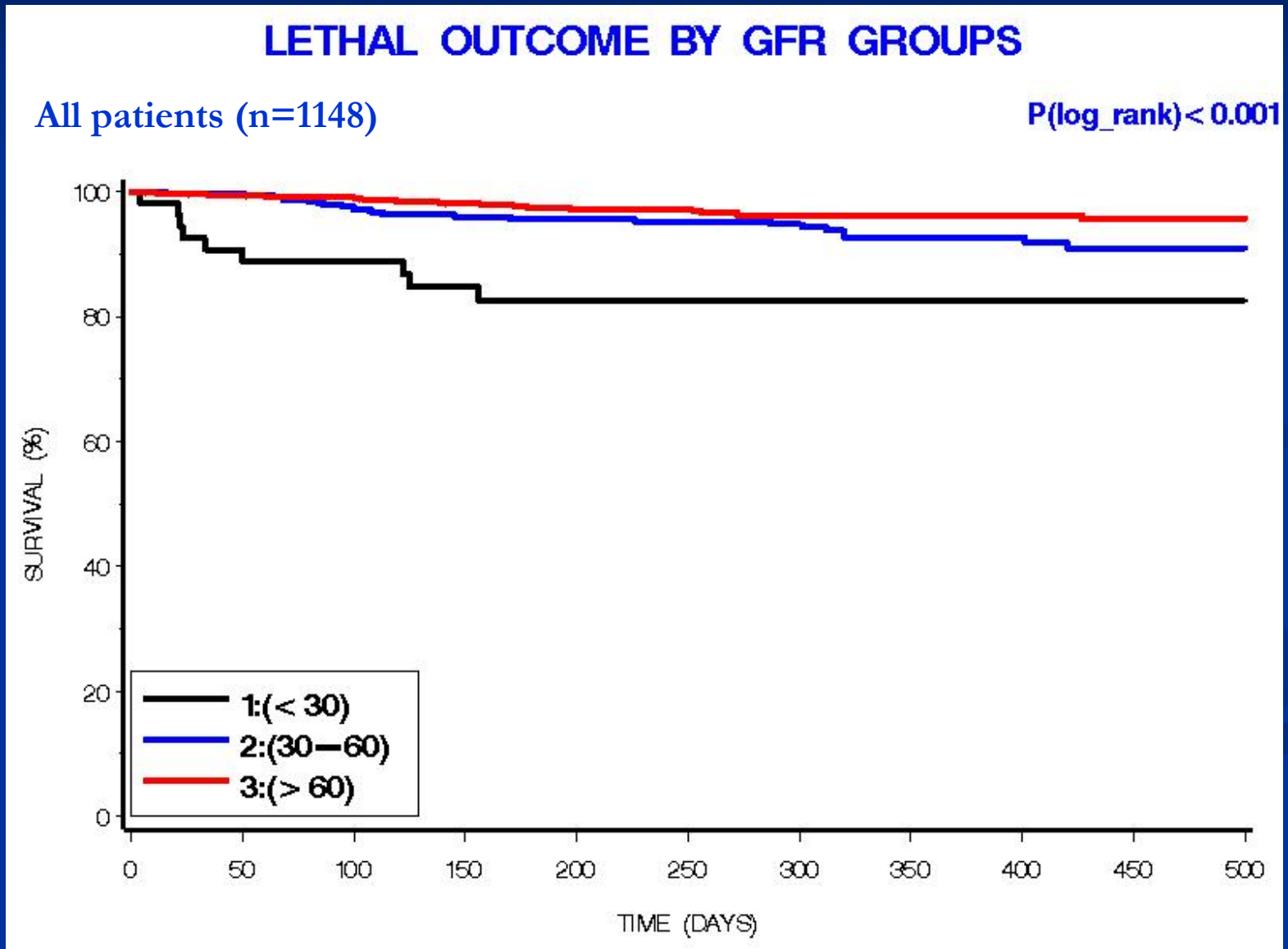
ECG and device characteristics

	ICD group (n=704) eGFR (ml/min/1.73m²)			P value	CRTD group (n=444) eGFR (ml/min/1.73m²)			P value
	<30 (n=26)	30-60 (n=178)	>60 (n=500)		<30 (n=28)	30-60 (n=162)	>60 (n=254)	
QRS duration (ms)	99.3 ± 19.5	108.8 ± 25.4	101.9± 21.1	0.005	147.1 ±25.8	150.4 ± 28.9	148.6 ±24.8	NS
LBBB	4 (15.4)	26 (14.6)	37 (7.4)	NS	18 (64.3)	100 (61.7)	179 (70.4)	0.09
Primary prevention	15 (57.7)	112 (62.9)	354 (70.8)	0.02	25 (89.3)	140 (86.4)	222 (87.4)	NS
Secondary prevention	11 (42.3)	66 (37.1)	146 (29.2)	0.01	3 (10.7)	22 (13.6)	32 (12.6)	NS

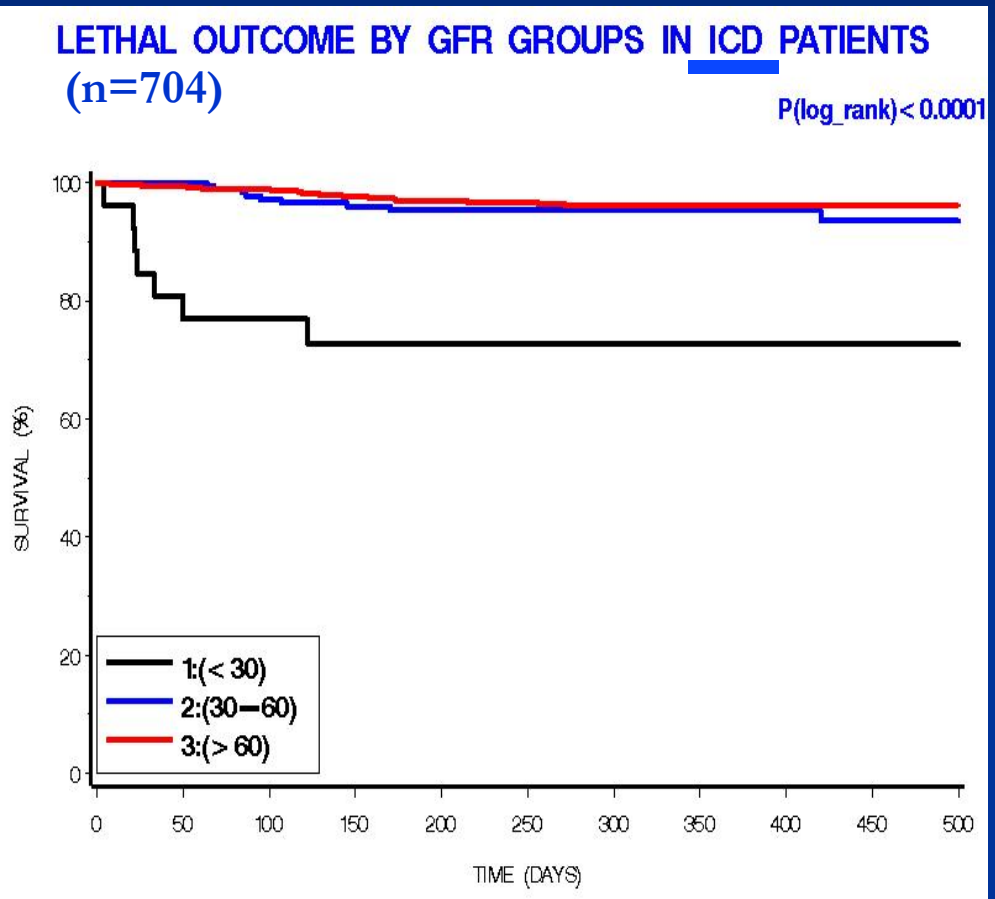
Clinical outcomes

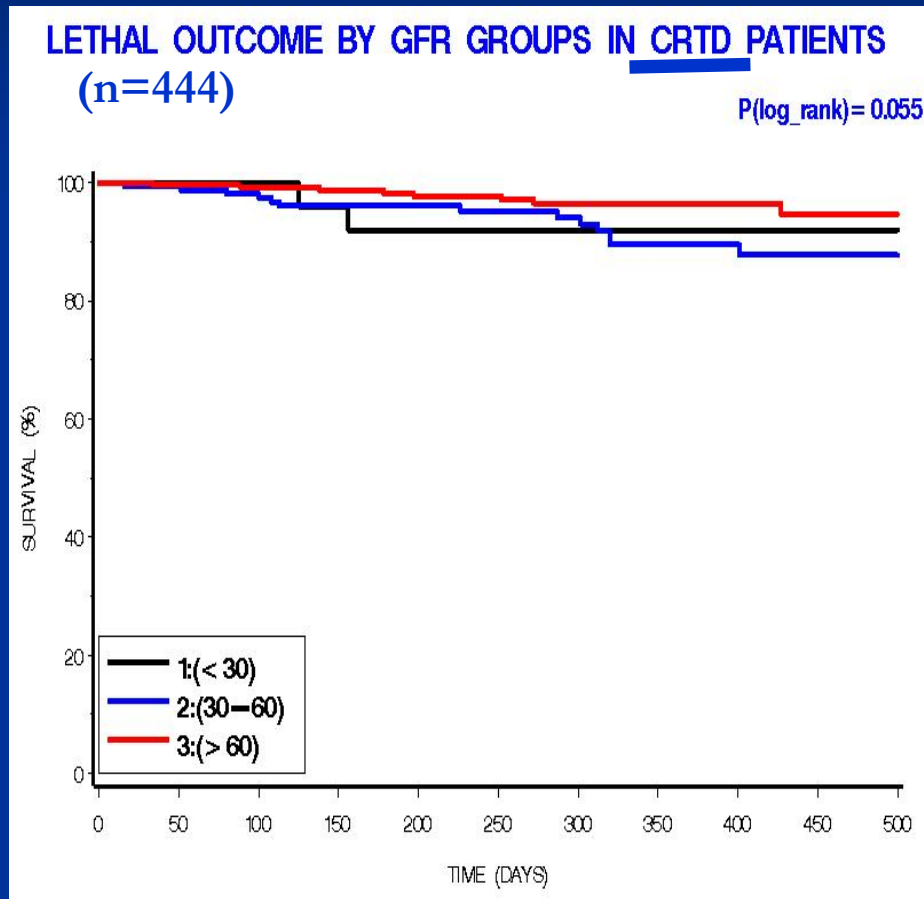
	ICD group (n=704) eGFR (ml/min/1.73m²)			P value	CRTD group (n=444) eGFR (ml/min/1.73m²)			P value
	<30 (n=26)	30-60 (n=178)	>60 (n=500)		<30 (n=28)	30-60 (n=162)	>60 (n=254)	
Death	7 (26.7)	9 (5.1)	17 (3.4)	<0.001	2 (7.1)	14 (8.6)	8 (3.1)	0.06
Cardiac sudden	0	0	3		1	2	1	
Cardiac non-sudden	1	2	3		1	5	4	
Non Cardiac	6	7	11		0	7	3	
VT/VF or Death	9 (34.6)	25 (14.1)	52 (10.5)	<0.001	4 (14.3)	19 (11.9)	25 (9.8)	0.68
HF or Death	10 (38.5)	27 (15.3)	47 (9.5)	<0.001	4 (14.3)	29 (18.1)	33 (13.0)	0.36
Total Hospitalization	10 (52.6)	53 (32.3)	113 (24.2)	0.005	7 (28.0)	46 (32.2)	67 (27.7)	0.64
1st appropriate therapy (shock or ATP)	2 (11.1)	16 (9.5)	35 (7.4)	0.60	2 (7.7)	5 (3.4)	17 (7.0)	0.32
1st inappropriate therapy (shock)	0 (0)	4 (25.0)	7 (20.0)	0.70	0 (0)	5 (1.2)	5 (1.2)	0.48

Primary outcome



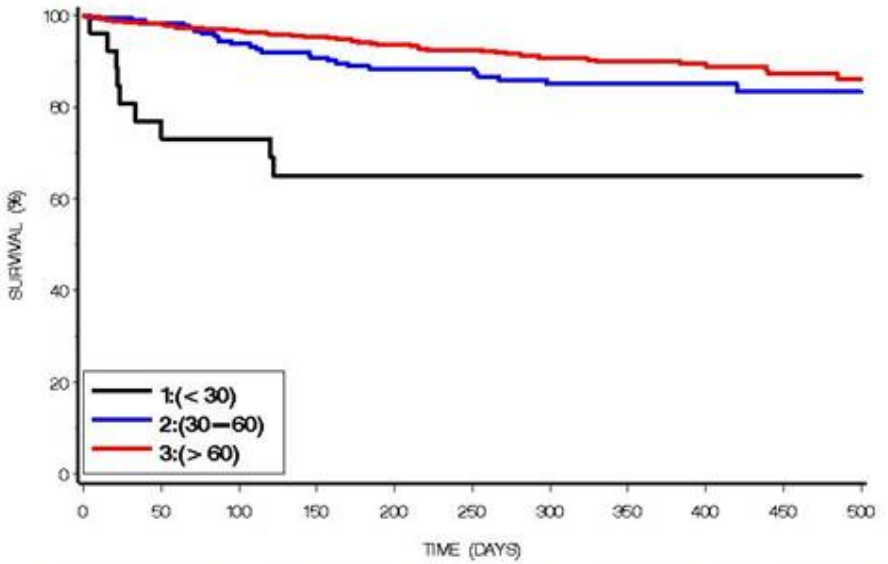
Primary outcome





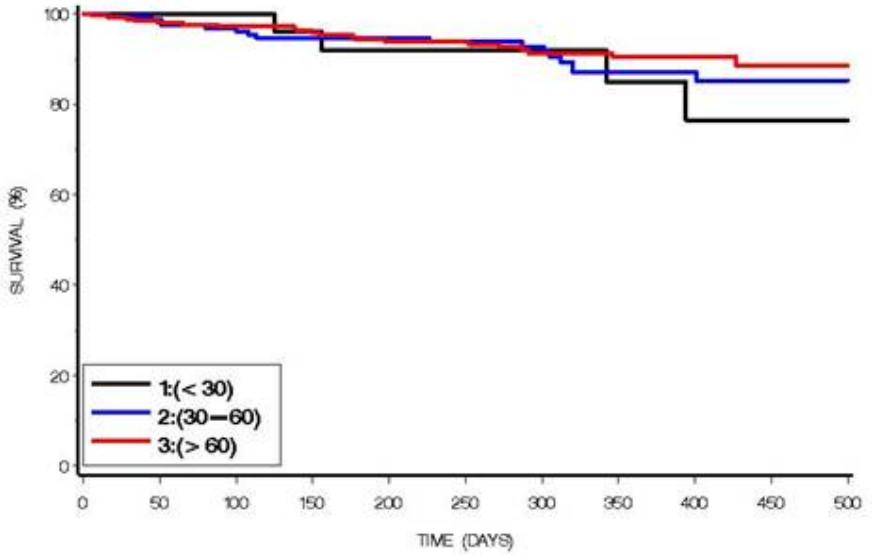
VTVF OR DEATH (COMBINED) BY GFR GROUPS IN ICD PATIENTS

P(log_rank)< 0.001



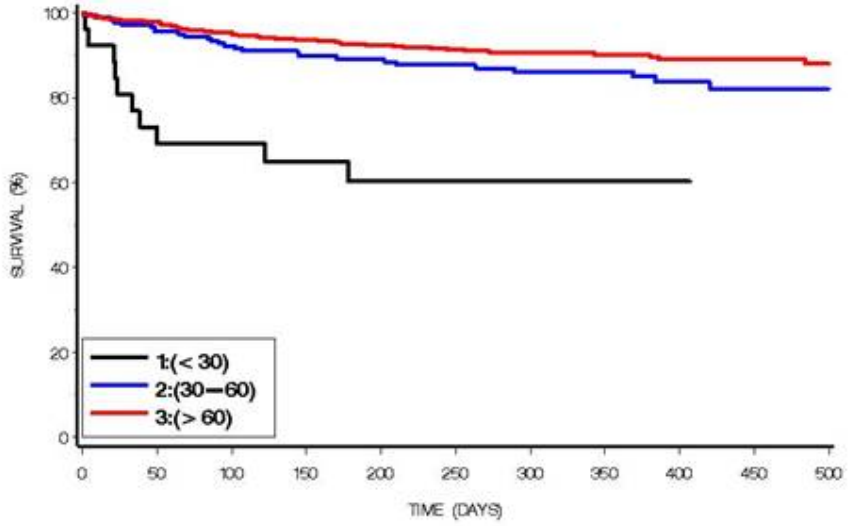
VTVF OR DEATH (COMBINED) BY GFR GROUPS IN CRTD PATIENTS

P(log_rank)= 0.59



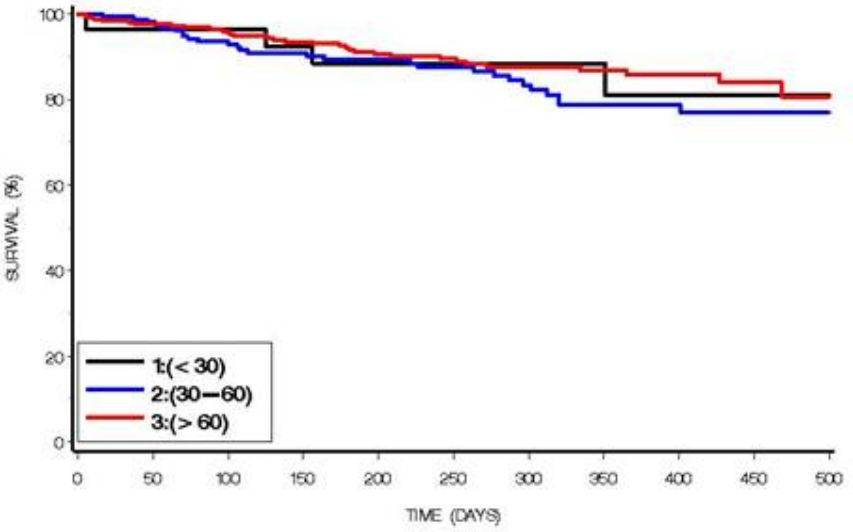
HF OR DEATH (COMBINED) BY GFR GROUPS IN ICD PATIENTS

P(log_rank)< 0.0001



HF OR DEATH (COMBINED) BY GFR GROUPS IN CRTD PATIENTS

P(log_rank)= 0.42



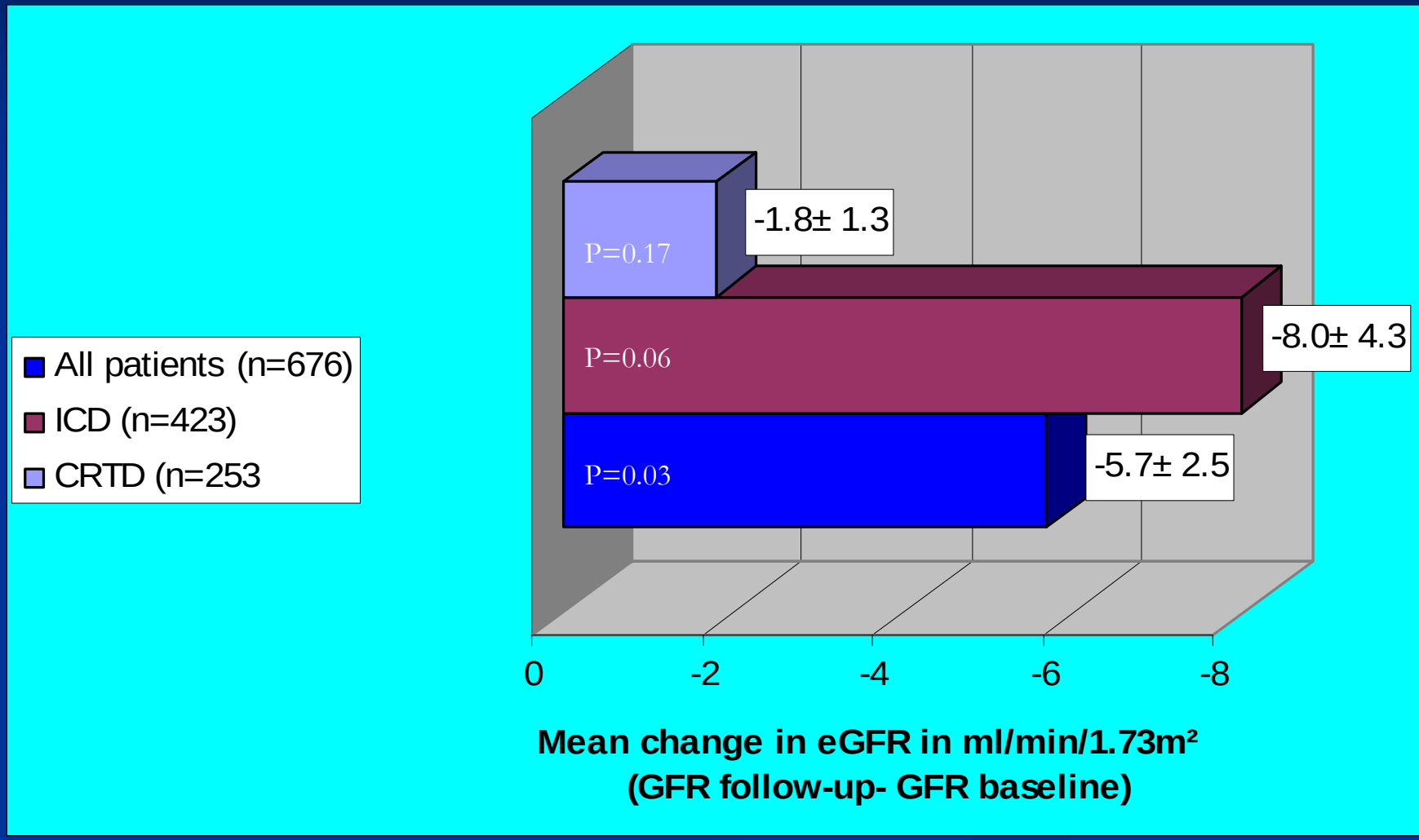
Advanced CKD and Outcomes

Multivariate analysis (adjusted for age, gender, NYHA, EF<30%, diabetes mellitus, secondary prevention, eGFR<30):

	HR (95% CI)	P value
Death	5.17 (1.40-19.05)	0.003
Death or HF	4.90 (1.85-12.96)	0.001
Death or VT/VF	3.57 (1.29-9.88)	0.01

	ICD patients		CRTD patients	
	HR (95% CI)	P value	HR (95% CI)	P value
Death	5.36 (1.50-19.18)	0.01	0.97 (0.12-7.52)	0.98
Death or HF	5.32 (2.01-13.89)	<0.001	0.85 (0.26-2.77)	0.79
Death or VT/VF	3.71 (1.29-10.67)	0.01	1.67 (0.49-5.62)	0.41

Change in renal function



Discussion

- CKD is associated with increased mortality, heart failure and ventricular arrhythmia in patients who undergo device therapy for HF.
- This is mainly driven by poor outcome of ICD patients with CKD.
- However, mortality rate of CRTD patients was similar regardless of renal function.

Discussion

- Patients who are candidates for CRTD should not be denied this therapy because of advanced CKD.
- The discrepancy between the effect of CKD in patients with regular ICDs vs. patients with CRTDs may point to the importance of the CRT component rather than the ICD component of the CRTD system .

Limitations

- A retrospective analysis.
- Renal function was measured in different laboratories.
- Echocardiographic data during follow-up were not assessed.

Conclusion

- CKD is associated with increased mortality after ICD implantation but not after CRTD within the first year of implantation.
- Advanced CKD should not be considered a reason for exclusion from CRTD implantation.

Thank you