CVC: The last resort for all or only for some?

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Disclosure

CSL Vifor

Baxter

Covidien

Boehringer Ingelheim

- Evidence
- Two cases
- Belfast data
- Summary

Central venous catheters: evidence

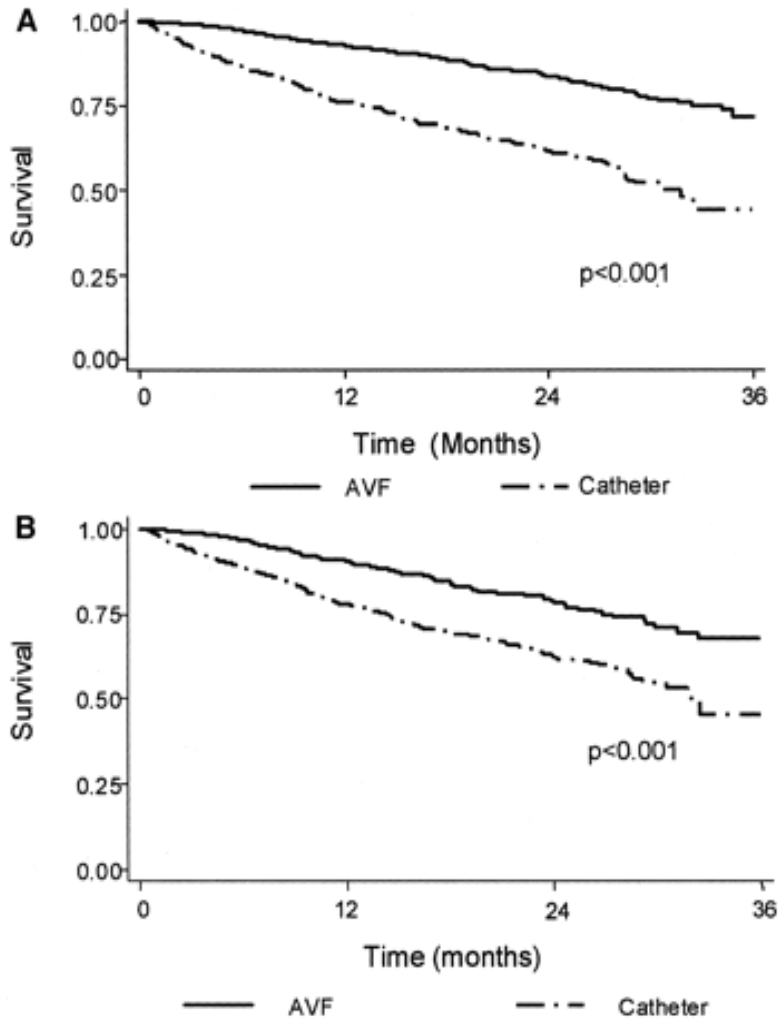


Figure 1. Kaplan-Meier survival curves for all-cause mortality for the whole cohort (A) (*n* 3381) and the propensity score–matched cohort (B) (*n* 1479) for patients with arteriovenous fistula (AVF)*versus* catheters.

Polkinghorne et al. JASN. 2004;15:477-486

Table 1.

Summary of absolute risks of death from all causes, major cardiovascular events, and fatal infections associated with dialysis vascular access types

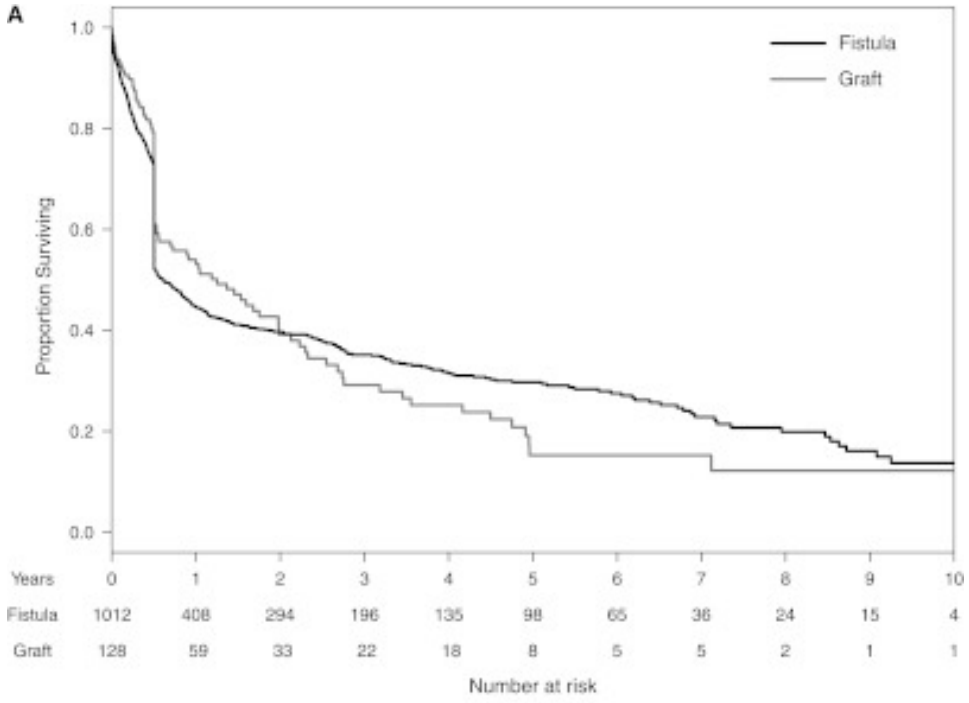
Reference Annual Event Risk[a]	Vascular Access Comparison	Meta-Analytical RR (95% CI)	Heterogeneity (I^2; *P* Value)	Number of Additional Events per 1000 Patients Exposed per Year (95% CI)
All-cause mortality				
0.20 for fistula users	Catheter versus fistula	1.53 (1.40–1.67)	83.9%; <0.01	106 (80–134) excess with catheter
0.24 for graft users	Catheter versus graft	1.38 (1.25–1.52)	86.2%; <0.01	91 (60–125) excess with catheter
0.20 for fistula users	Graft versus fistula	1.18 (1.09–1.27)	82.1%; <0.01	36 (18–54) excess with graft
Major cardiovascular events				
0.10 for fistula users	Catheter versus fistula	1.38 (1.24–1.54)	0%; 0.47	38 (24–54) excess with catheter
0.11 for graft users	Catheter versus graft	1.26 (1.11–1.43)	0%; 0.57	28 (12–46) excess with catheter
0.10 for fistula users	Graft versus fistula	1.07 (0.95–1.21)	0%; 0.52	7 (−5–21)[b] excess with graft
Fatal infections				
0.03 for fistula users	Catheter versus fistula	2.12 (1.79–2.52)	0%; 0.82	28 (20–38) excess with catheter
0.04 for graft users	Catheter versus graft	1.49 (1.15–1.93)	0%; 0.23	17 (5–32) excess with catheter
0.03 for fistula users	Graft versus fistula	1.36 (1.17–1.58)	0%; 0.78	9 (4–15) excess with graft

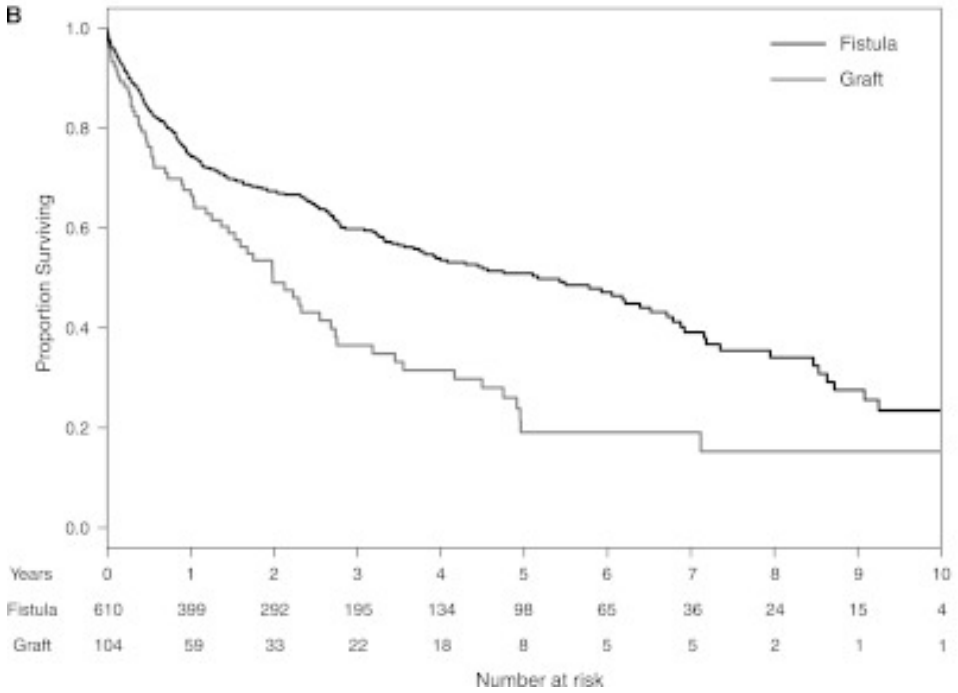
[a]Outcome measure includes all-cause mortality, fatal or nonfatal cardiovascular events, and fatal infection events as defined in each study, with RRs obtained from the meta-analysis. Reference risks are from the United States Renal Data System.[1]

[b]The 95% CI includes negative numbers, indicating that the superiority of graft versus fistula for cardiovascular events is uncertain (the 95% CI ranges between 5 fewer events and 21 in excess with grafts).

Ravani et al. JASN. 2013;24(3):465-473

Central venous catheters: AVF failure





Survival curves of cumulative patency in hemodialysis patients. (A) 1140 patients: arteriovenous fistulas versus arteriovenous grafts (hazard ratio [HR], 0.99; 95% confidence interval [CI], 0.79–1.23). (B) 714 patients after excluding 426 primary failures: arteriovenous fistulas versus arteriovenous grafts (HR, 0.56; 95% CI, 0.43–0.74).

Lok et al. cJASN. 2013; 8(5): 810-818

CVC: role of arteriovenous grafts

Review

JVA | The Journal of Vascular Access

Recruitment into randomised trials of arteriovenous grafts: A systematic review

The Journal of Vascular Access
1–12

DOI: 10.1177/11297298231158413
journals.sagepub.com/home/jva
SAGE

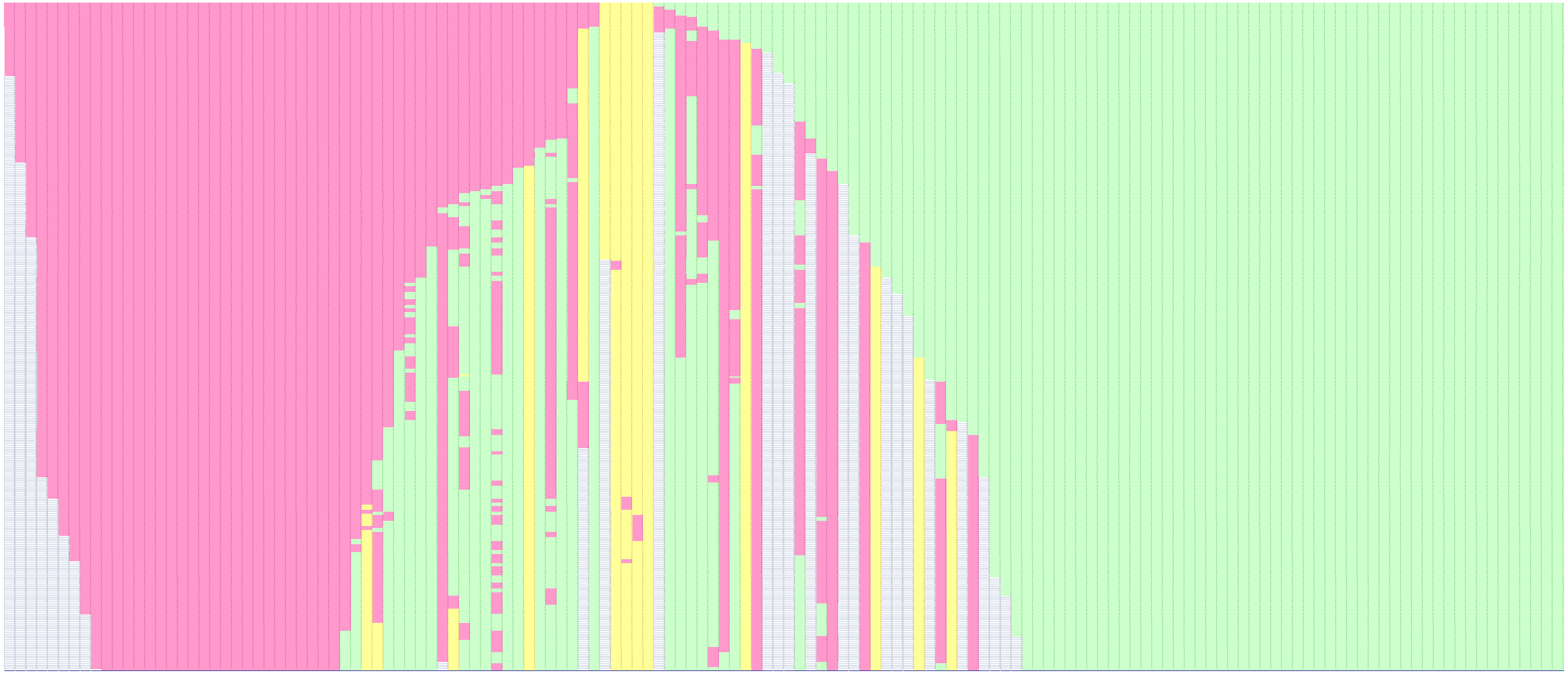
David Kingsmore[1,2], Richard D White[3], Gaspar Mestres[4], Mike Stephens[5], Francis Calder[6], Georgios Papadakis[6], Emma Aitken[2], Andrew Jackson[2], Nick Inston[7], Rob G Jones[8], Colin Geddes[9], Karen Stevenson[2], Laszlo Szabo[5], Peter Thomson[9], Callum Stove[10], Ram Kasthuri[11], Ben Edgar[2], Matteo Tozzi[11], Marco Franchin[11], Rajesh Sivaprakasam[12] and Nikolaos Karydis[13]

AVF vs AVG
Cuff
AVF vs AVG
GT
Cuff
GT
GT
AVF vs AVG
GT
AVF vs AVG
HERO vs AVG
GT
CVC vs AVG
GT
BBF vs AVG
GT

Central venous catheters: get it right 1st time

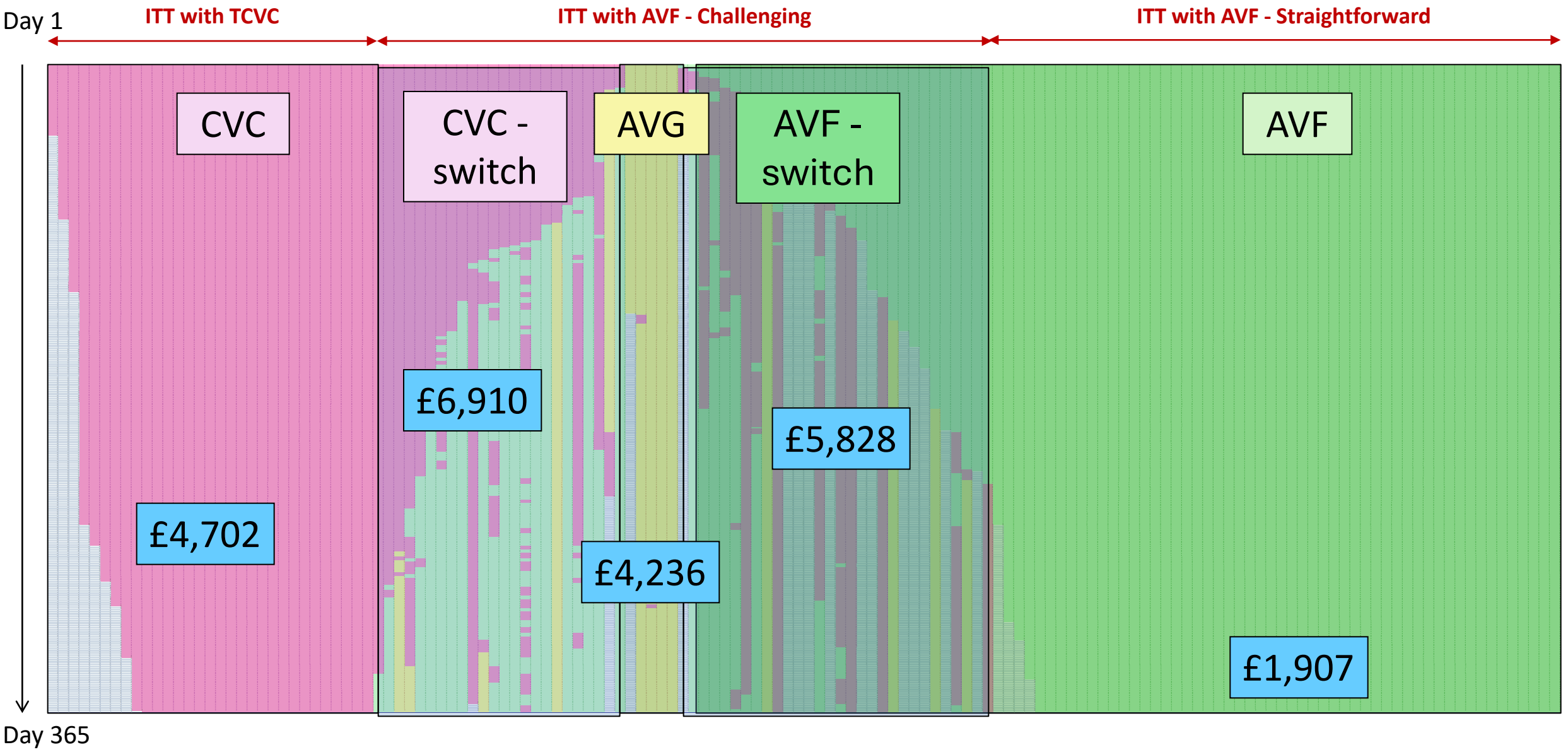
N = 144 patient starting HD

Day 1



Day 365

Murray et al Nephrol Dial Trans 2018 ;33(7):1244



Murray et al Nephrol Dial Trans 2018 ;33(7):1244

Belfast Practice: time to CVC removal

461 patients on HD >360 days

180 AVF starts

- 11 temp lines (eg AVF miscannulation)
  - One for 6 weeks, 2 for 8 weeks

Years	N	Ave days	Median days
2011-14	48	458	378
2015-23	30	304	282

281 line starts

- 78 lines out for functioning AV access (4 AV grafts)
- Average time to line removal 399 days, median 328 days!
  - Range 38-1392 days

Central venous catheters: summary

AVFs not without issue

- Failure rates
- Mature AVFs that are never used for dialysis
- Aneurysms / steal syndrome / high output cardiac failure

Catheters will always be with us

- Acute haemodialysis
- No other options due to arterial + venous disease
- Poor prognosis
- Patient choice

Right access, right patient, right time, right reason

Times have moved on…

- Better at catheter care
- Dialysis patients older with more co-morbidities
- AV grafts including ecAVGs

Central venous catheters: summary

Similar to transplant

- For those with a good prognosis, Tx and AVF best
- For both Tx and AVF, there is a point at which risk vs benefit ratios become less favourable
- Aim to get access right first time: changing access accrues cost and morbidity
- Need to accept that for some patients we don’t know + be willing to participate in RCTs

Belfast Experience

Catheters: when they are good, they are very good

Catheters: when they are good…

IM started HD aged 78 via a BC AVF

- Developed very resistant mid-cephalic stenosis
- Two partial salvages
- Recurrence of stenosis shortly thereafter
- Stent would be in the cannulation zone + patient not keen

Tunnelled dialysis catheter inserted 11 months after HD start

- Worked for >10 years
- No interventions, no even a thrombolytic lock!

Catheters: when they are bad…

GR, 60 yoa, known to nephrology

- Precipitous HD start in setting of acute illness Dec 2022
- L BC AVF created 6 weeks later

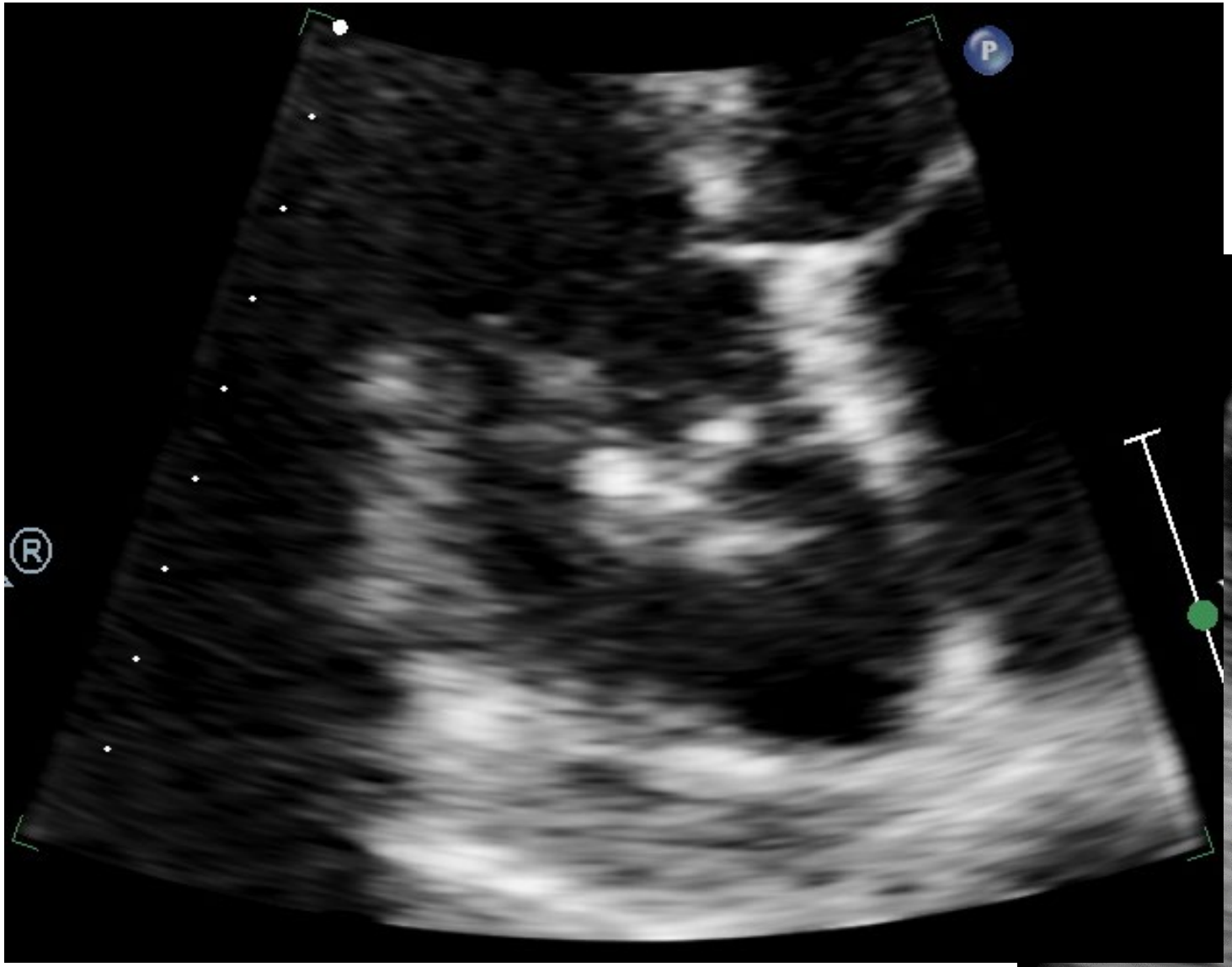
Admitted 10 days later with ?line sepsis (coag –ve staph)

- Only one set of cultures positive + rapidly settled on Abs
- Discharged for 4 weeks of antibiotics to allow AVF maturation

Two weeks later, readmitted with further temps

- Catheter removed

ECHO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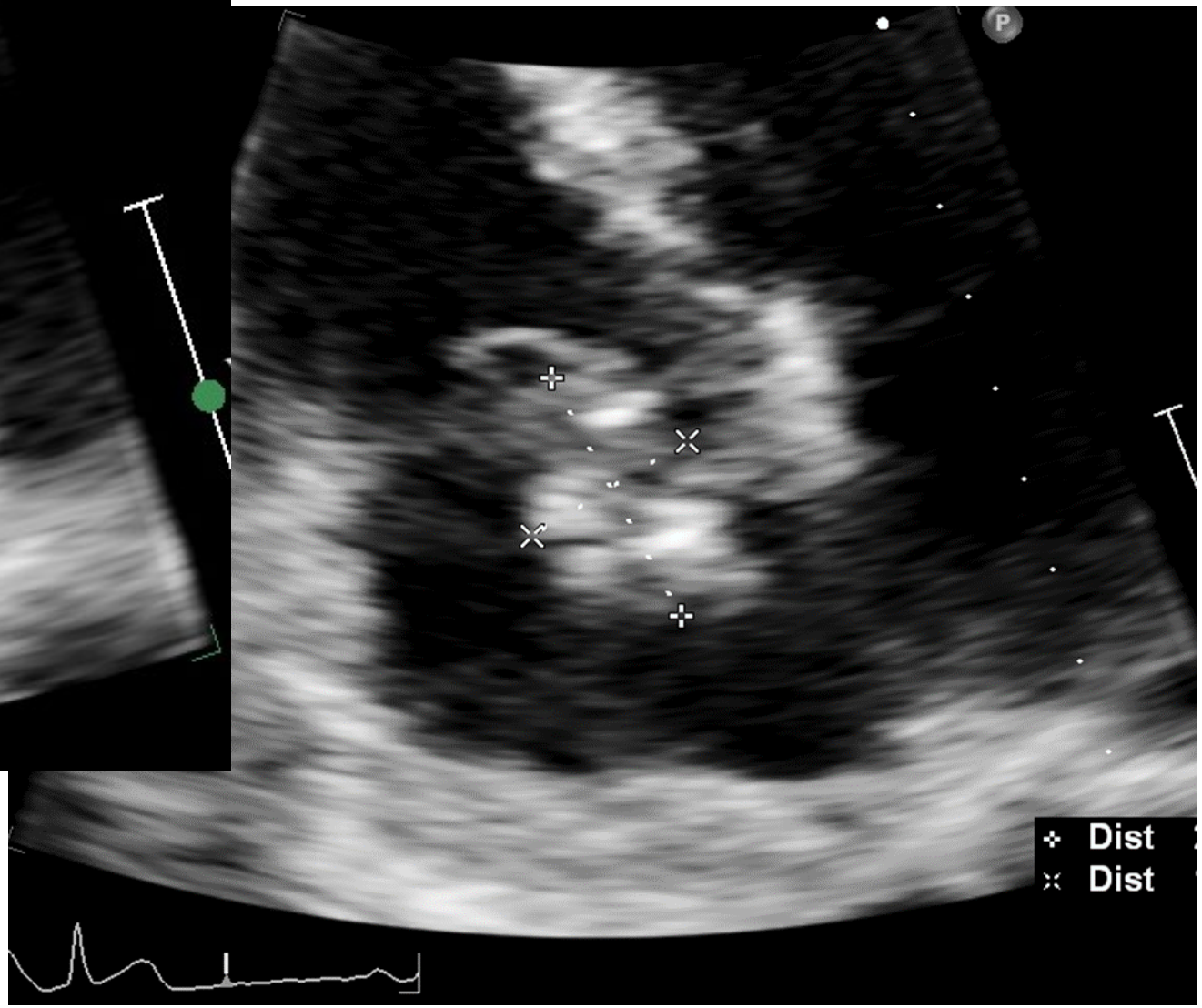
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CTPA

- Large right atrial thrombus with multiple small pulmonary emboli in the right lower lobe segmental pulmonary arteries. Borderline right cardiac strain noted with the right atrium to right ventricle ratio of 3.8-3.7 cm.

- AVF needled 4 wks + 2 days after creation
- Suspended on-call for kidney transplant

Belfast data / practice

M Corr, A Masengu, J Hanko

Belfast Data

Review + present all Renal Replacement Therapy (RRT) starts yearly

- Included all first ever RRT for patient ‘known to nephrology’ >90 days
- Focus on HD starts with a line + categorise as ‘optimal’ vs ‘suboptimal’

2011 - 2020

Total 356 HD starts known to nephrology >90 days

Excluded

- Transplanted = 80 (42 within one year, 63 by 2 years)
- Recovered = 8
- PD = 10
- Other = 4

Included patients who remained on HD = 254

- Context re changed HD cohort
- All 1st ever RRT known >90d
  - 2011-2015 = 290
    - **Preemptive Tx = 17% (48)**
    - PD = 17% (50)
    - **HD = 66% (192)**
  - 2016-2020 = 307
    - **Preemptive Tx = 28% (86)**
    - PD = 18% (56)
    - **HD = 54% (165)**
- <15% of chronic HD patients potentially transplantable

‘Optimal’ Line Starts (N = 91)

45% acute on chronic deterioration (n = 41)

- At 3m before HD, eGFR >20 if aged <70, eGFR >15 if >70 yoa

27% no veins for AVF on US assessment (n = 25)

8% ended up on chosen modality within 90 days (n = 7)

13% predialysis failed AVF creation (n = 12)

7% AVF ready but cannulation issues + line out at 4 wks (n = 6)

Suboptimal Line Starts (N = 67)

37% late / no referral for access assessment (n = 25)

28% inappropriate / late change in modality (n = 19)

19% delays in AVF creation pathway (n = 13)

15% non-adherence (n = 10)

Total cohort = 254v	Age Median years	Diabetic nephropathy	Male
AVF at HD start = 96	72	30 (31%)	56 (58%)
Line at HD start = 158	71	57 (36%)	88 (56%)
Optimal line = 91	70	30 (33%)	51 (56%)
Suboptimal line = 67	72	27 (40%)	37 (55%)

Gender and diabetic nephropathy status did not increase the risk of suboptimal line start

Time known to nephrology	Hazard ratio for suboptimal start
1st Quartile (92 – 606 days)	2.95 (95% CI: 1.98 – 6.03)
2nd Quartile (606 – 1576)	1.31 (95% CI: 0.79 – 1.32)
3rd Quartile (1576 – 3092)	0.66 (95% CI: 0.48 – 0.91)
4th Quartile (3092 – 9175)	2.38 (95% CI: 1.29 – 5.14)

Total = 254	2 year mortality	5 year mortality	
AVF at HD start = 96	30% (29 / 96)	55% (40 / 73)	
Line at HD start = 158	46% (73 / 158)	83% (106 / 128)	
Optimal line = 91	53% (48 / 91)	87% (66 / 76)	12% used AVF
Suboptimal line = 67	37% (25 / 67)	77% (40 / 52)	24% used AVF

Mean survival in AVF group 2.53 years vs 1.97 years in line group (p-value 0.002)
Mean survival optimal line group 1.4 years vs 2.31 years in suboptimal group (p-value 0.16)
No significant difference AVF vs suboptimal group (p-value 0.31)

‘Optimal’ line starts (N=91)

45% acute on chronic deterioration (n = 41)

- **26% of all line starts in those ‘known to nephrology’**
- **At 3m before HD, eGFR >20 if aged <70, eGFR >15 if >70 yoa**

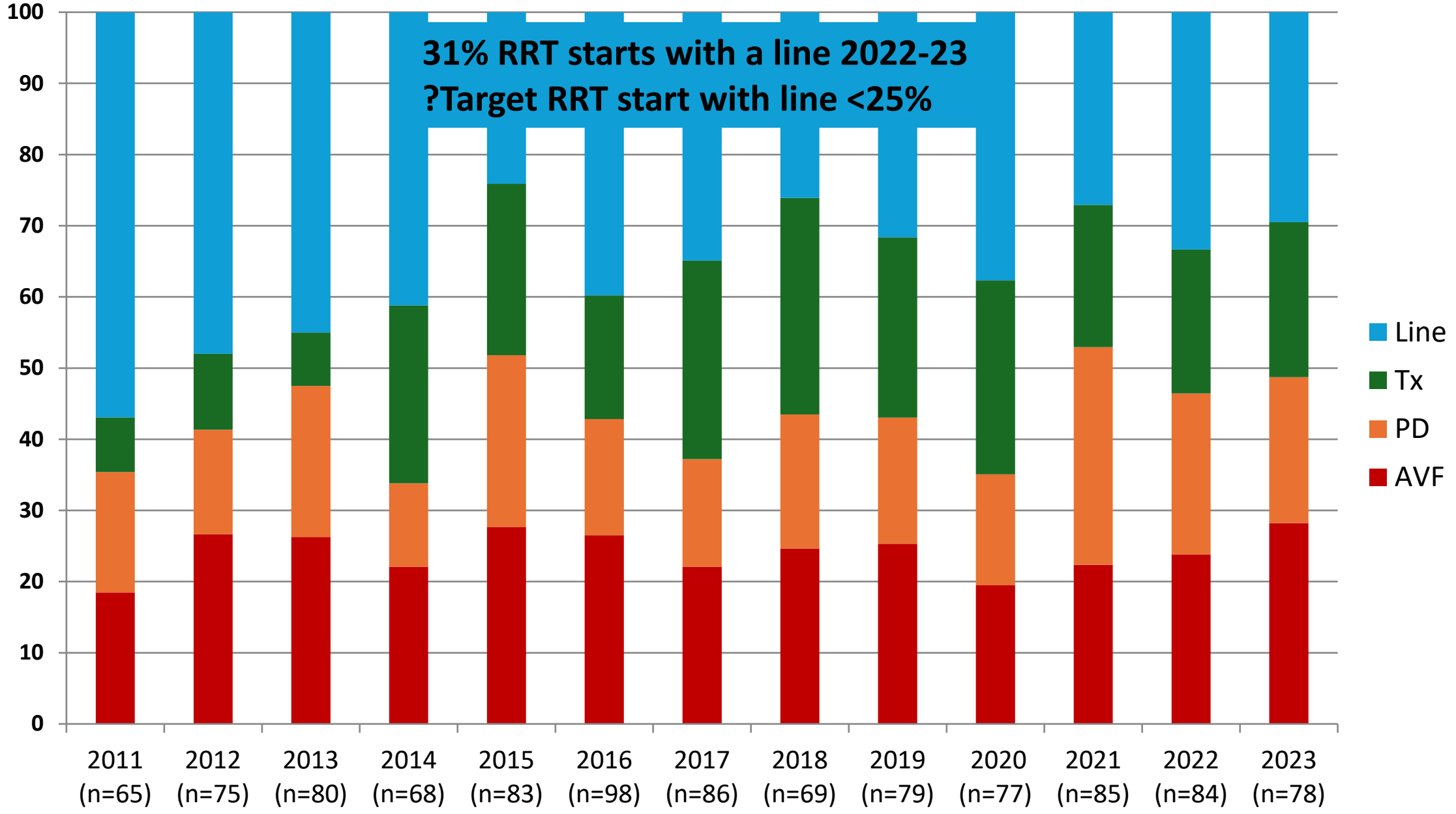
GRAFTS!

27% no veins for AVF on US assessment (n = 25)

VEIN PRESERVATION!

- 8% ended up on chosen modality within 90 days (n = 7)
- 13% predialysis failed AVF creation (n = 12)
- 7% AVF ready but cannulation issues + line out at 4 wks (n = 6)

Proportion of patients commencing RRT modalities from renal clinics



Summary

AVFs best for those with a good prognosis on dialysis

Suboptimal evidence to guide access choice for patient subgroups

- Poor prognosis on haemodialysis
- ‘Crash landers’ including those known to nephrology
- No veins for AVF

Need multicentre RCTs (OASIS)

Conclusion

- Catheters not a last resort for all
- An appropriate, well considered option for some

Catheter starts should be reviewed to ensure they are never accepted as the default for ‘suboptimal’ medical practice / system issues