Glucose dynamics and mortality in RRT patients: an initial report

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Background

- Hypoglycaemia has been associated with increased length of stay and mortality in non-RRT populations[1]
- Increasing data suggesting glucose variability is important[2]
- RRT populations: hypo/hyper literature conflicting[3]
- Effect of variability in RRT populations on mortality unclear

1) Kerry C. Diabet Med 2013
2) Zinman B. Diabetologia 2017
3) Abe. Nature Reviews. Nephrology 2015

Aim

To explore associations between measured inpatient CBG characteristics on mortality in renal replacement therapy patients

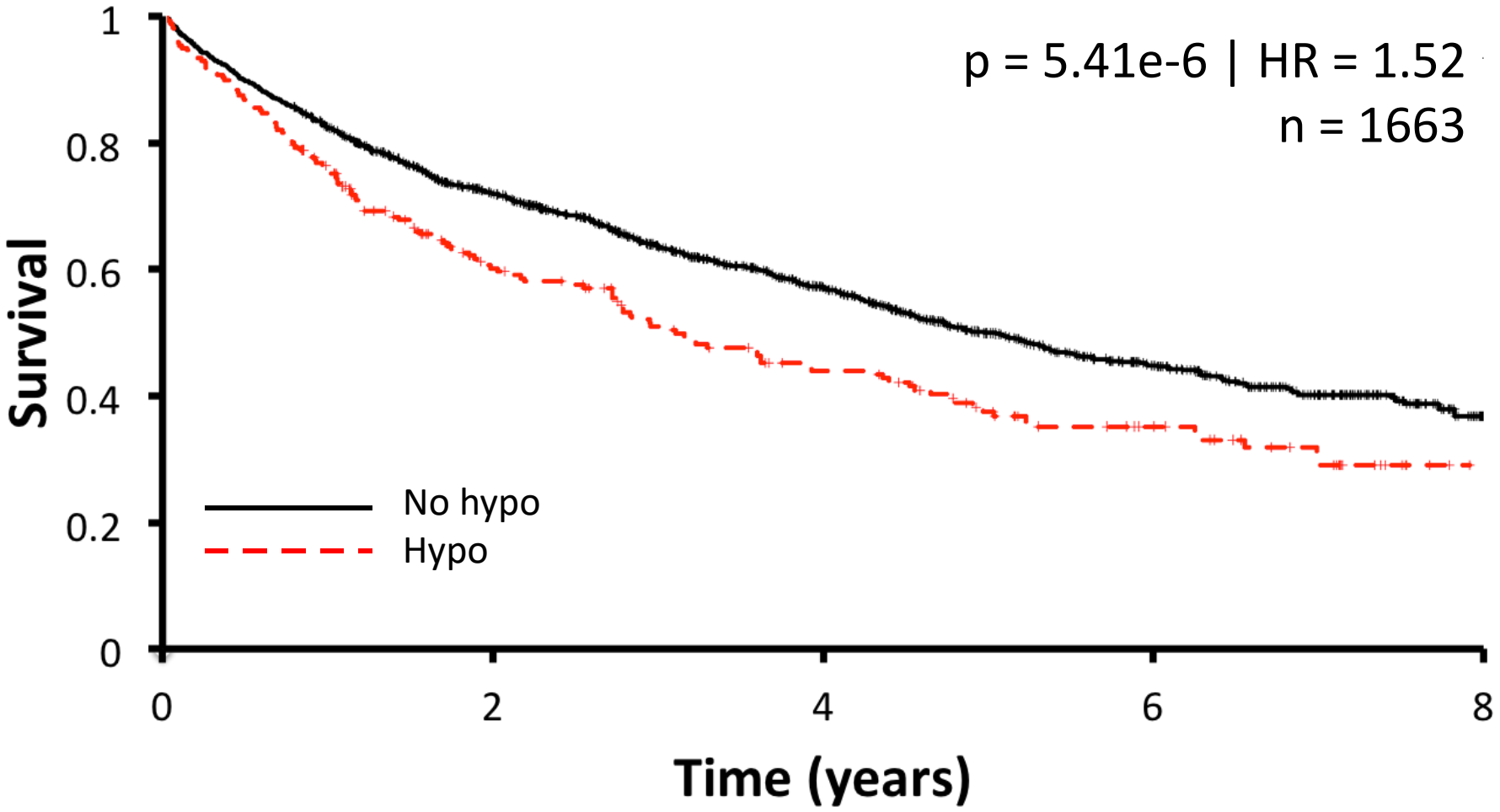
Methods

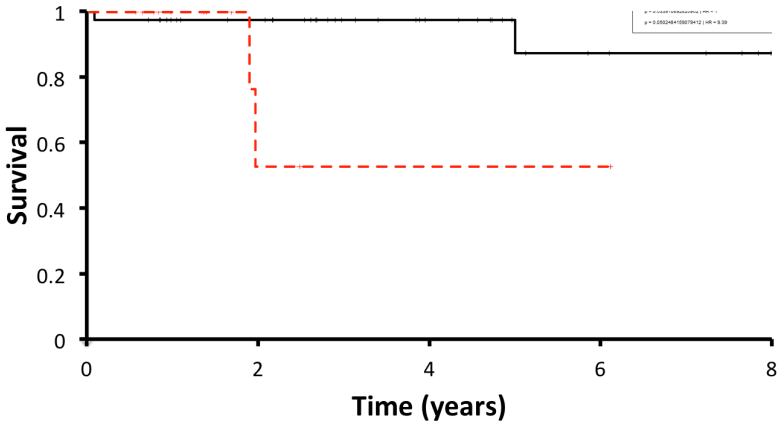
- Data for all incident and prevalent RRT patients from 2008 to 2016 extracted from e-record
- Incident patient data merged with hospital capillary blood glucose (CBG) dataset
  - Abbott Precision Web
- CBG time stamp technique used to identify admissions
- Glucose characteristics within the first admission calculated
  - Hypoglycaemia < 4 mmol/l
  - Variability: above or below median interquartile range
- Survival analysis
  - Cox proportional hazard model (time to death)
  - Age as covariable
  - R software

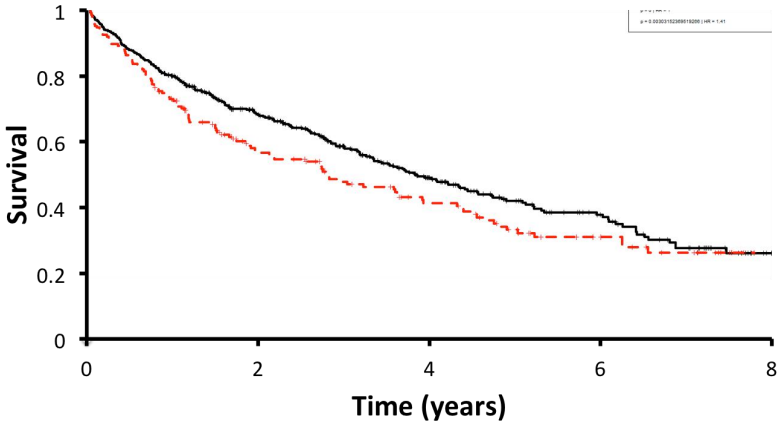
Results

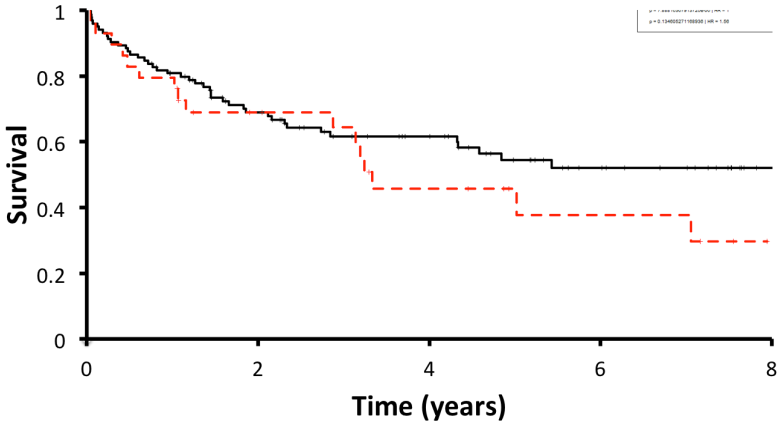
- 3134 RRT patients: incident and prevalent
  - 2215 prevalent individuals
- 367 544 CBGs
- 31 340 ‘time stamp’ admissions from 1663 individuals
  - First admissions analysed
- CBGs < 4 mmol/l
  - Longer admission (3.6 vs 1.9 days, $p<0.001$)
  - Higher number CBGs recorded (13 vs 4, $p<0.001$)

Whole cohort: hypo vs no hypo









RRT type: hypo vs no hypo

Transplant

p = 0.0502 | HR = 9.39

n = 52

HD

p = 0.003 | HR = 1.41

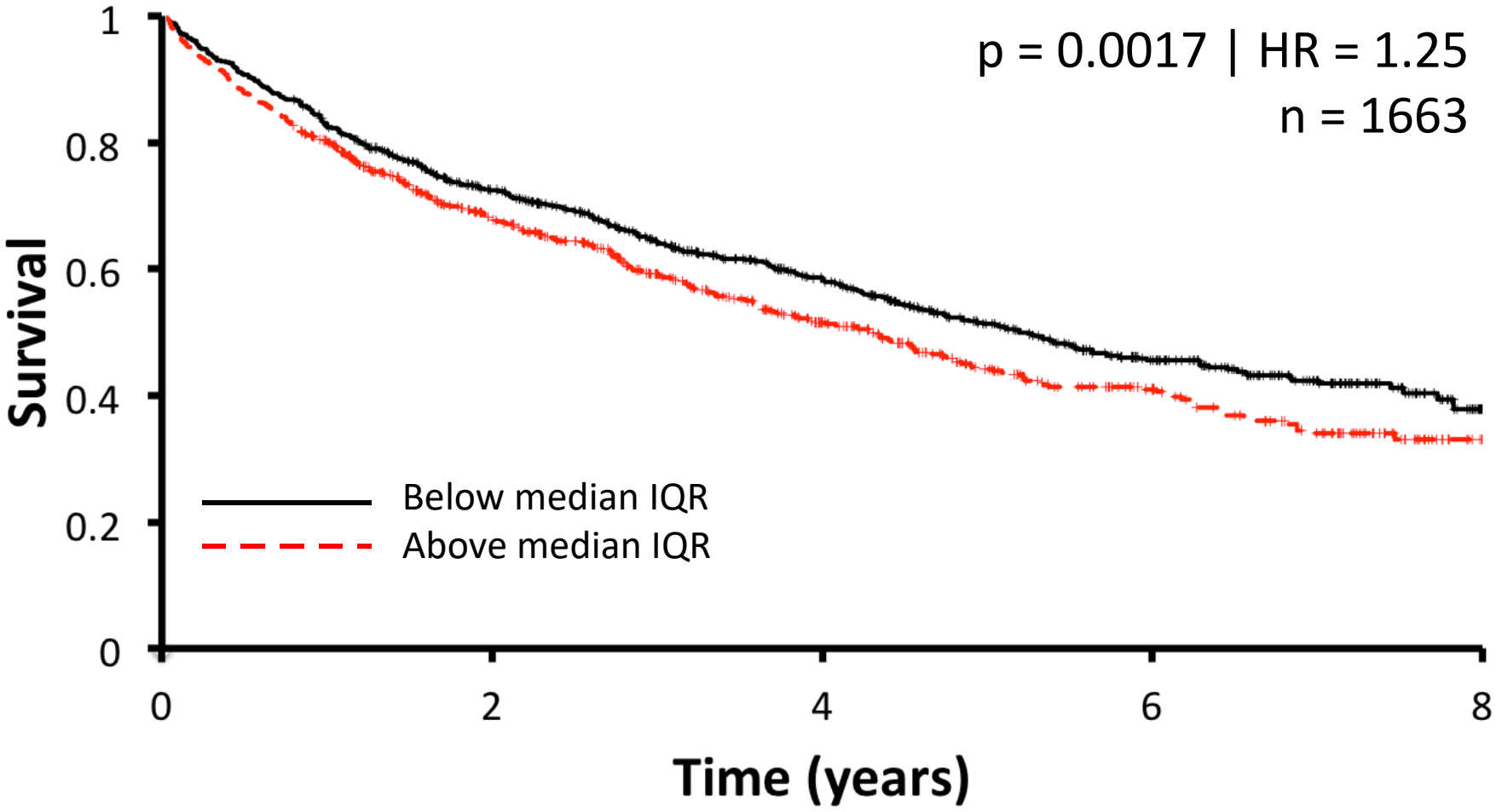
n = 626

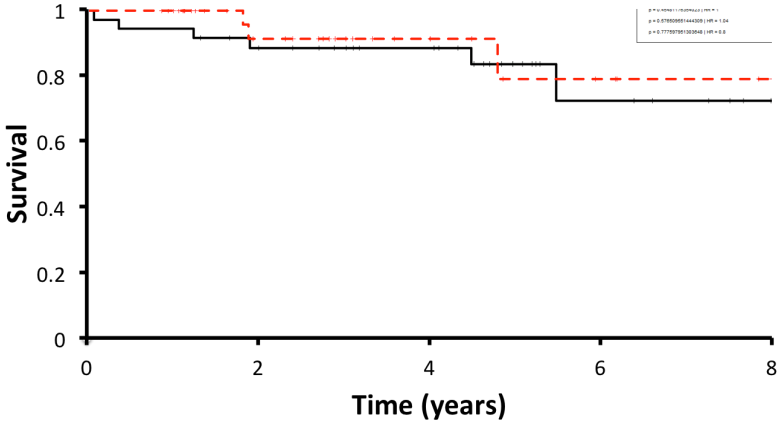
PD

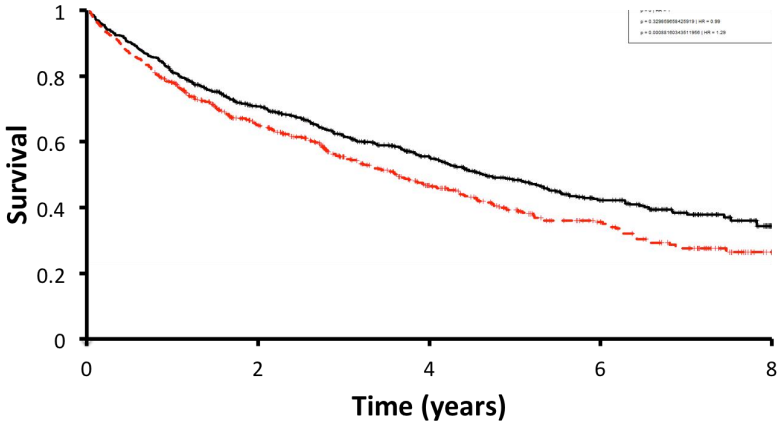
p = 0.135 | HR = 1.56

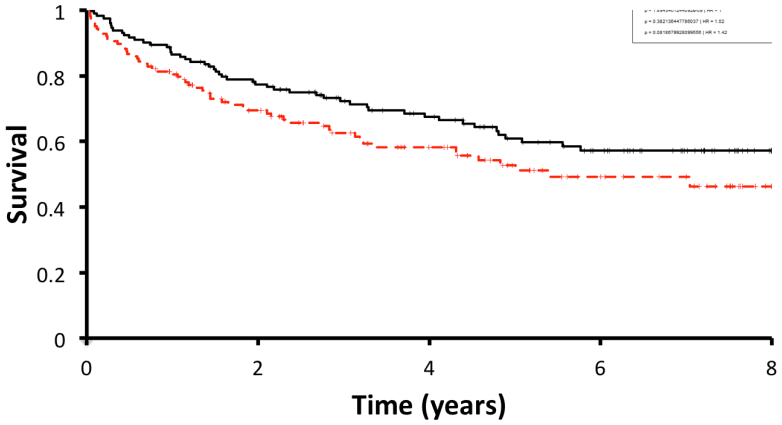
n = 128

Whole cohort: high vs low variability









RRT type: high vs low variability

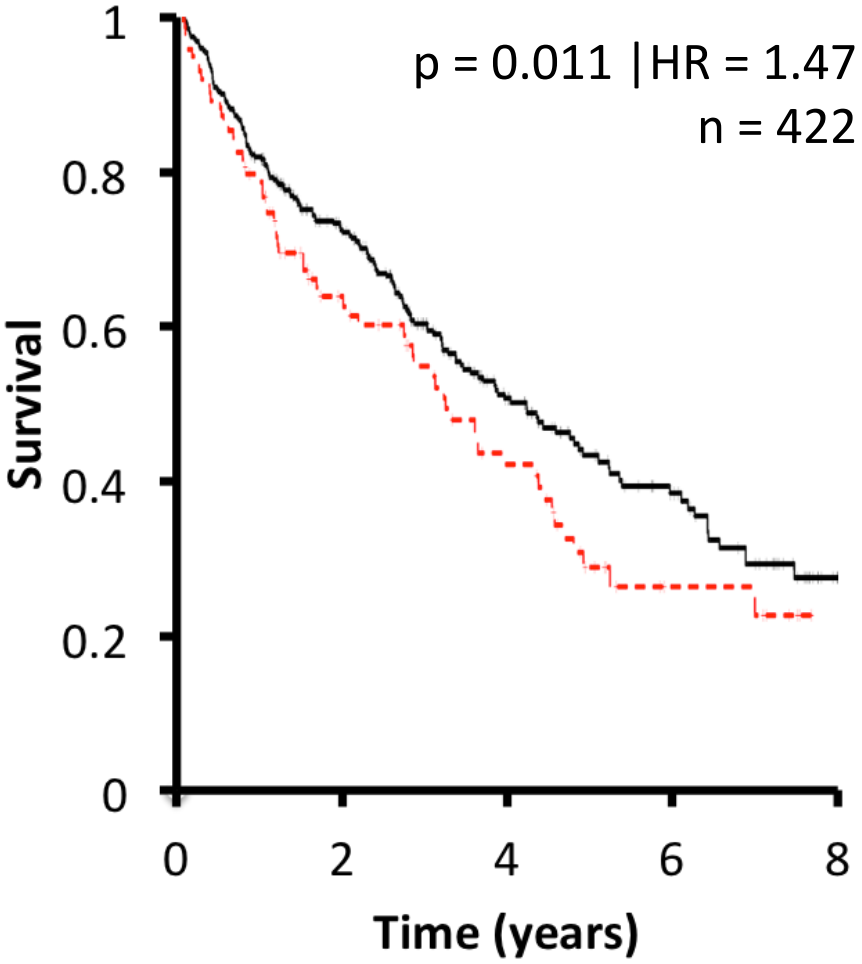
Transplant
p = 0.57 | HR = 1.04
n = 68

HD
p = 0.00088 | HR = 1.29
n = 1304

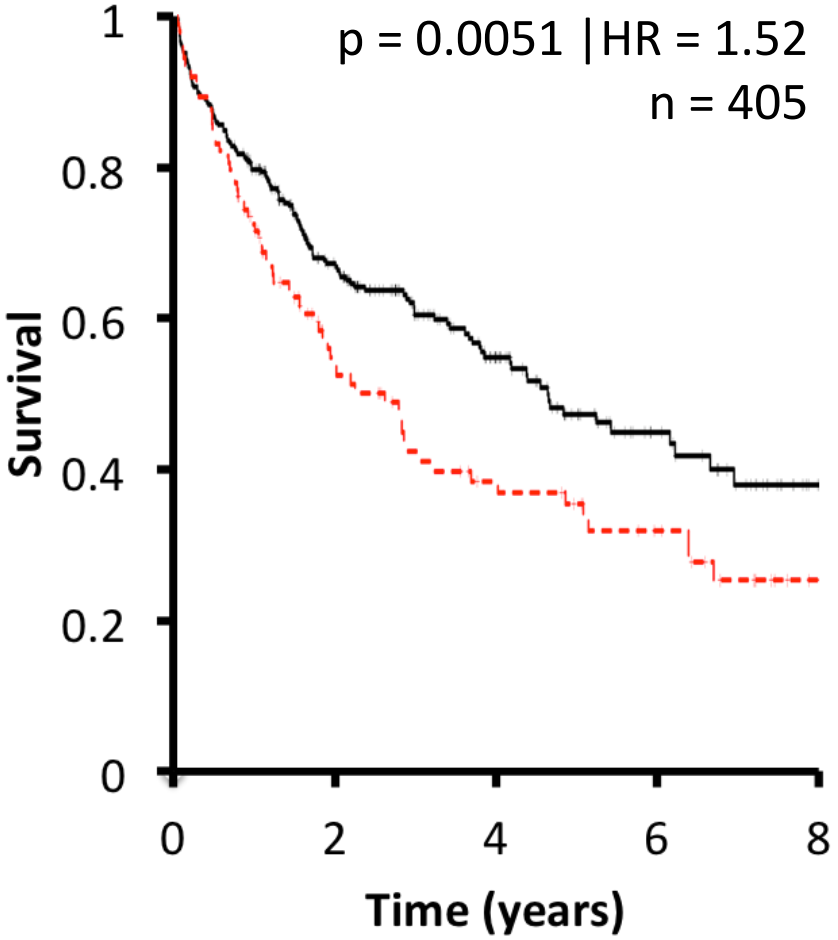
PD
p = 0.082 | HR = 1.42
n = 252

Hypo vs no hypo:

Diabetes

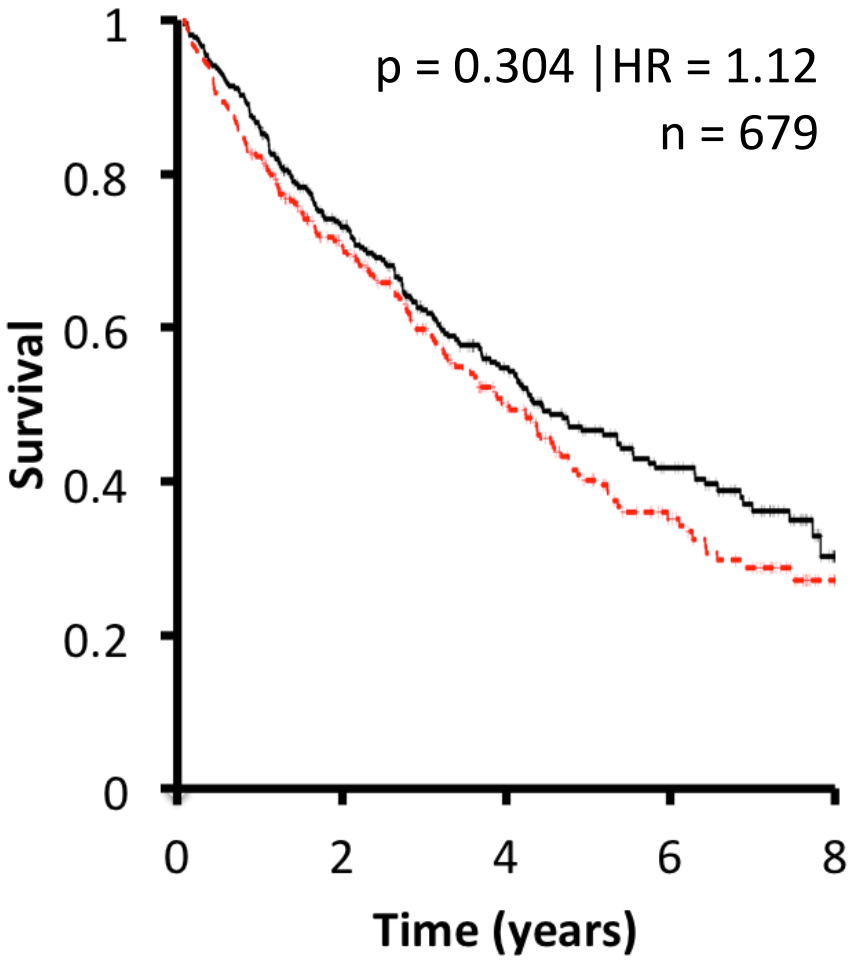


No Diabetes

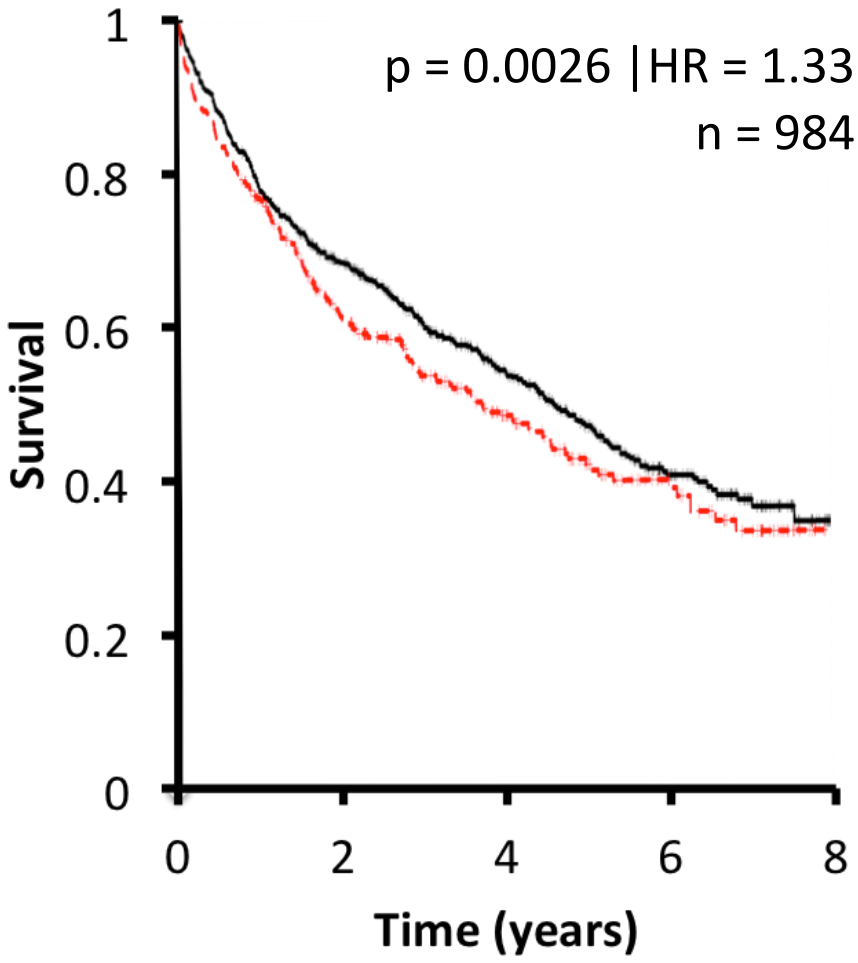


High vs Low variability:

Diabetes



No Diabetes



Results - summary

Hypoglycaemia and high glucose variability are associated with increased mortality in RRT patients

Hypoglycaemia is associated with increased mortality in RRT patients with and without diabetes

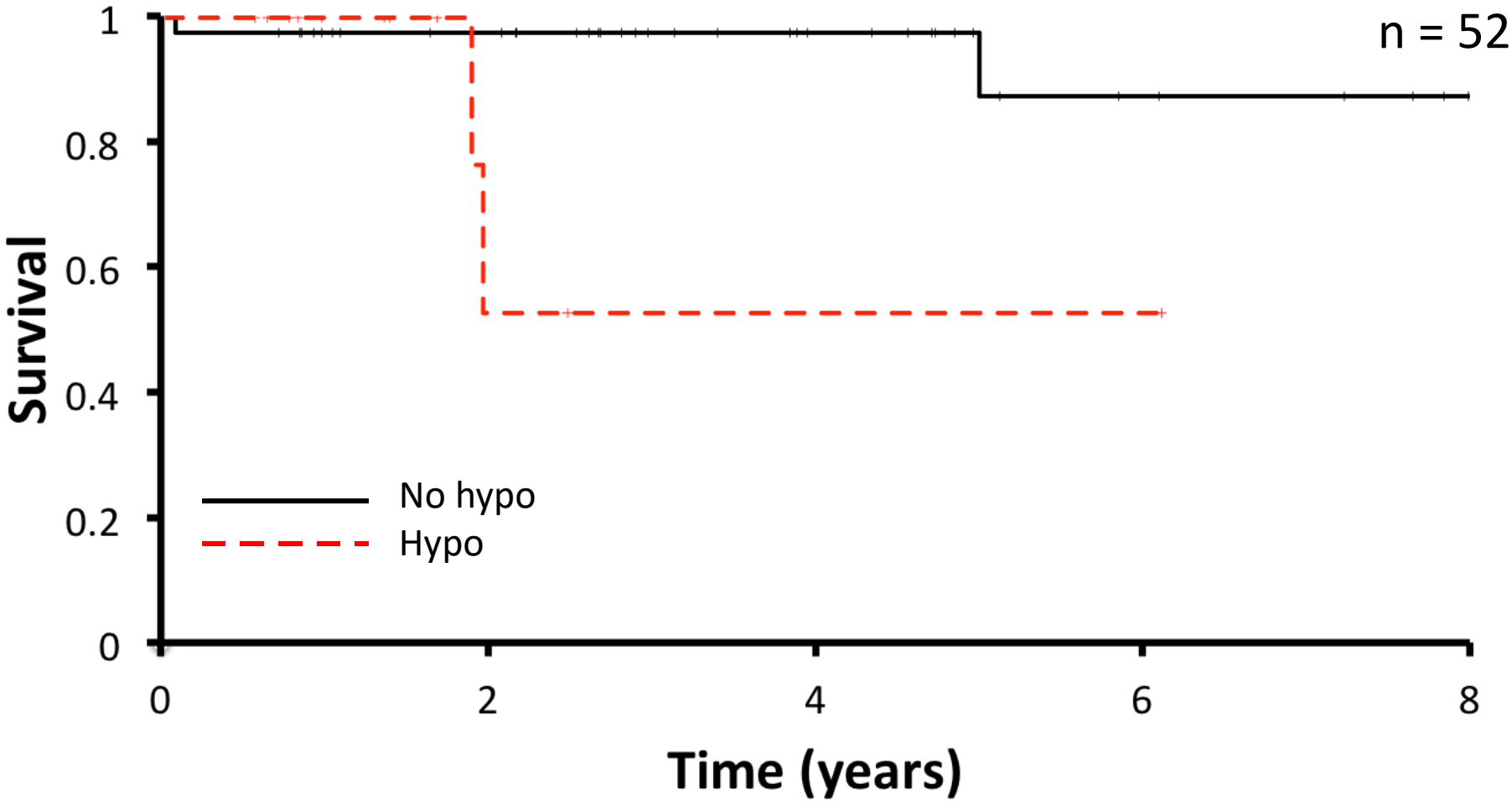
High glucose variability is associated with increased mortality in RRT patients without diabetes but not those with diabetes

Discussion

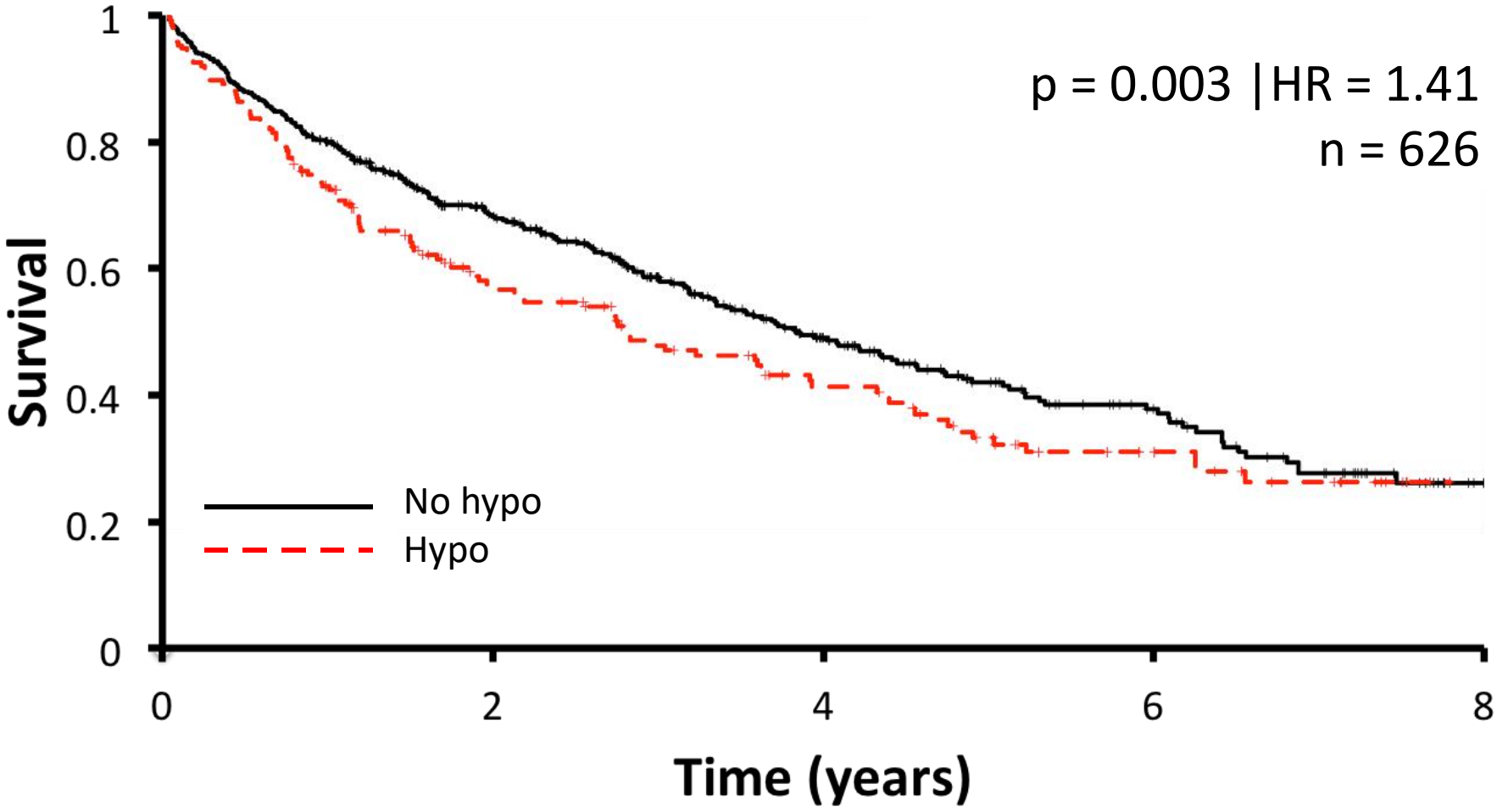
- Diabetes likely a confounder with whole cohort group
- Hypoglycaemia associated with increased mortality in non-diabetic group
  - Mechanism – dialysis related?
  - Sepsis / alcohol / liver / adrenal
- Lack of effect on mortality of variability in diabetes surprising
- Further work planned

Tx hypo vs no hypo

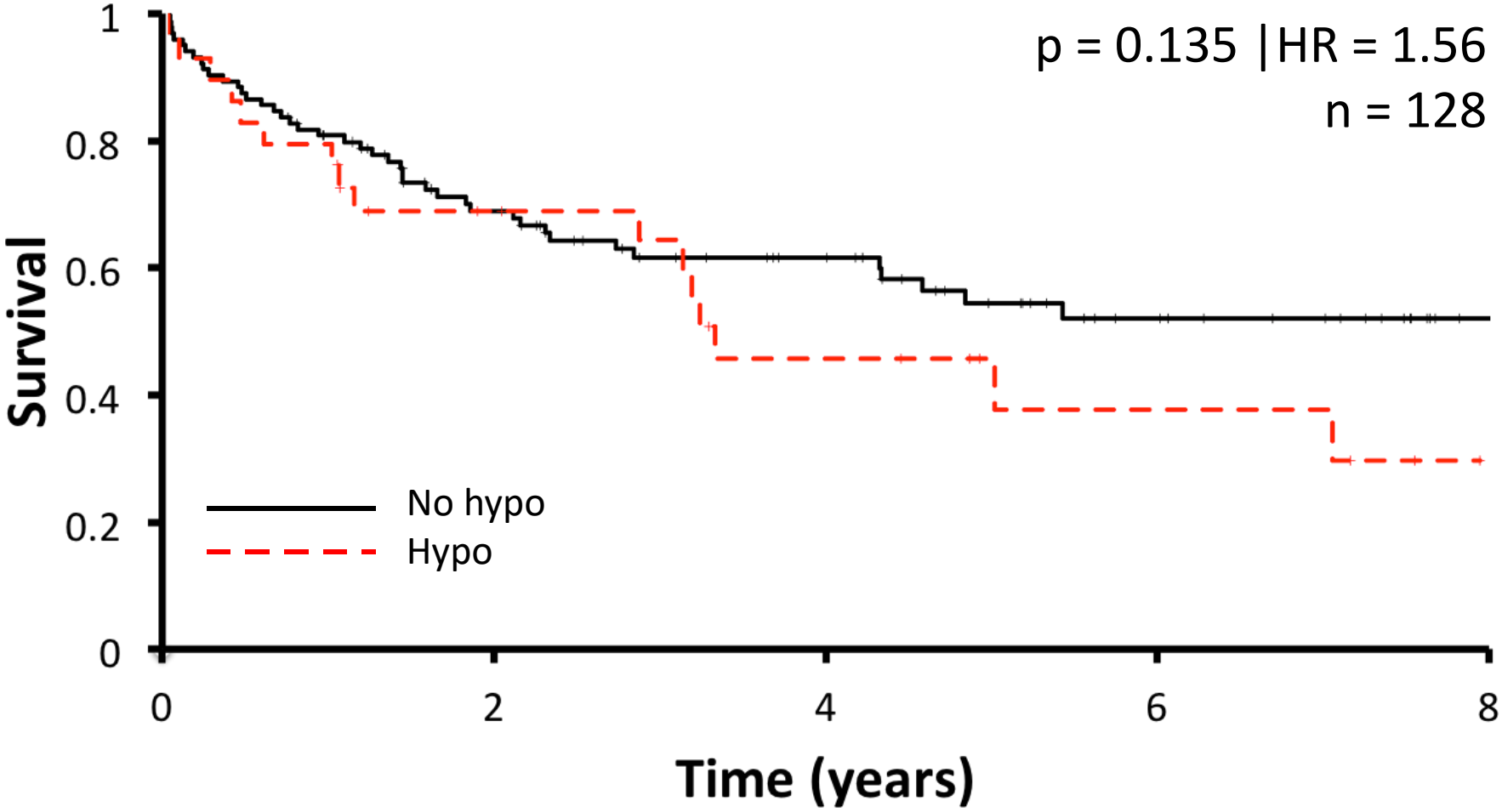
p = 0.0502 |HR = 9.39



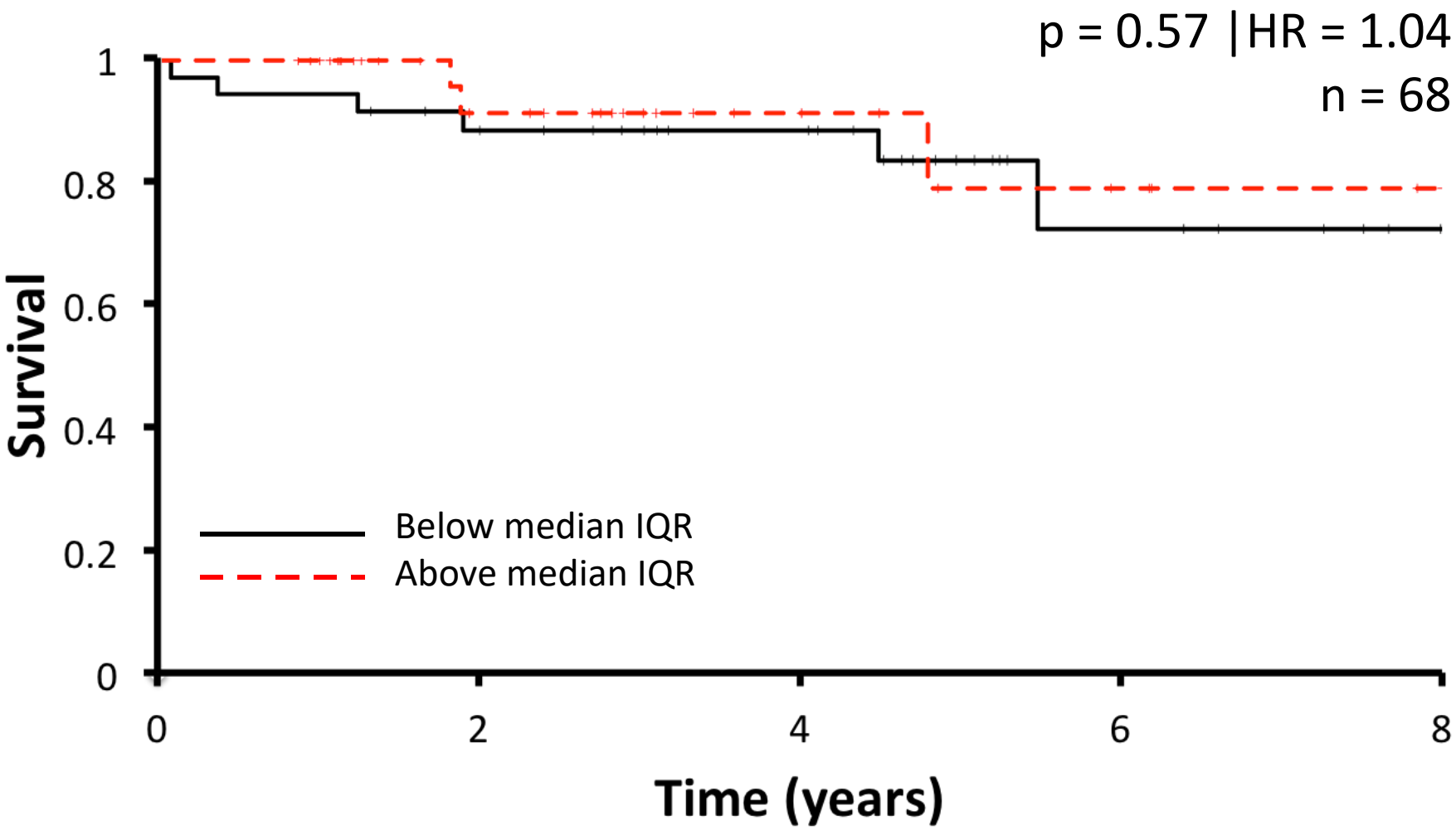
HD hypo vs no hypo



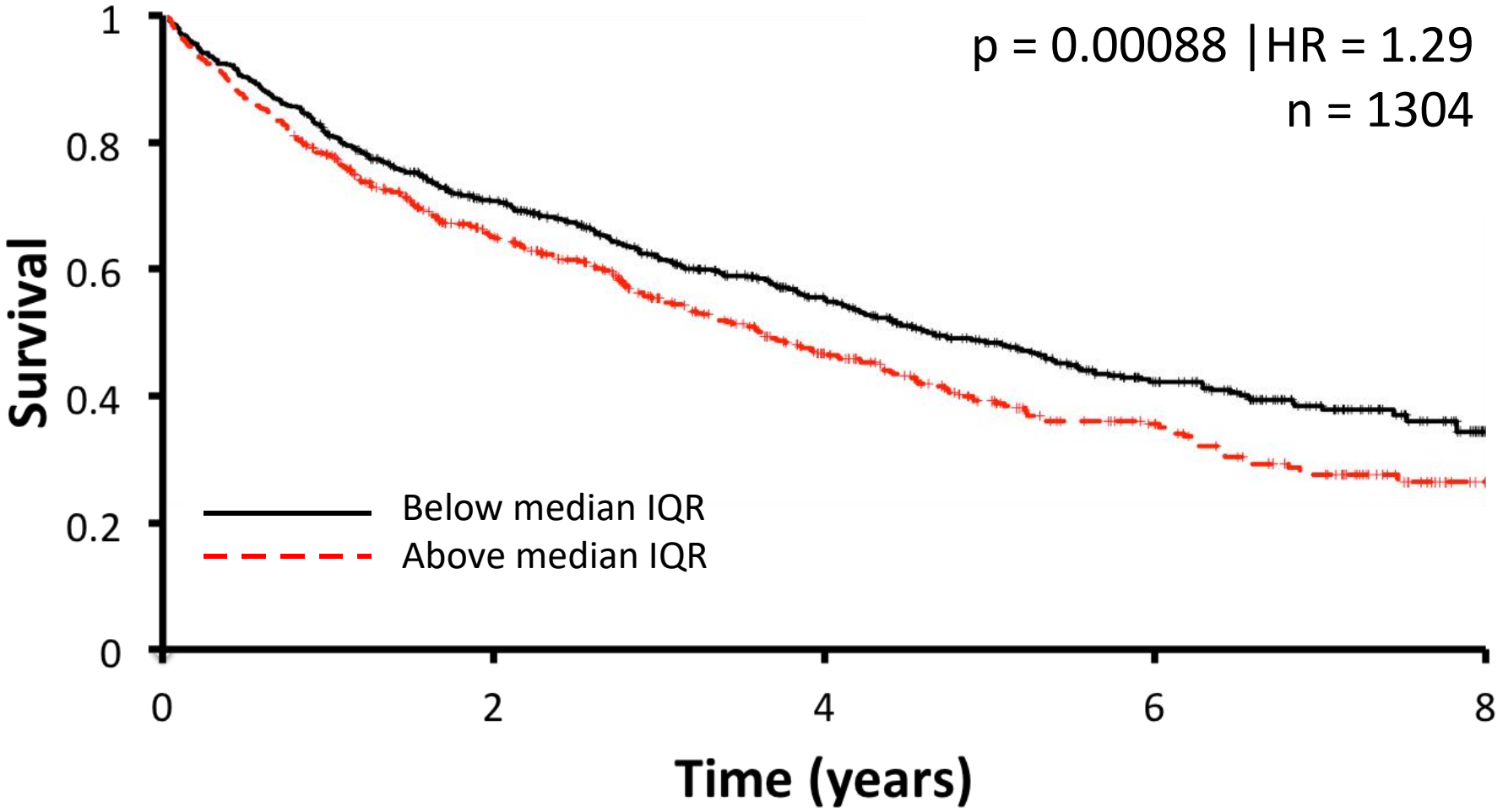
PD hypo vs no hypo



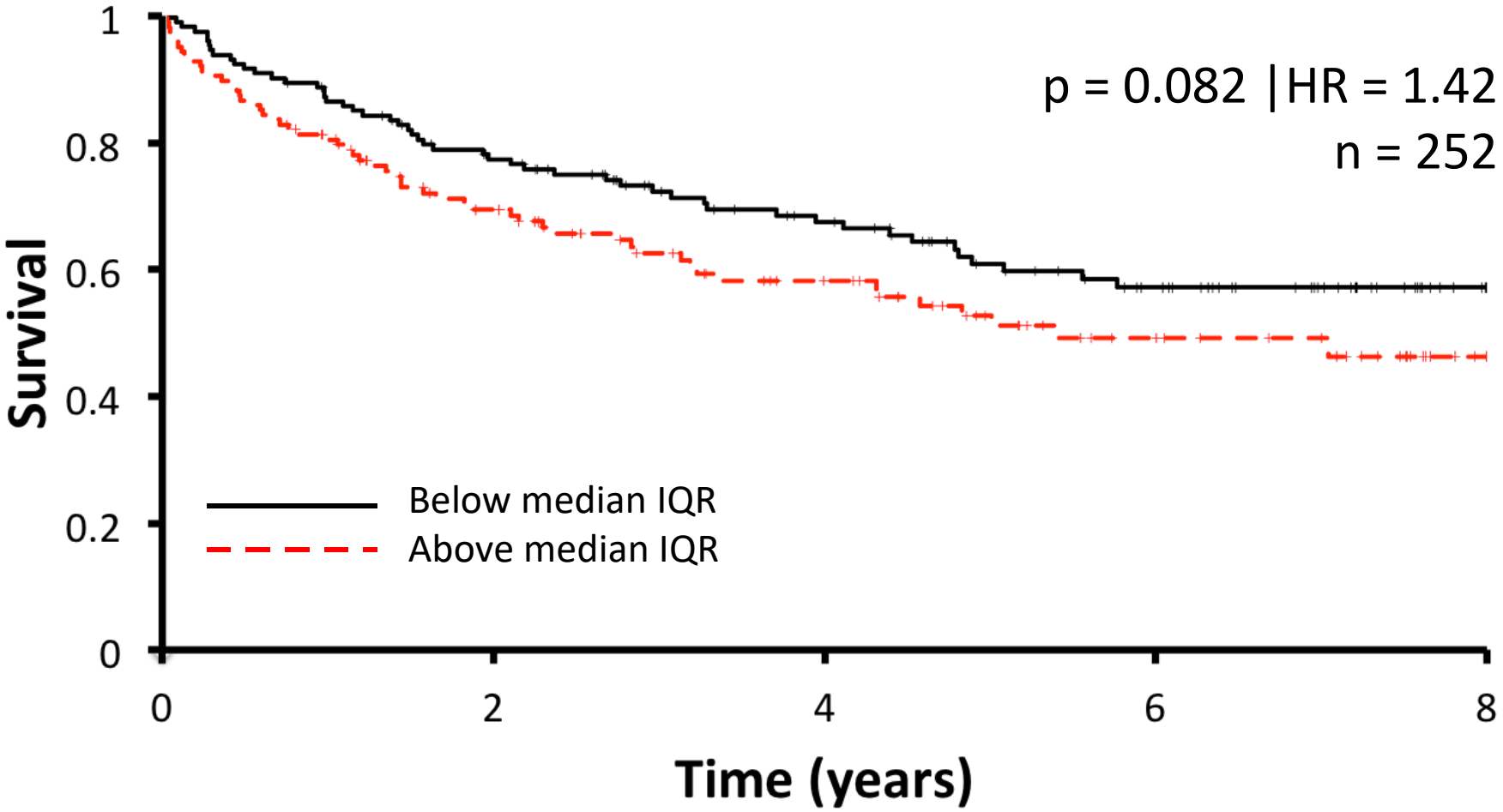
Tx high vs low variability



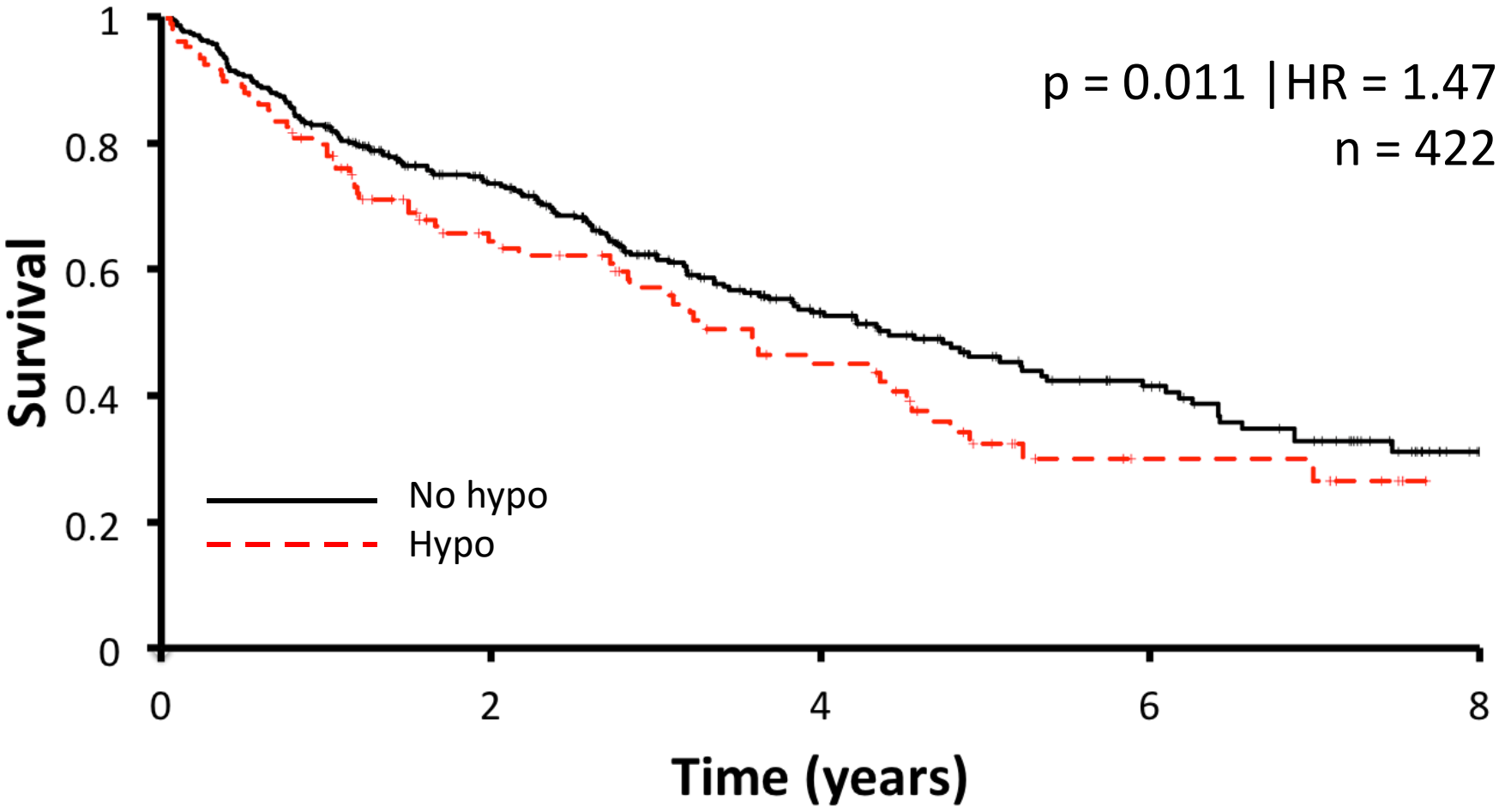
HD high vs low variability



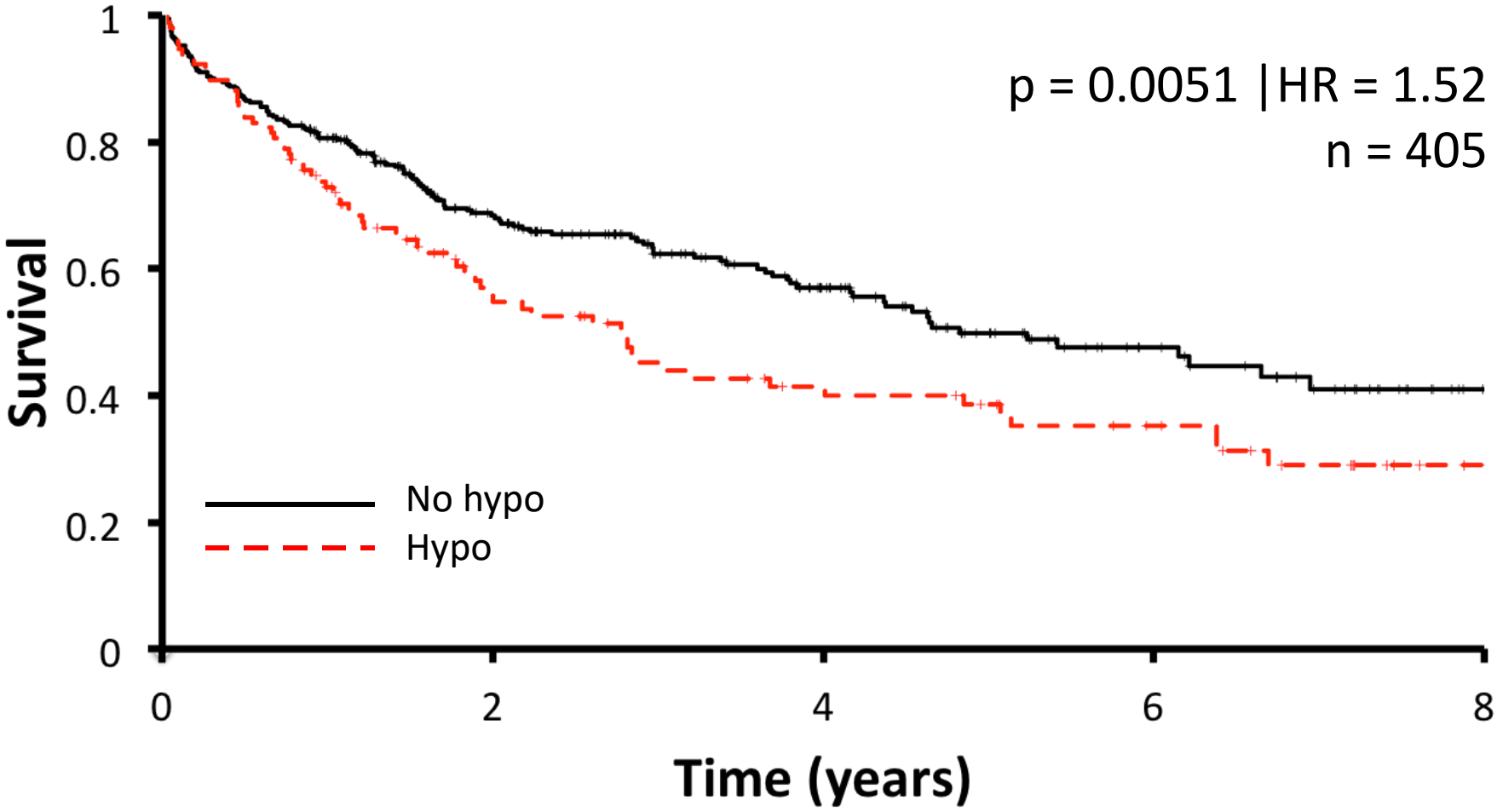
PD high vs low variability



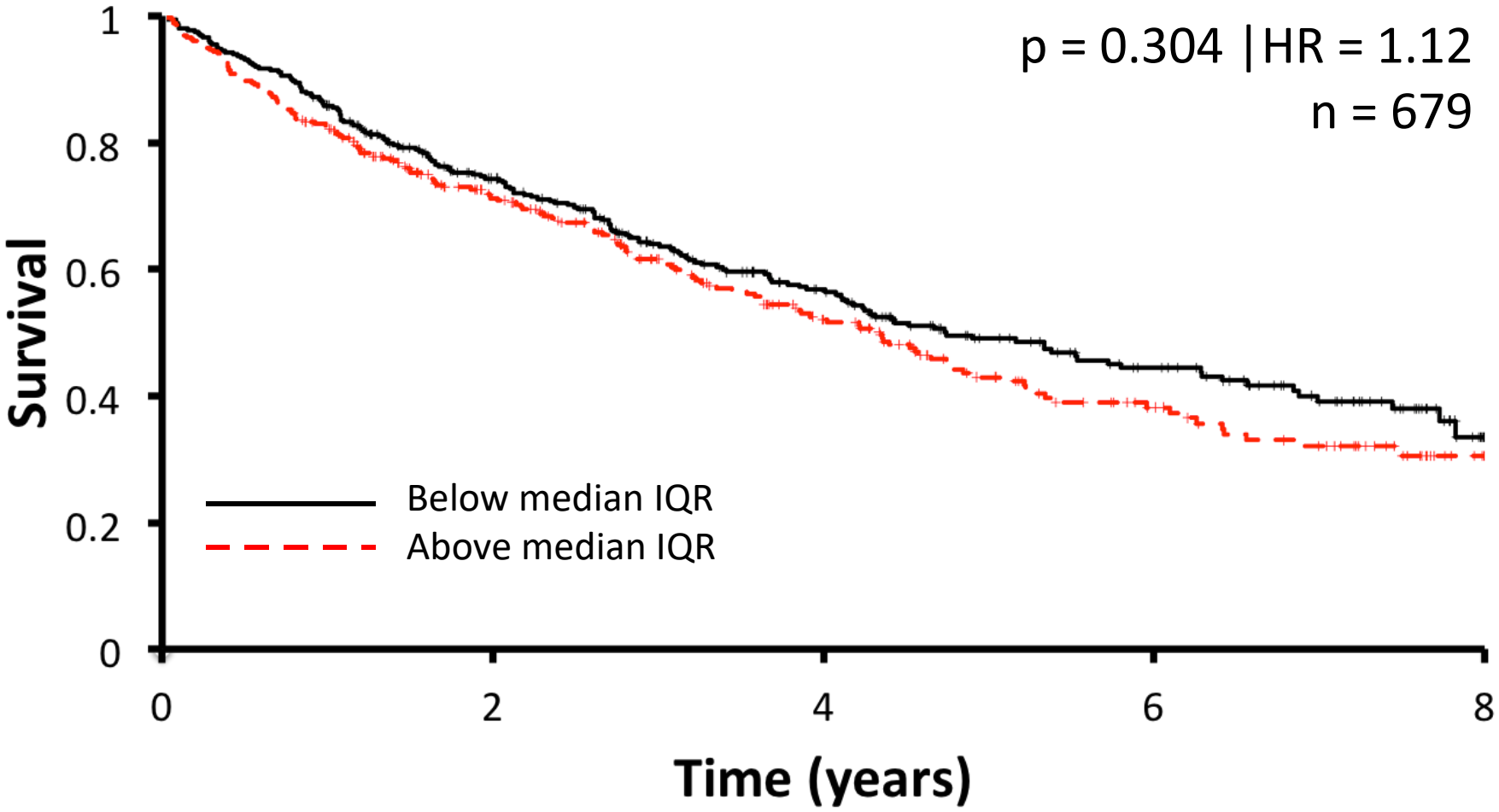
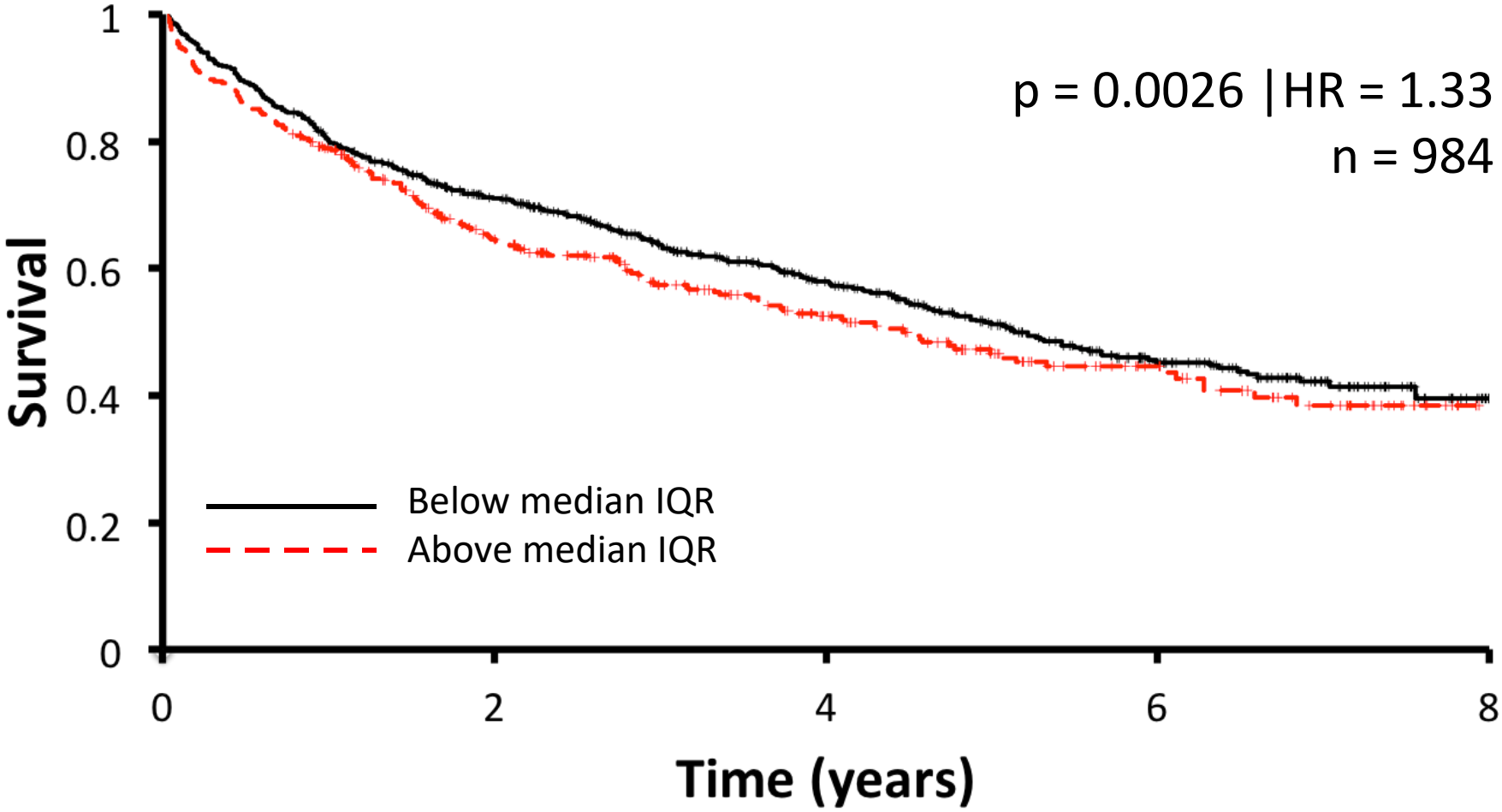
Diabetes (all RRT): hypo vs no hypo



No diabetes (all RRT): hypo vs no hypo



Diabetes (all RRT): high vs low variability



No diabetes (all RRT): high vs low variability