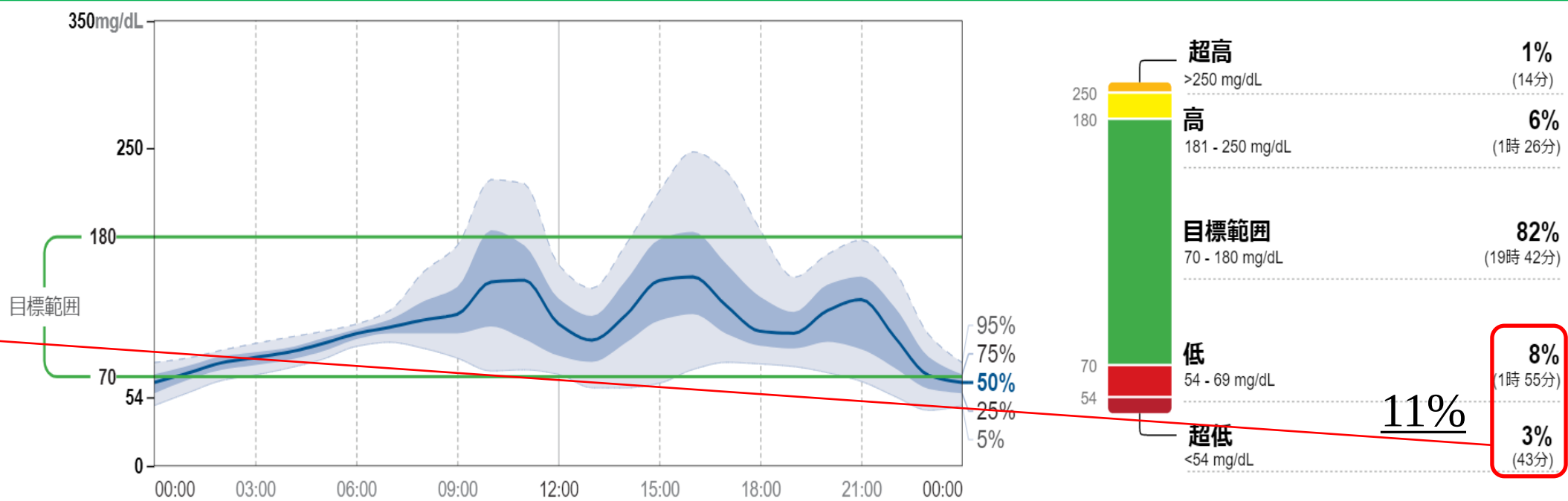




Background

- Ambulatory glucose profile (AGP) is very useful for grasping glycemic variability and determining therapeutic strategy [1, 2].
- Time-below-range (TBR) for target duration is described in AGP reports for CGM [1, 2].
- For a method to reduce hypoglycemia, it is necessary to determine the frequency of hypoglycemia and the time zone when hypoglycemia occurs.
- In this study, we evaluated a method for predicting TBR from AGP.

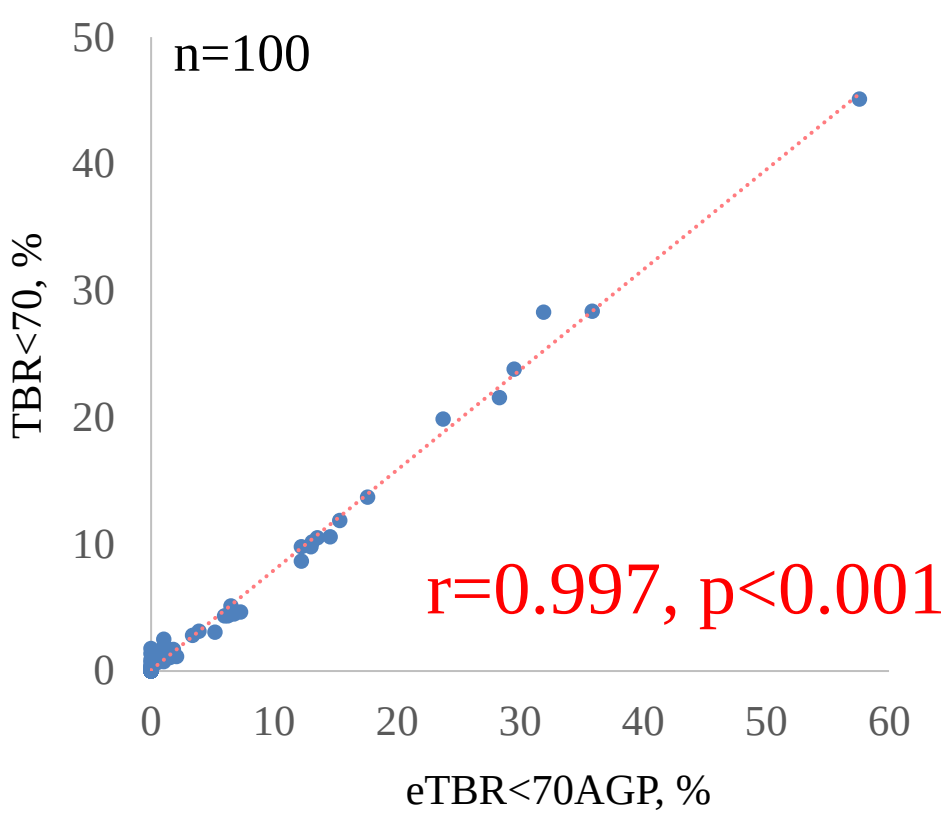
1. Kröger, et al. J Diabetes Sci Technol. 2020; 14: 586–594.
2. Czupryniak L, et al. Diabetes Ther. 2022; 13: 811–821.



Research design & Methods

- This is a cross-sectional study.
- We analyzed glucose levels (GL) measured using CGM (FreeStyle Libre Pro) over 24 hours for 13 days (from 00:00 on Day 2 to 00:00 on Day 15 [CGM attachment: Day 1]) for 100 outpatients with type 2 diabetes, whose diabetic treatment did not change through the CGM-wearing duration.
- We proposed the metric, “eTBR<70AGP” as follows:
 - ① When 95 percentile values are <70 mg/dL, glucose levels (GL) <70 mg/dL are defined to exist at “100%” (“hypoglycemia existing rate (HER)”).
When 95 percentile values are not <70 mg/dL and 75 percentile values are <70 mg/dL, GL <70 mg/dL are defined to exist at 95%.
When 75 percentile values are not <70 mg/dL and 50 percentile values are <70 mg/dL, GL <70 mg/dL are defined to exist at 75%.
When 50 percentile values are not <70 mg/dL and 25 percentile values are <70 mg/dL, GL <70 mg/dL are defined to exist at 50%.
When 25 percentile values are not <70 mg/dL and 5 percentile values are <70 mg/dL, GL <70 mg/dL are defined to exist at 25%.
When 5 percentile values are not <70 mg/dL, GL <70 mg/dL are defined nonexistent for convenience.
 - ② We applied the definition mentioned in ① to the percentile values in the 13 days for each 96 timepoint of measurement every 15 minutes over 24-hours and determined the HER.
 - ③ We calculated the eTBR<70AGP as the average of HER of the 96 timepoint.
- We also calculated “TBR (<70 mg/dL)” [TBR<70] for the 13 days.

- Primary endpoints
Correlation between eTBR<70AGP and TBR<70
- Secondary endpoints
The optimal cutoff value of TBR<70 for “eTBR<70AGP – TBR<70 > 0”
Comparison between eTBR<70AGP and TBR<70



Characteristic	Values
N (Male / Female)	100 (60 / 40)
Age, years	69.5 ± 13.4
BMI, kg/m ²	24.2 ± 4.1
HbA1c, %	8.0 ± 1.5

Table 1: Baseline characteristics
Data are shown as mean ± standard deviation.
BMI, body mass index; HbA1c, hemoglobin A1c

Fig. 1: Correlation between eTBR<70AGP and TBR<70
p: Pearson's product-moment correlation coefficient
TBR<70; time-below-range (<70 mg/dL)
eTBR<70AGP; TBR<70 estimated from Ambulatory Glucose Profile

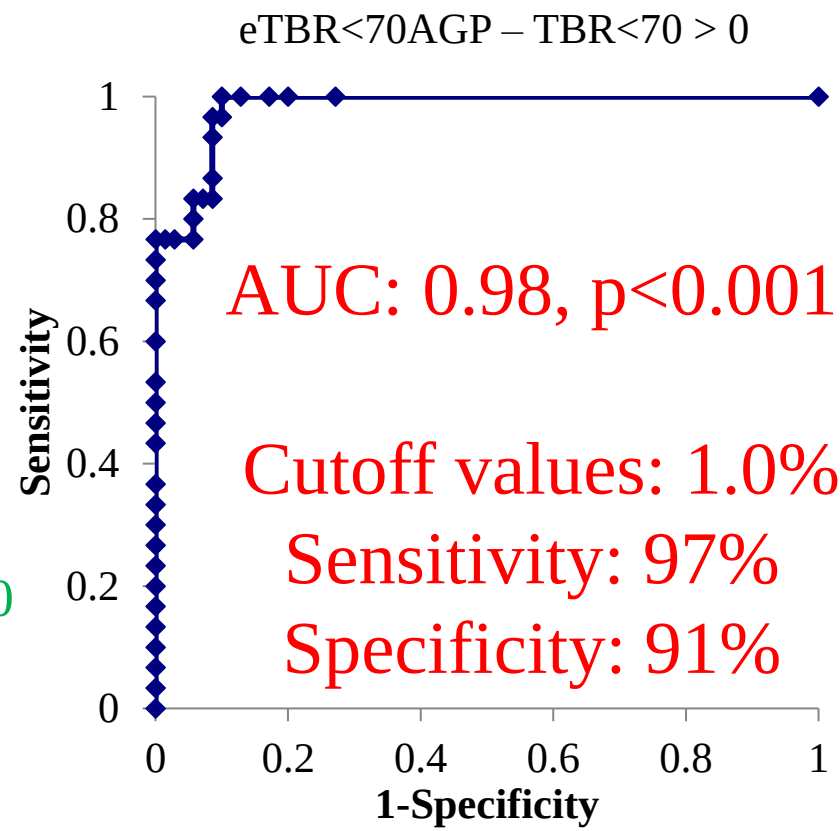


Fig. 2: The optimal cutoff value of TBR<70 for “eTBR<70AGP – TBR<70 > 0”
p: Receiver Operating Characteristic analysis
AUC: area under the curve

	eTBR<70 AGP	TBR<70	p
Overall (n=100)	3.9±9.2	3.1±7.3	<0.001
TBR<70 >1% (n=34)	11.3±12.9	9.0±10.2	<0.001
TBR<70 <1% (n=66)	0.04±0.2	0.08±0.2	0.02

Table 2: Comparison between eTBR<70AGP and TBR<70
p: paired t-test

In patients with TBR<70 >1%, eTBR<70AGP was clinically equivalent to TBR<70 as values. However, eTBR<70AGP was statistically significantly higher than TBR<70.

In patients with TBR<70 <1%, eTBR<70AGP was clinically equivalent to TBR<70 as values. However, eTBR<70AGP was statistically significantly lower than TBR<70.

Discussion

- The advantage of using eTBR predicted from AGP is that the concrete ideas to reduce hypoglycemia can be gotten from percentile values.
- TBR consists of “hypoglycemia frequency” and “hypoglycemia duration”.
- Reducing repeated occurrences at the same timepoint mainly leads to reducing frequency. To reduce duration, patients need to know the cause of continued hypoglycemia.

Conclusion

- eTBR<70AGP may be substituted for TBR<70 without underestimating the risk of hypoglycemia.
- Thinking in the calculation process of eTBR<70AGP may be utilized for assessment of the risk of hypoglycemia at each time zone.

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