

# Effect of Smoking on Outcomes of Arteriovenous Access for Hemodialysis

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# Disclosures

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None

# Background

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- Prevalence of ESRD increased over time
- Hemodialysis most prevalent mode of renal replacement therapy
- Mode of AV access impacts survival and quality of life
- Smoking is popular modifiable risk factor
- The impact of smoking on AV access outcomes is understudied

# Objective

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Evaluate the effect of active smoking on outcomes of arteriovenous fistulas (AVF) and grafts (AVG) for hemodialysis access at population levels.

# Methods

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- United States Renal Disease Database
  - Prospective Data registry of all ESRD patients in the US
  - Medicare, ESRD networks, United Network for Organ Sharing, CDC
- All AVF (CPT: 36818, 36819, 36820, 36821, 36825) and AVG (36380)
- January 2007 – December 2014
- Active smokers at time of AV access creation (ICD 305.1)

# Methods

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## Outcomes

- Catheter free dialysis
- Access maturation
- Primary patency
- Primary assisted patency
- Secondary patency
- Patient survival

# Methods

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## Statistical analyses

Descriptive: Chi-square, t-tests

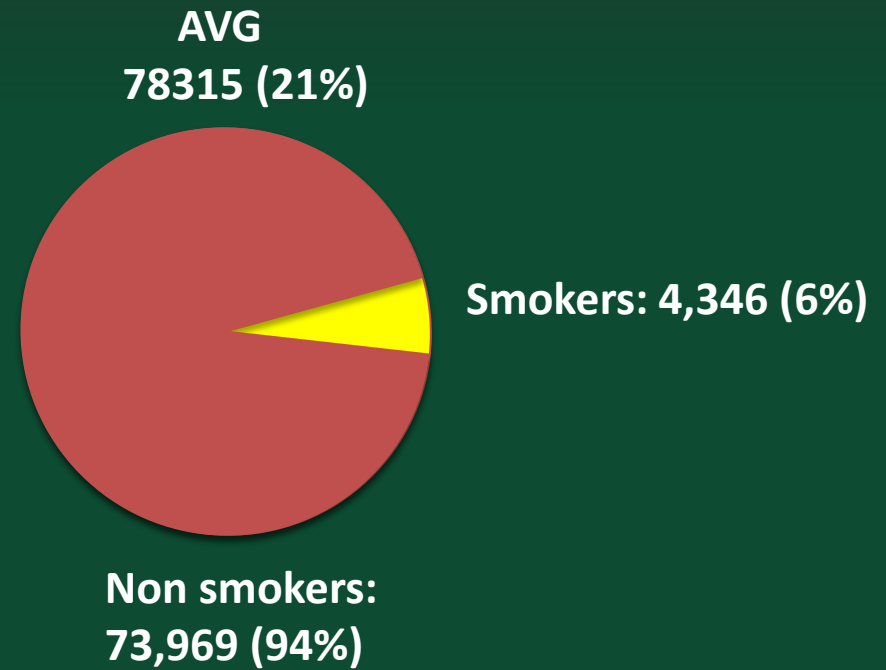
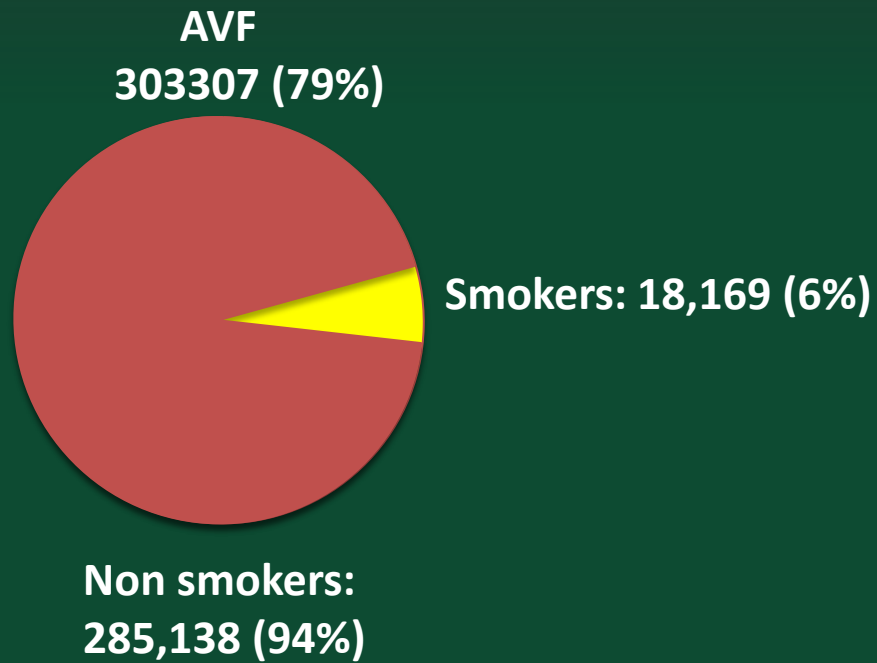
Kaplan Meier, log rank tests

Inference: multivariable logistic and cox regression

- Adjusting for demographic and clinically significant variables

# Results

**N= 381622**





# Results

Patient characteristic	AVF			AVG		
	Smokers	Non Smokers	P-value	Smokers	Non Smokers	P-value
Age, median (S.D)	58.6 (12.8)	64.4 (14.6)	<0.001	59.4 (12.5)	66.5 (14.2)	<0.001
Female gender (%)	32.5	39.9	<0.001	46.3	56.9	<0.001
Race (%)						
White	59.4	58.5	<0.001	46.1	46.5	<0.001
Black	32.9	27.2		47.4	40.9	
Hispanic	4.4	8.4		3.7	7.2	
Other	3.3	5.9		2.8	5.5	
BMI, Mean (S.D)	28.0 (7.7)	29.5 (8.0)	<0.001	27.4 (7.9)	29.4 (8.4)	<0.001

# Results

Patient characteristic	AVF			AVG		
	Smokers	Non Smokers	P-value	Smokers	Non Smokers	P-value
Hypertension (%)	90.2	87.3	<0.001	89.9	86.8	<0.001
Diabetes (%)	53.4	60.5	<0.001	54.7	63.0	<0.001
CAD (%)	21.6	19.4	<0.001	20.6	19.5	0.08
PAD (%)	19.2	12.3	<0.001	19.6	13.6	<0.001
CHF (%)	31.4	30.3	0.003	31.6	33.5	0.013
COPD (%)	25.8	8.0	<0.001	25.9	8.7	<0.001
Cancer	7.2	6.7	0.011	7.7	6.9	0.035
Prior Catheter	60.0	56.4	<0.001	66.9	66.3	0.39

# Results

Median follow up: 29 (IQR 10-43) months

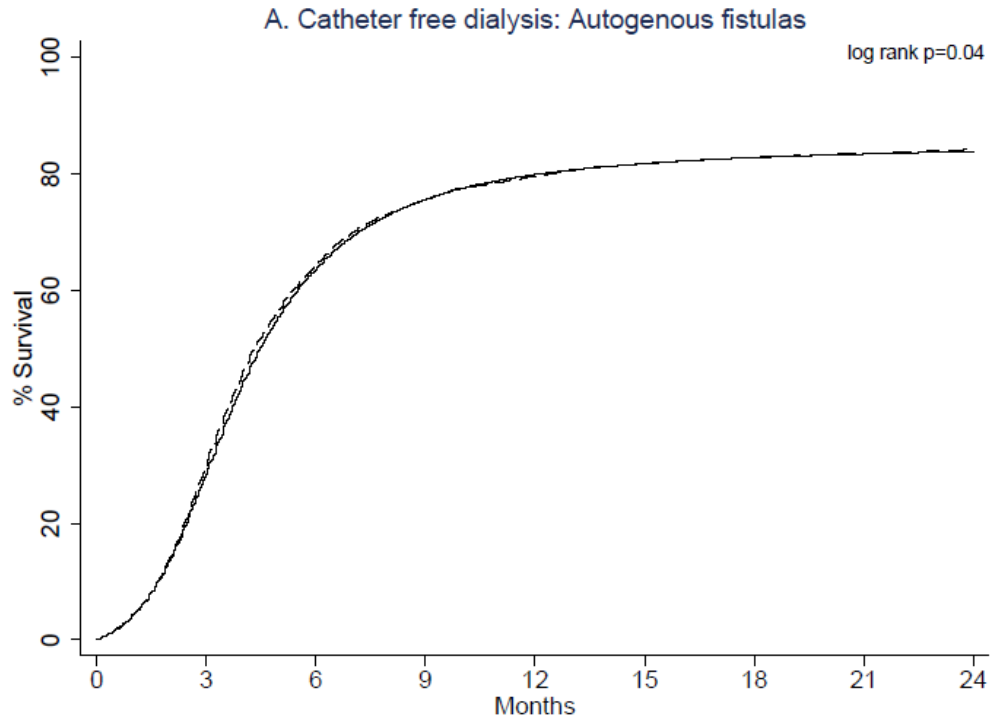
Outcome	AVF			AVG		
	Smokers	Non Smokers	P-value	Smokers	Non Smokers	P-value
Pre-emptive access utilization (%)	77	77	0.94	84	83	0.56
Catheter-free dialysis at 12 months (%)	80	80	0.06	77	78	0.53
Median interval to use (days)	85	76	0.02	46	41	0.32

Maturation smokers relative to non-smokers

AVF: 1.01 (95%CI: 0.98-1.03. p=0.57)

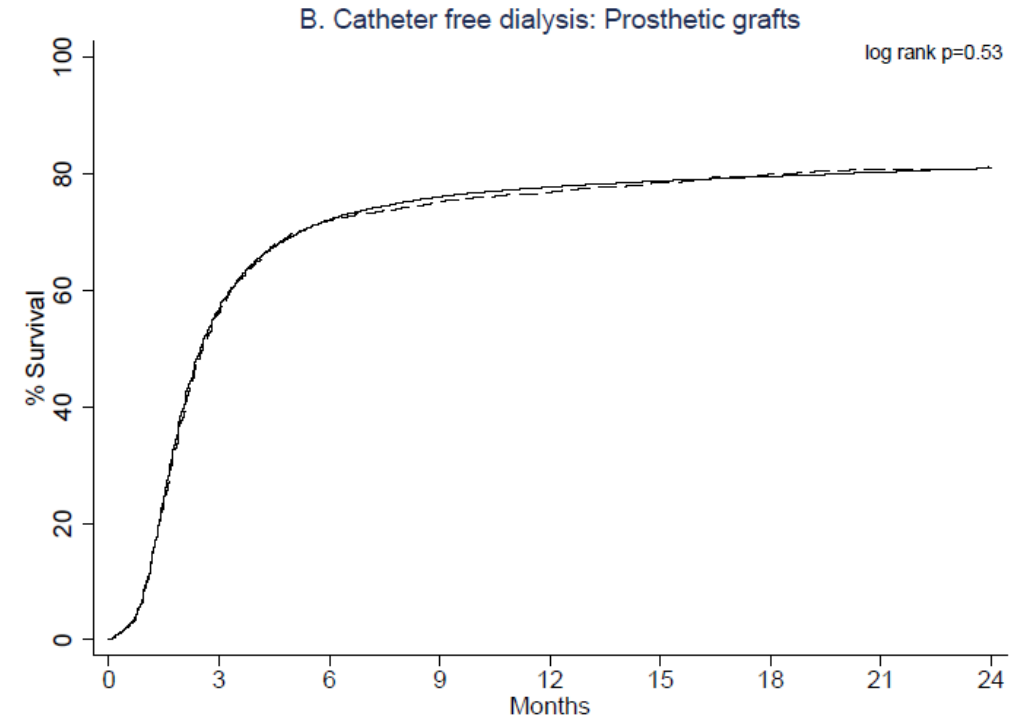
AVG: 0.99 (95%CI: 0.95-1.04. p=0.83)

# Results



Number at risk		0	3	6	9	12	15	18	21	24
Non-smoker	Smoker	160730 10906	102305 6815	45367 3046	26611 1809	19415 1332	15884 1070	13608 909	11910 771	10368 662

— Non-smokers    - - - - Smokers

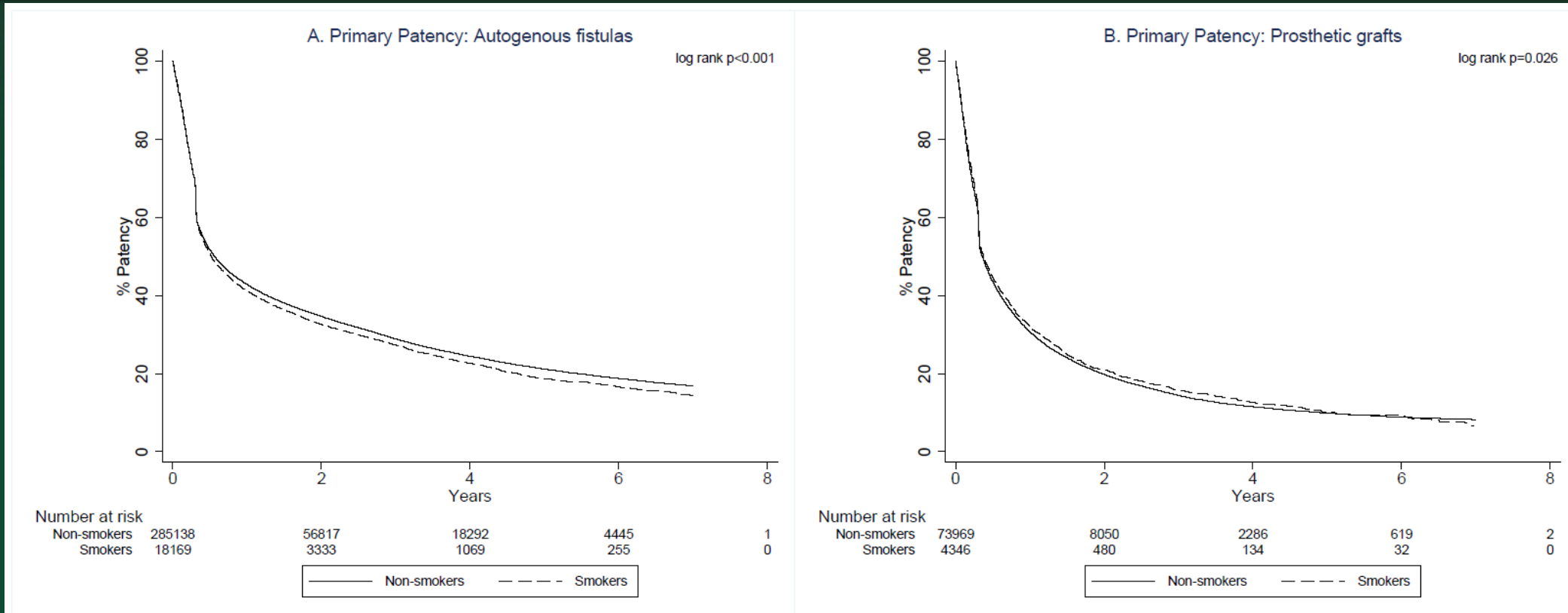


Number at risk		0	3	6	9	12	15	18	21	24
Non-smoker	Smoker	49011 2907	18142 1122	10005 621	7493 471	6136 391	5199 320	4476 266	3867 234	3335 218

— Non-smokers    - - - - Smokers

# Results

## Primary Patency

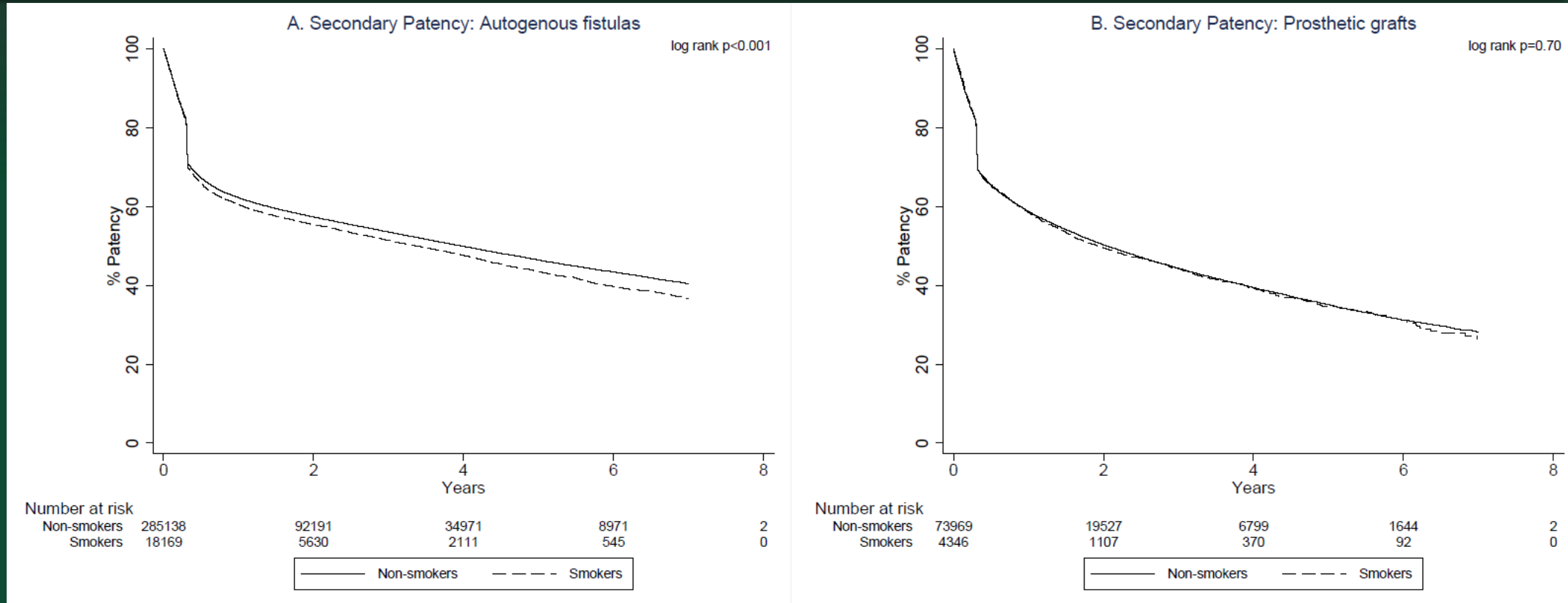


5 Years

AVF			AVG		
Smokers	Non Smokers	P-value	Smokers	Non Smokers	P-value
19	21	<0.001	10.2	9.9	0.026

# Results

## Secondary Patency



5 Years

AVF			AVG		
Smokers	Non Smokers	P-value	Smokers	Non Smokers	P-value
44	47	<0.001	35	35	0.70

# Results

Outcome	AVF			AVG		
	Smokers	Non Smokers	P-value	Smokers	Non Smokers	P-value
Number of interventions, mean (S.D)	2.4 (5.5)	2.1 (4.7)	<0.001	4.7 (8.5)	4.2 (8.1)	<0.001
Proportion of patients requiring interventions (%)	39	39	0.85	54	55	0.32

# Results

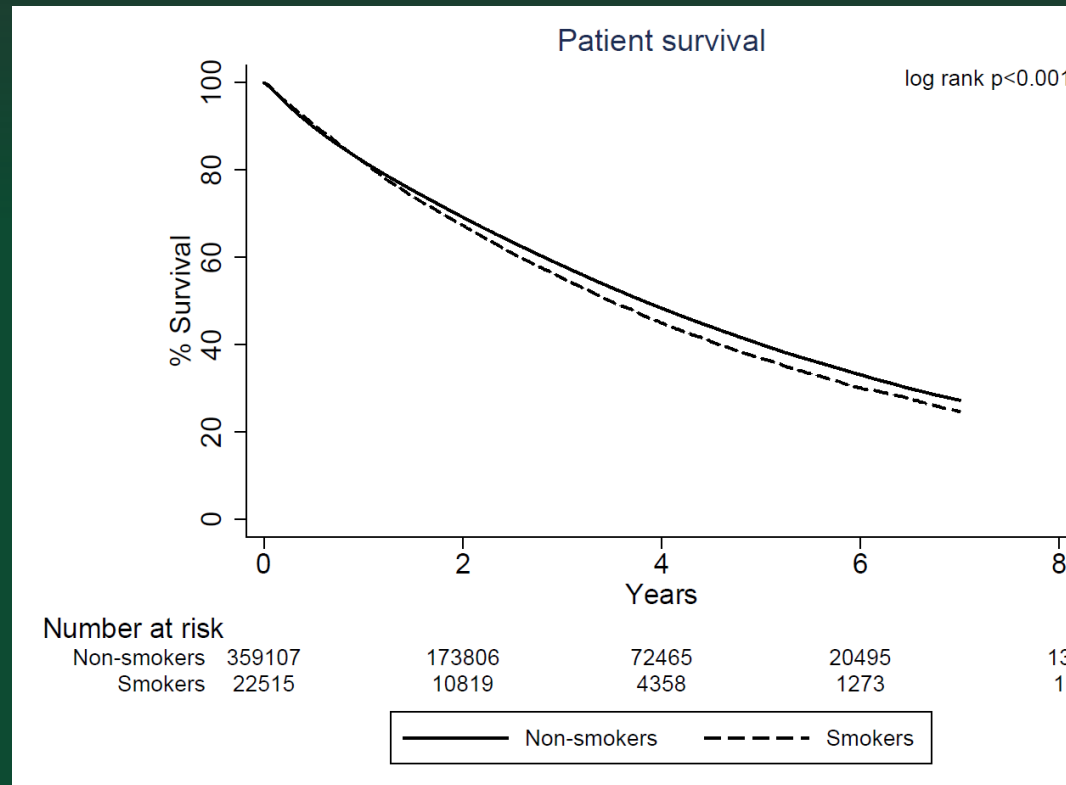
## Multivariable regression

Outcome Smokers vs Non smokers	AVF		AVG	
	aHR (95% CI)	P value	aHR (95% CI)	P value
Primary Patency	0.97 (0.95-0.99)	0.001	0.96 (0.93-0.99)	0.033
Primary Assisted Patency	0.97 (0.95-0.99)	0.019	0.98 (0.94-1.02)	0.35
Secondary Patency	0.97 (0.95-0.99)	0.007	1.01 (0.97-1.06)	0.66



# Results

## Patient survival

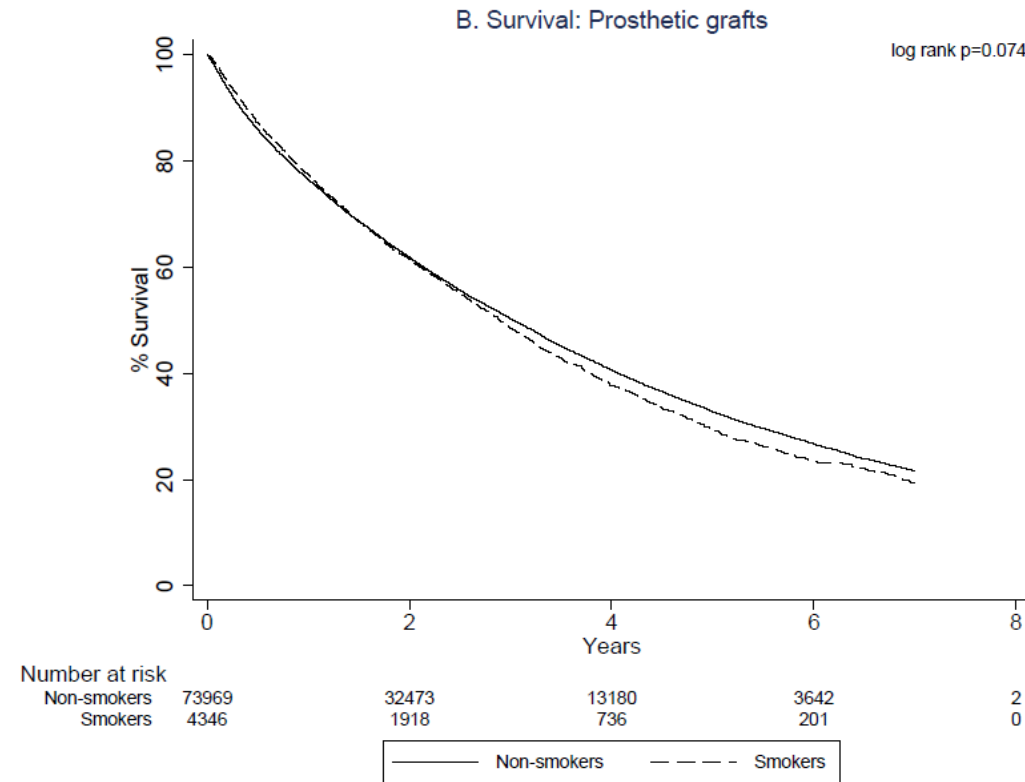
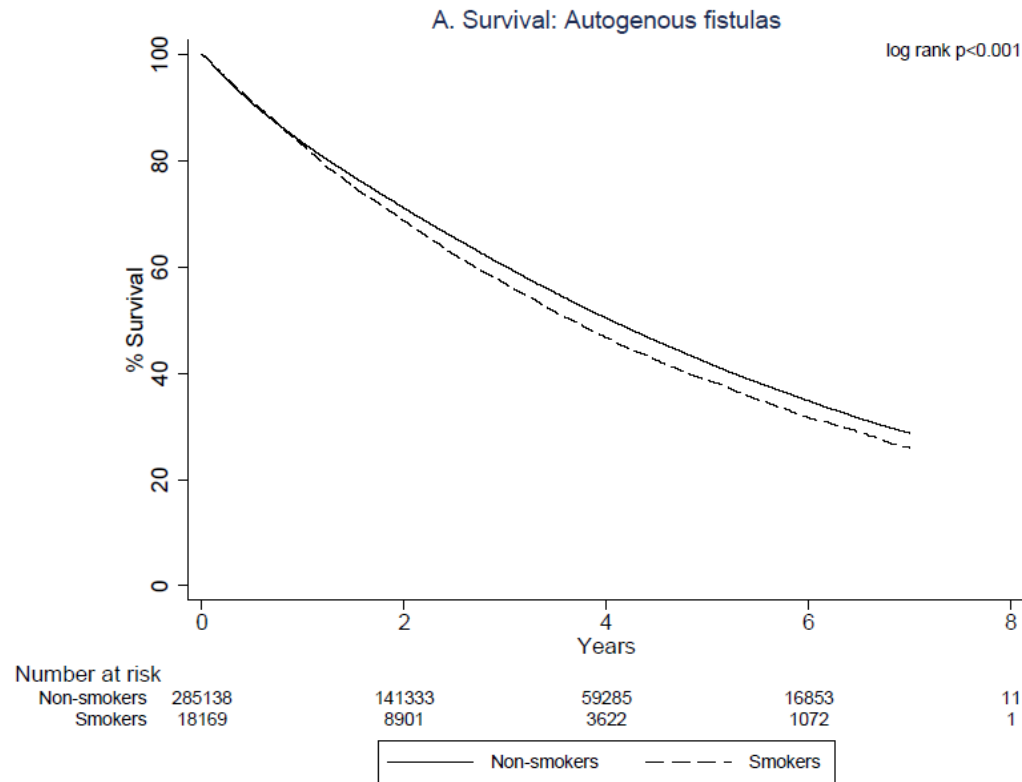


5 Years

Smokers	Non Smokers	P-value
37	40	<math>< 0.001</math>

# Results

## Patient survival



5 Years

AVF			AVG		
Smokers	Non Smokers	P-value	Smokers	Non Smokers	P-value
39	42	<0.001	29	33	0.074

# Results

## Multivariable regression

	All patients		AVF		AVG	
	aHR (95% CI)	P value	aHR (95% CI)	P value	aHR (95% CI)	P value
All cause mortality Smokers vs non smokers	1.21 (1.19-1.24)	<0.001	1.23 (1.20-1.25)	<0.001	1.16 (1.11-1.21)	<0.001

# Conclusions

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- No significant association between active smoking and AV access maturation
- Active smoking associated with modest decrease in AVF primary, primary assisted and secondary patency
- Active smoking associated with modest decrease in AVG primary patency but not primary assisted and secondary patency
- Active smoking associated with significant decrease in all cause mortality in overall and sub-cohorts of AVF and AVG