Admission Glucose Number (AGN):
A novel point-of-admission score associated with prolonged admission duration, and with glycaemic characteristics in patients with Type 1 Diabetes

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Faculty Disclosure

	No, nothing to disclose
	Yes, please specify:

Company Name	*Honoraria/ Expenses*	*Consulting/ Advisory Board*	*Funded Research*	*Royalties/ Patent*	*Stock Options*	*Ownership/ Equity Position*	*Employee*	*Other (please specify)*
Novo Nordisk		x						
Lilly			x					
GlycoSys						x		

AGN - rationale

- individuals with T1DM have high rate of adverse events whilst in hospital
- within our dataset, inpatient hypoglycaemia common (43.6% T1DM admissions)
  - dysglycaemia is associated with prolonged duration of admission[1]
  - higher glucose variability associated with higher rate of adverse outcome
- stratification of individuals for risk at the point of admission enables appropriate clinical response to risk - with a potential for improved outcomes for patients

1. Hypoglycemia and Clinical Outcomes In Hospitalized Patients With Diabetes: Does Association With Adverse Outcomes Remain When Number of Glucose Tests Performed Is Accounted For? GC Jones et al. Journal of Diabetes Science and Technology, 2017

AGN - rationale

- for an individual, the distance of initial glucose (at the point of admission) from average glucose values are a means of indicating metabolic stress, and may therefore assist risk stratification
  - average glucose value taken from last measured HbA1c value within a 15-month window pre-admission
  - initial glucose taken as the first measured CBG during the admission (CBG^{1})

admission glucose number (AGN) calculation

last HbA1c prior to admission

convert to estimated Average Glucose (eAG) (mmol/l)

CBG measured at admission

CBG[1] (mmol/l)

point of admission

$$AGN = eAG - CBG^{1}$$

design

- retrospectively identify admissions of individuals with Type 1 Diabetes
- calculate Admission Glucose Number (AGN)
- associate AGN with metrics directly or indirectly associated with poor outcome:
  - minimum glucose during admission
  - glucose variability during admission (IQR)
  - admission duration
  - hypoglycaemia rate / day

data setting – all inpatient episodes 2009-16

5151 unique IDs | 21246 secondary care contacts
428247 CBG values

n CBG per contact >1

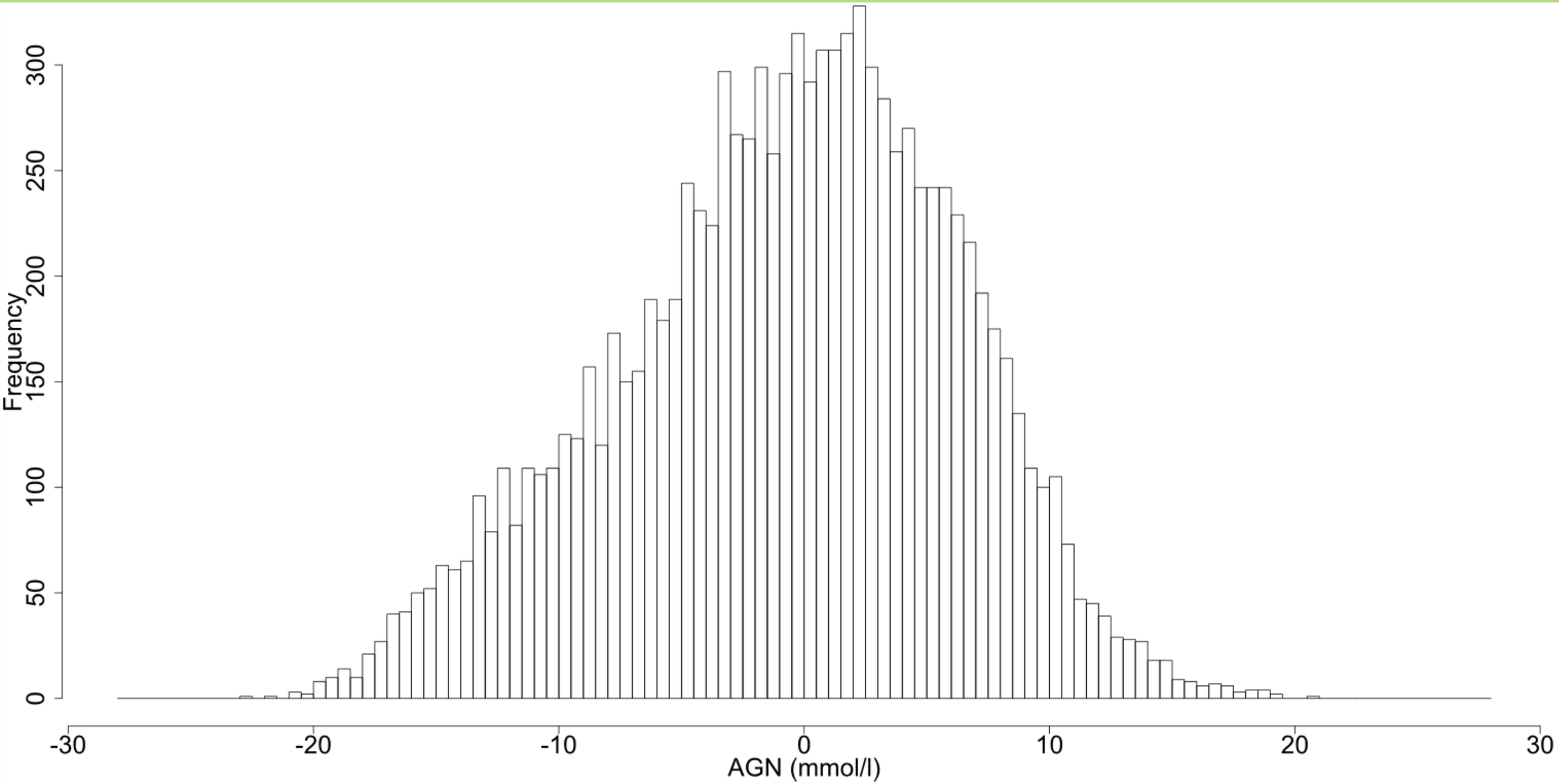
HbA1c within 15 months prior to admission

3507 unique IDs | **10598** admission episodes

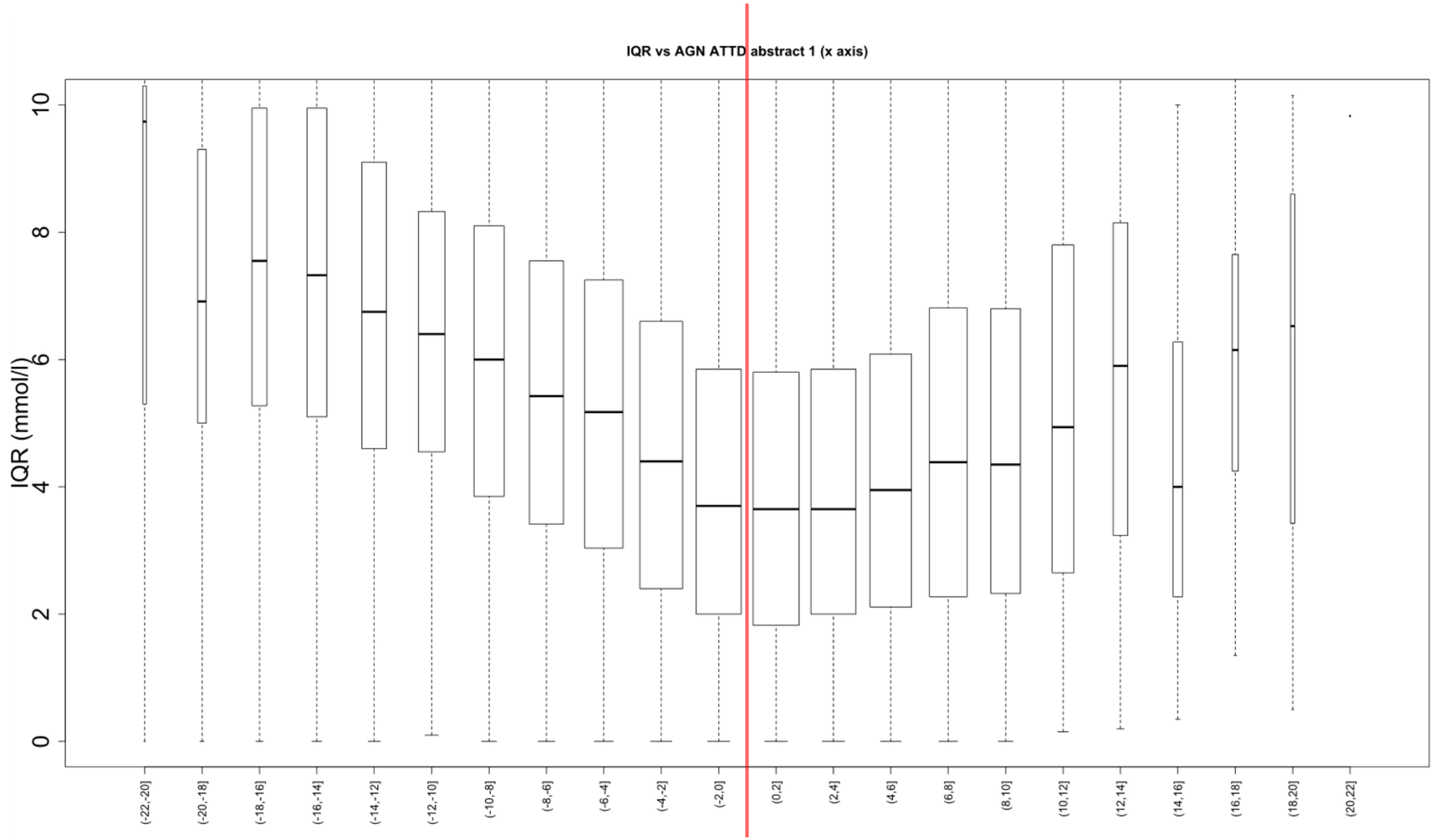
admission characteristics

age at admission	46.9 (30.7 – 60.4)	years
diabetes duration	17.7 (10.1 – 29.4)	years
admission duration	1.8 (0.5 – 5.1)	days
median glucose	10.6 (8.1 – 13.2)	mmol/l
glucose IQR	4.6 (2.5 – 7.0)	mmol/l
initial glucose	12.2 (7.3 – 18.2)	mmol/l
proportion of admissions with >=1 CBG <4mmol/l	0.43	
hypoglycaemia rate	0.22	episodes / day
last HbA1c prior to admisison	77 (64 – 93)	mmol/mol
eAG	12.1 (10.2 – 14.4)	mmol/l
AGN	-0.2 (-5.2 – 4.3)	mmol/l

AGN distribution

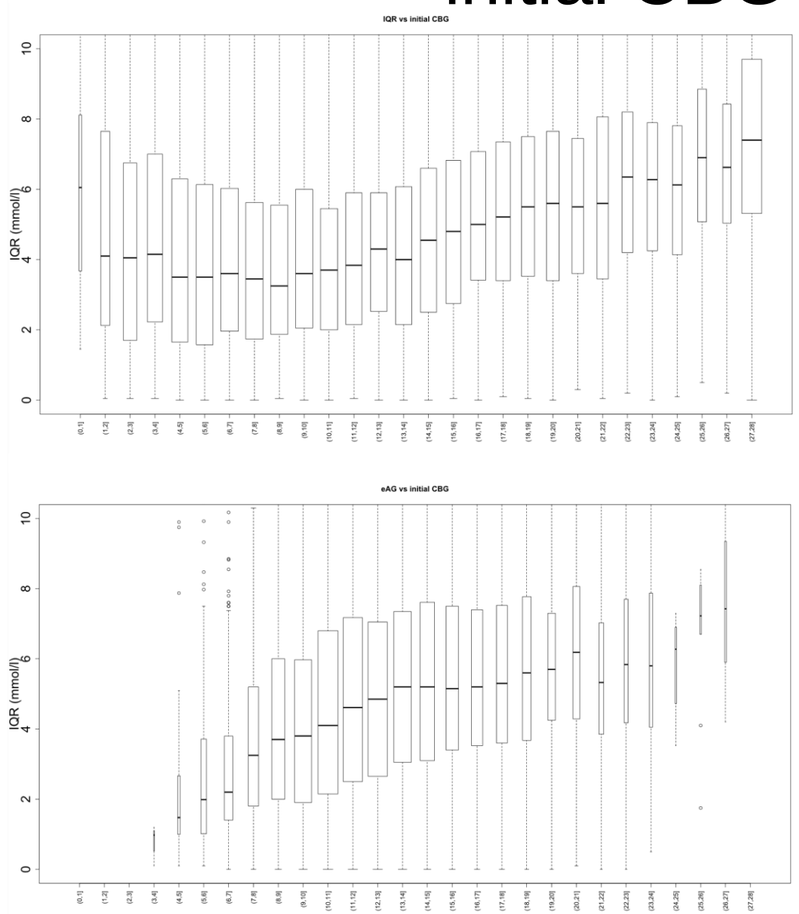


glucose variability (IQR) during admission



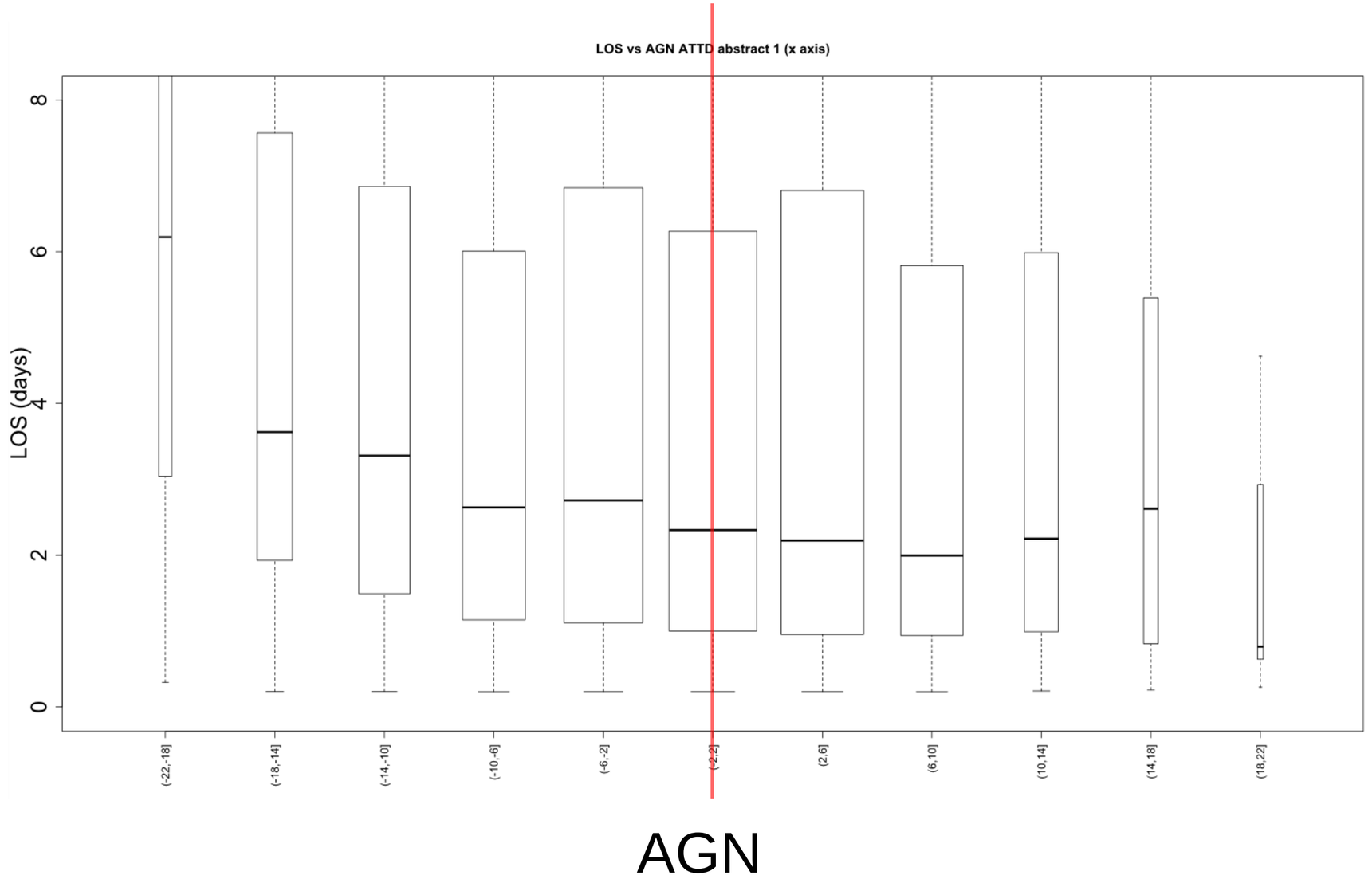
AGN

initial CBG



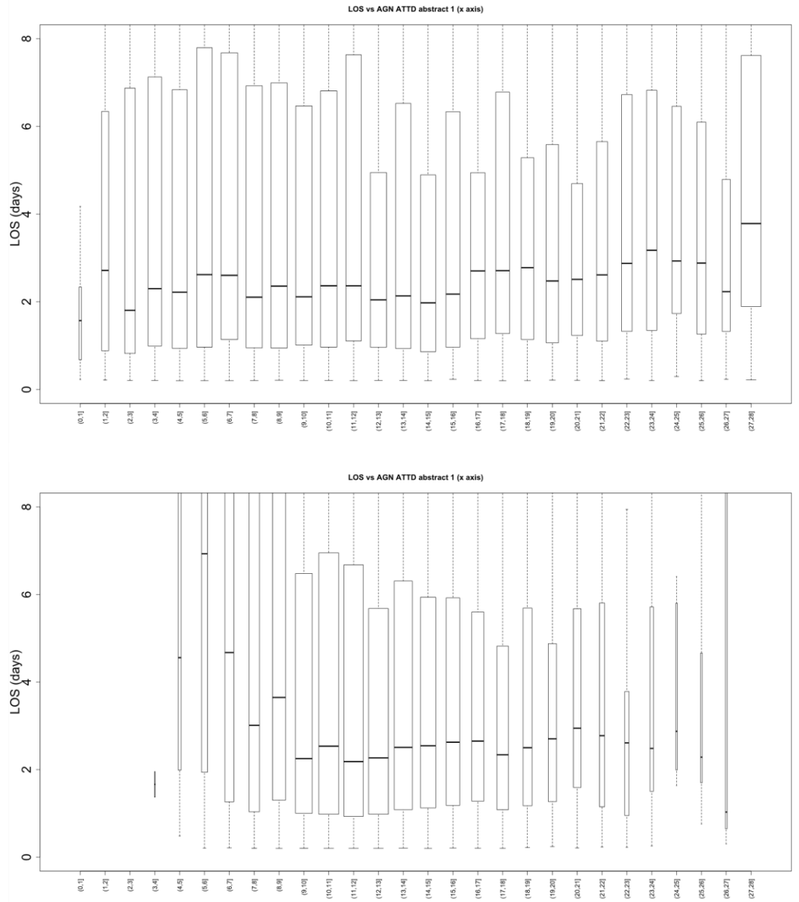
eAG

admission duration (days)



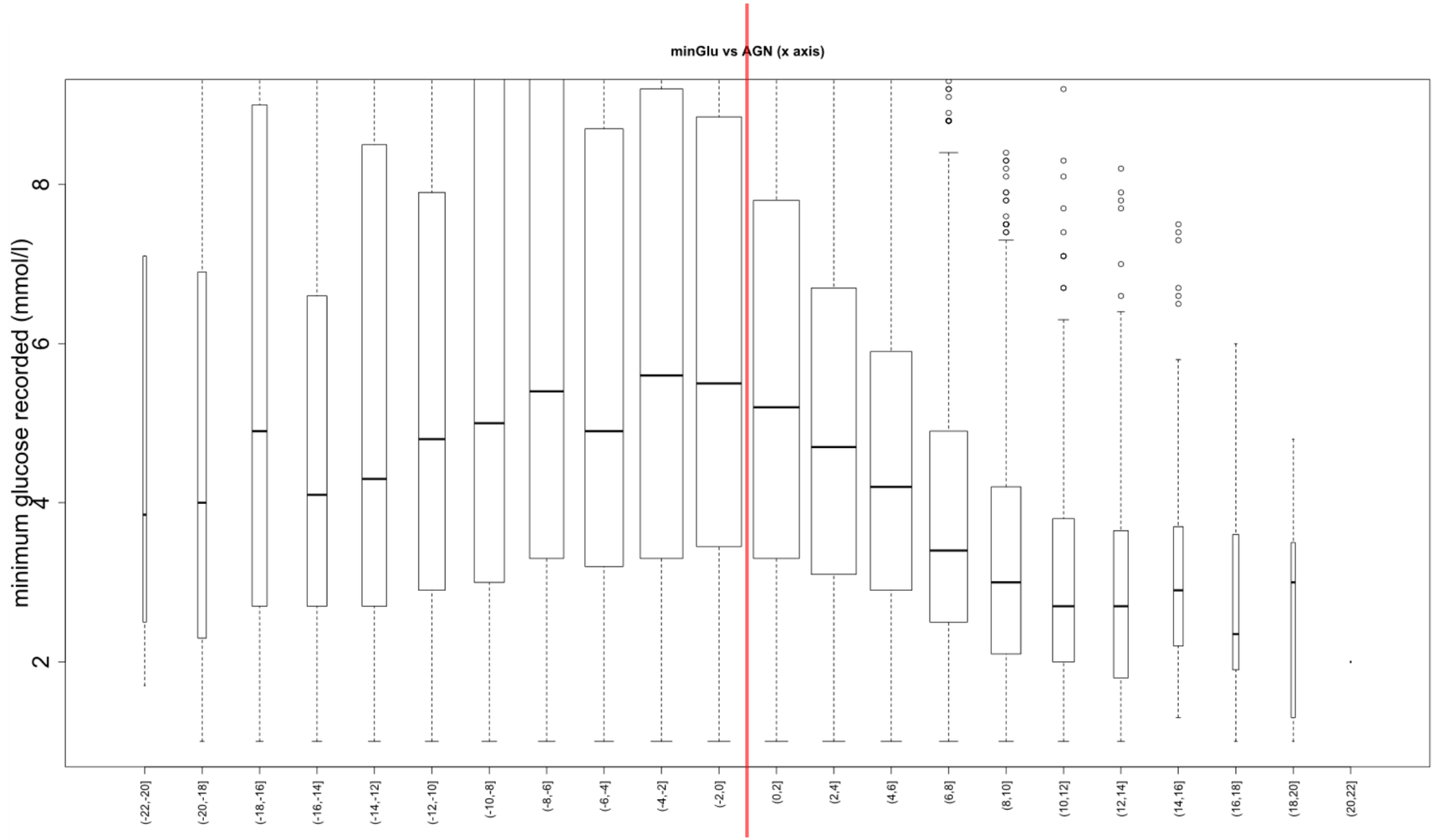
AGN

initial CBG



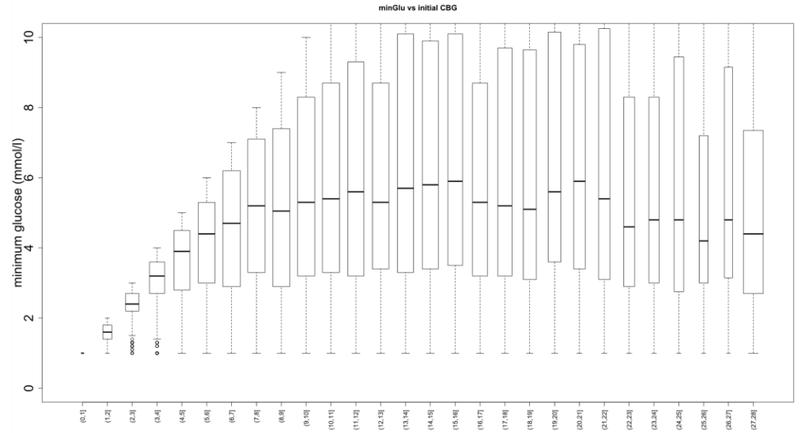
eAG

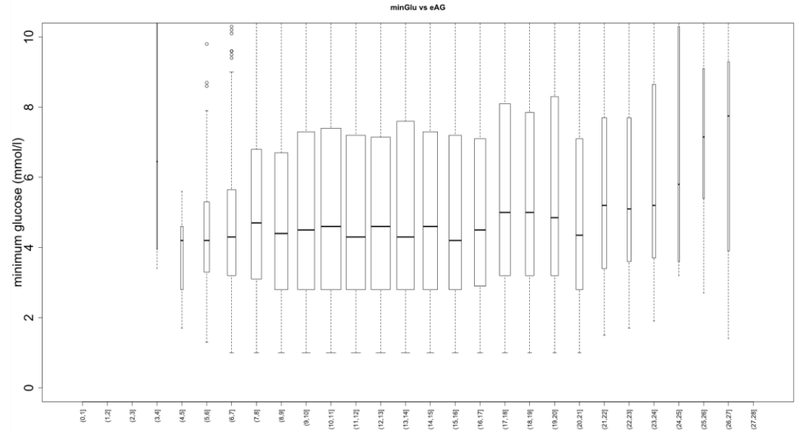
minimum glucose during admission



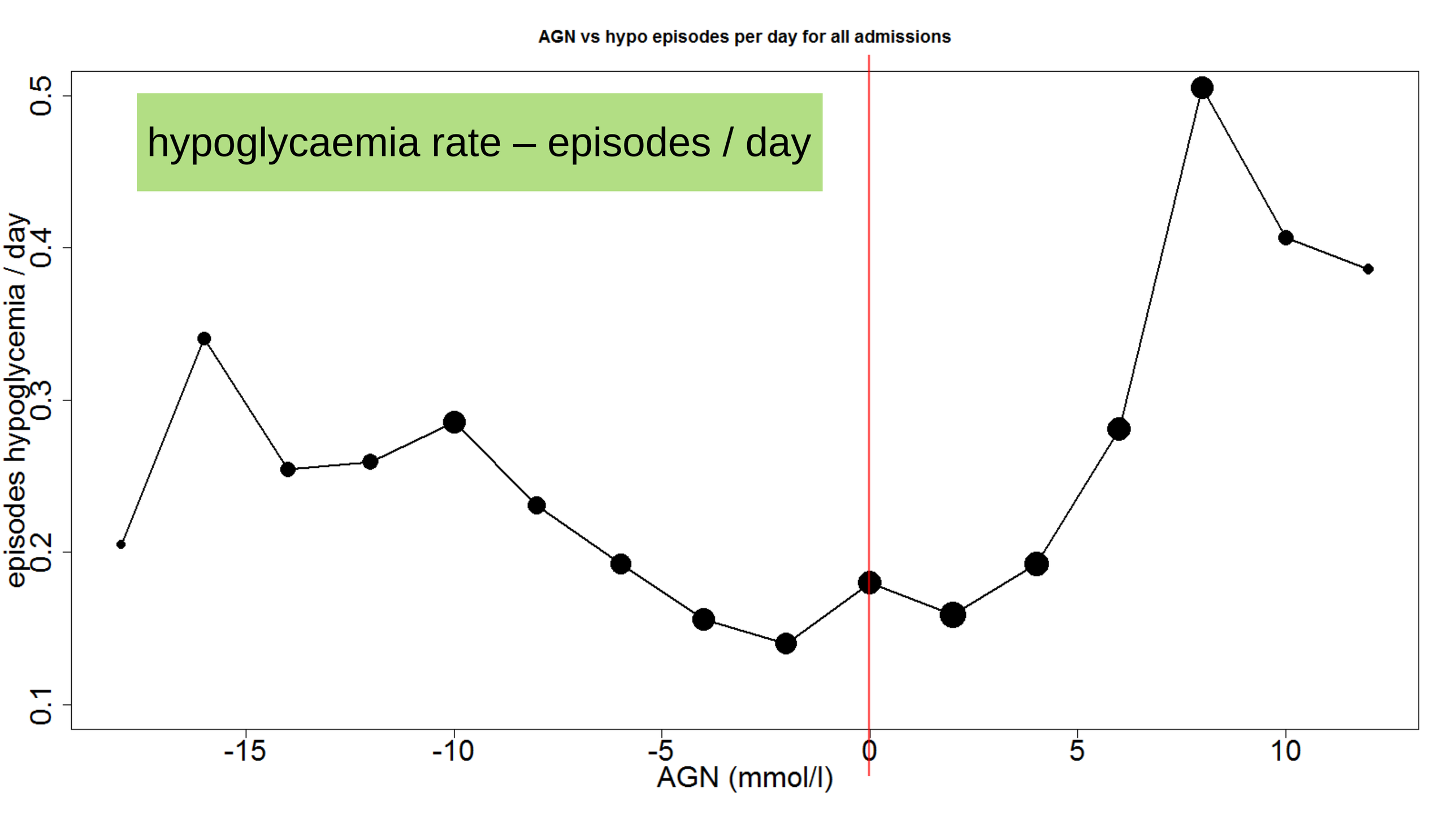
AGN

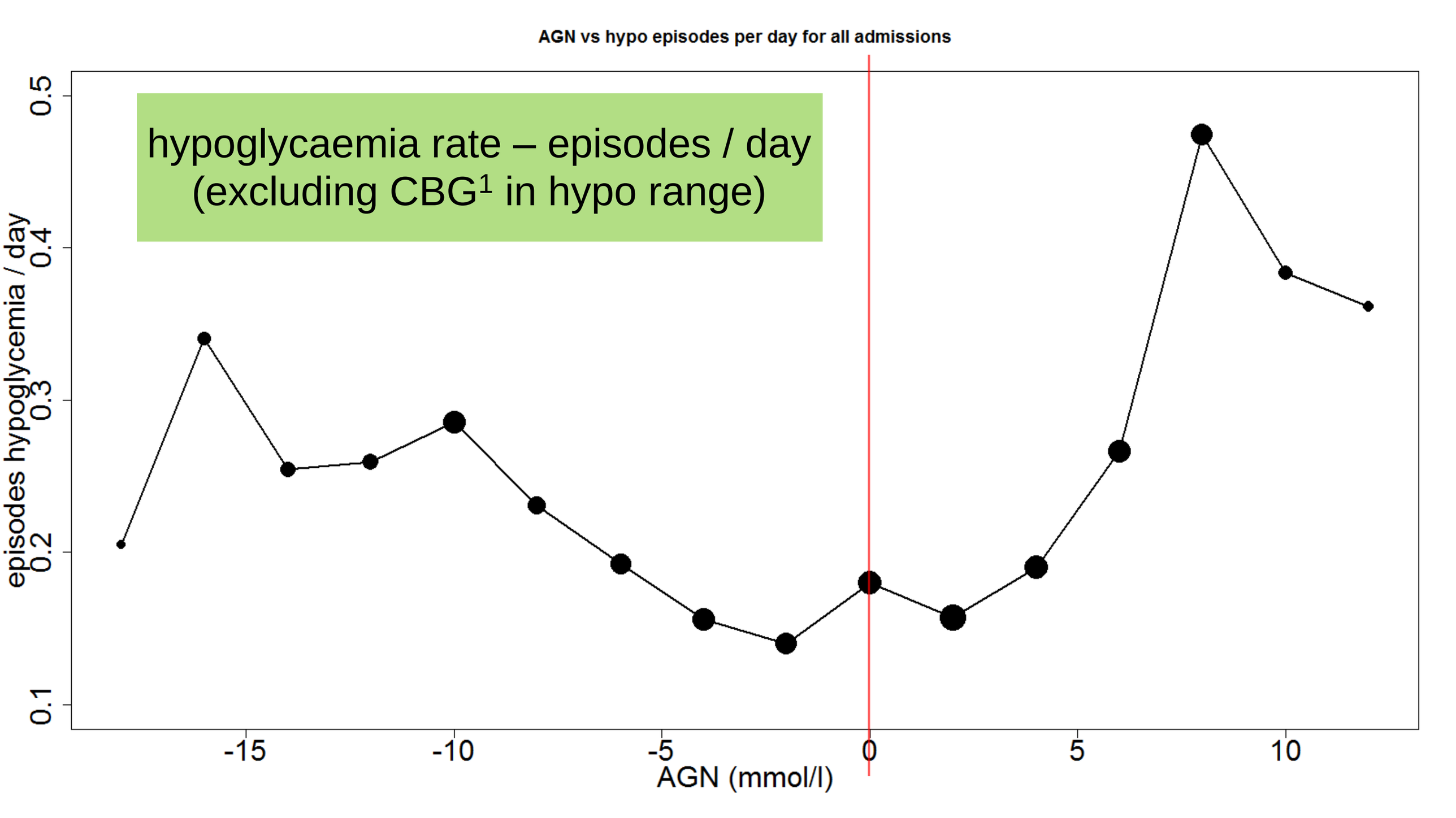
initial CBG





eAG


AGN vs hypo episodes per day for all admissions
hypoglycaemia rate – episodes / day
episodes hypoglycemia / day
0.1
0.2
0.3
0.4
0.5
-15
-10
-5
0
5
10
AGN (mmol/l)


AGN vs hypo episodes per day for all admissions
hypoglycaemia rate – episodes / day
(excluding CBG[1] in hypo range)
episodes hypoglycemia / day
0.1
0.2
0.3
0.4
0.5
-15
-10
-5
0
5
10
AGN (mmol/l)

in summary

- AGN has a clear association with glycaemic variability and hypoglycaemia frequency during admission.
- simple to calculate and uses measures that will be available for the majority of patients with T1DM at the point of admission
- out-performs its component elements (admission CBG and immediate past HbA1c) when stratifying for risk

thankyou

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