GTT@home – Home Oral Glucose Tolerance Test
An alternative to clinic visits

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Introduction and Aims

Traditionally, diagnosis of the various classifications of glucose intolerance has been achieved by performing an Oral Glucose Tolerance Test (OGTT). More recently, measurement of glycated haemoglobin (HbA1c) has been employed as a diagnostic test for glucose intolerance, however there remain situations where HbA1c is not suitable.

OGTT can be expensive, inconvenient and difficult to provide, we therefore evaluated the performance of GTT@home, a novel home-use OGTT system, compared to a reference laboratory glucose analyser.
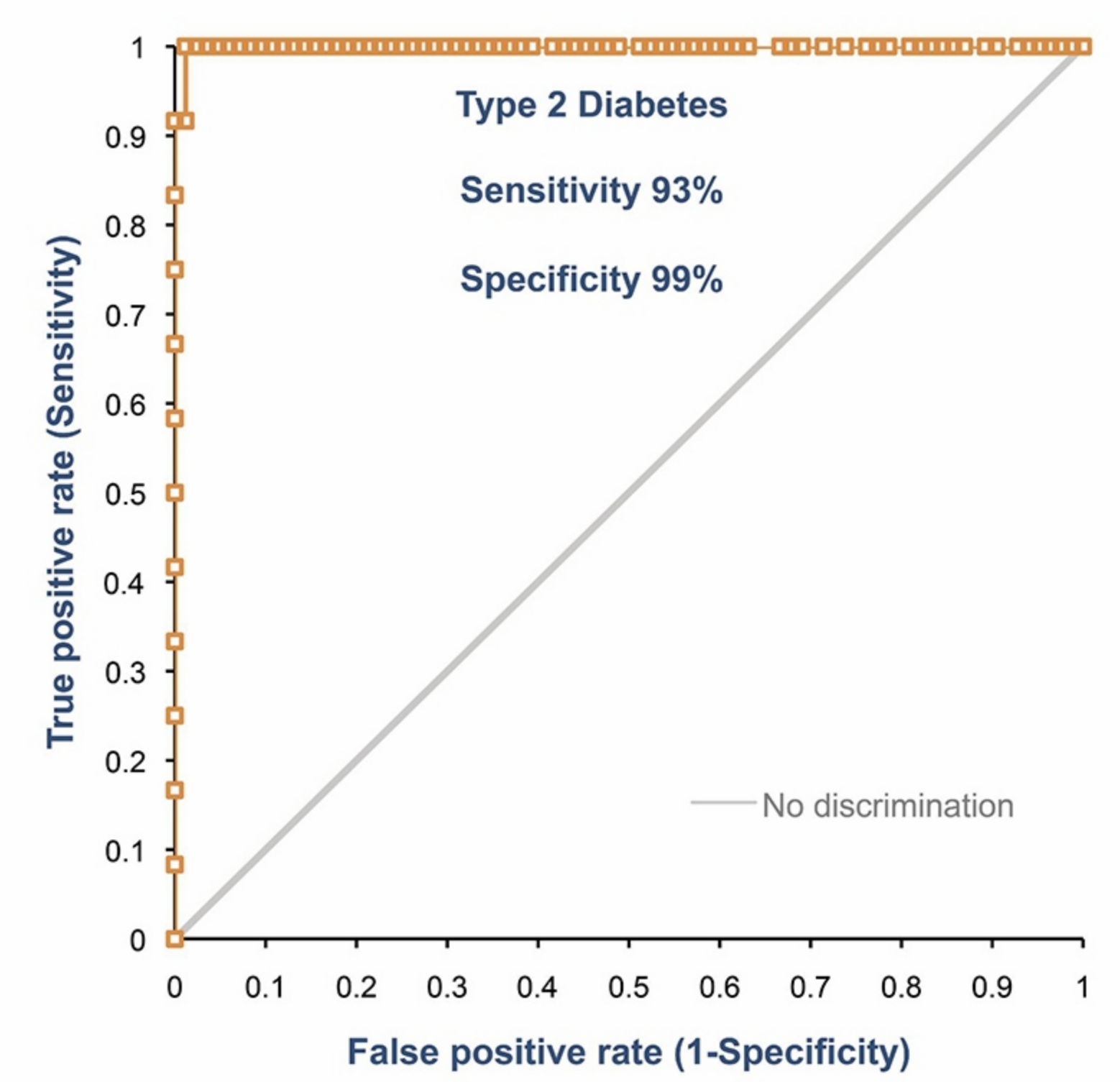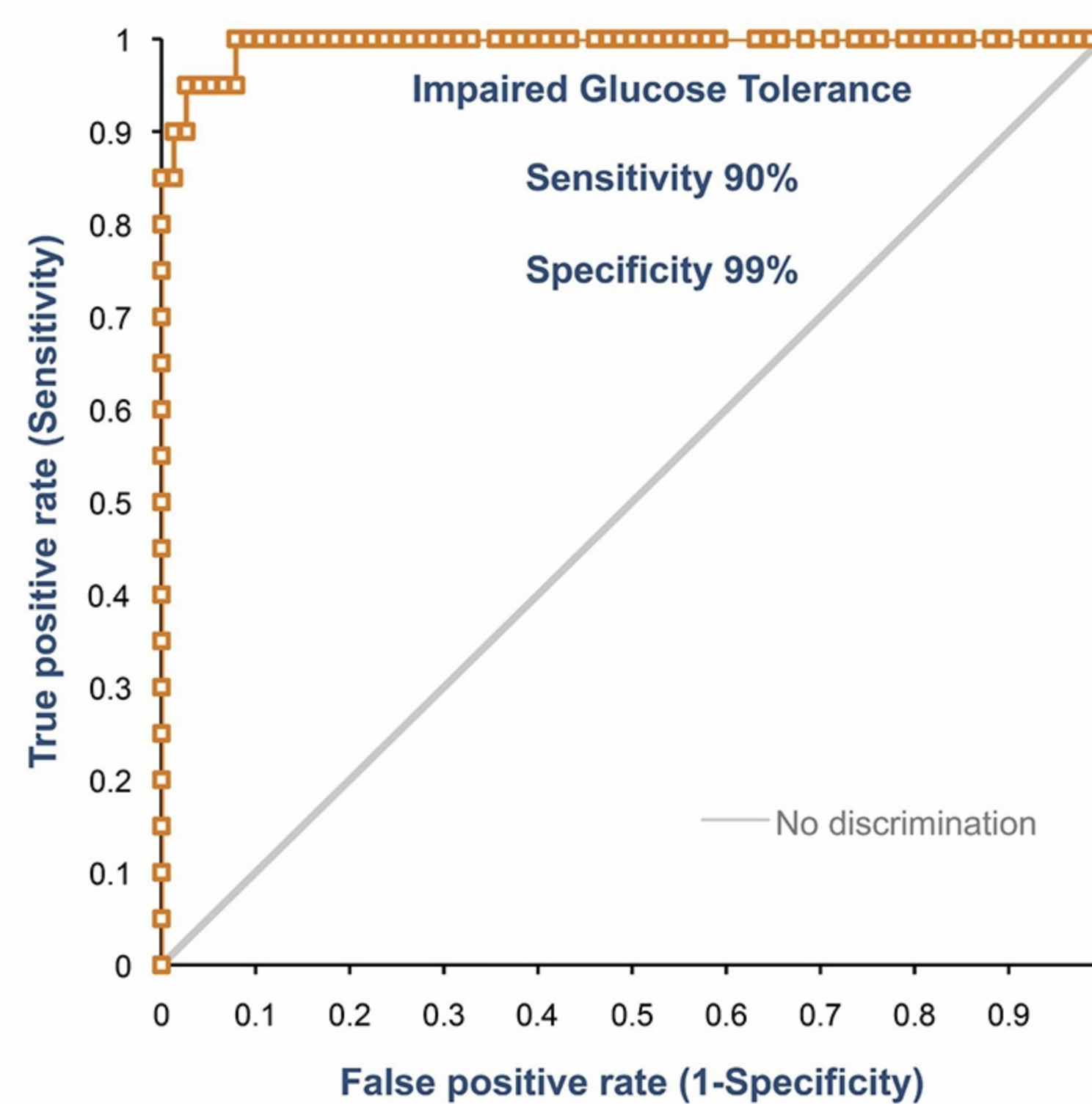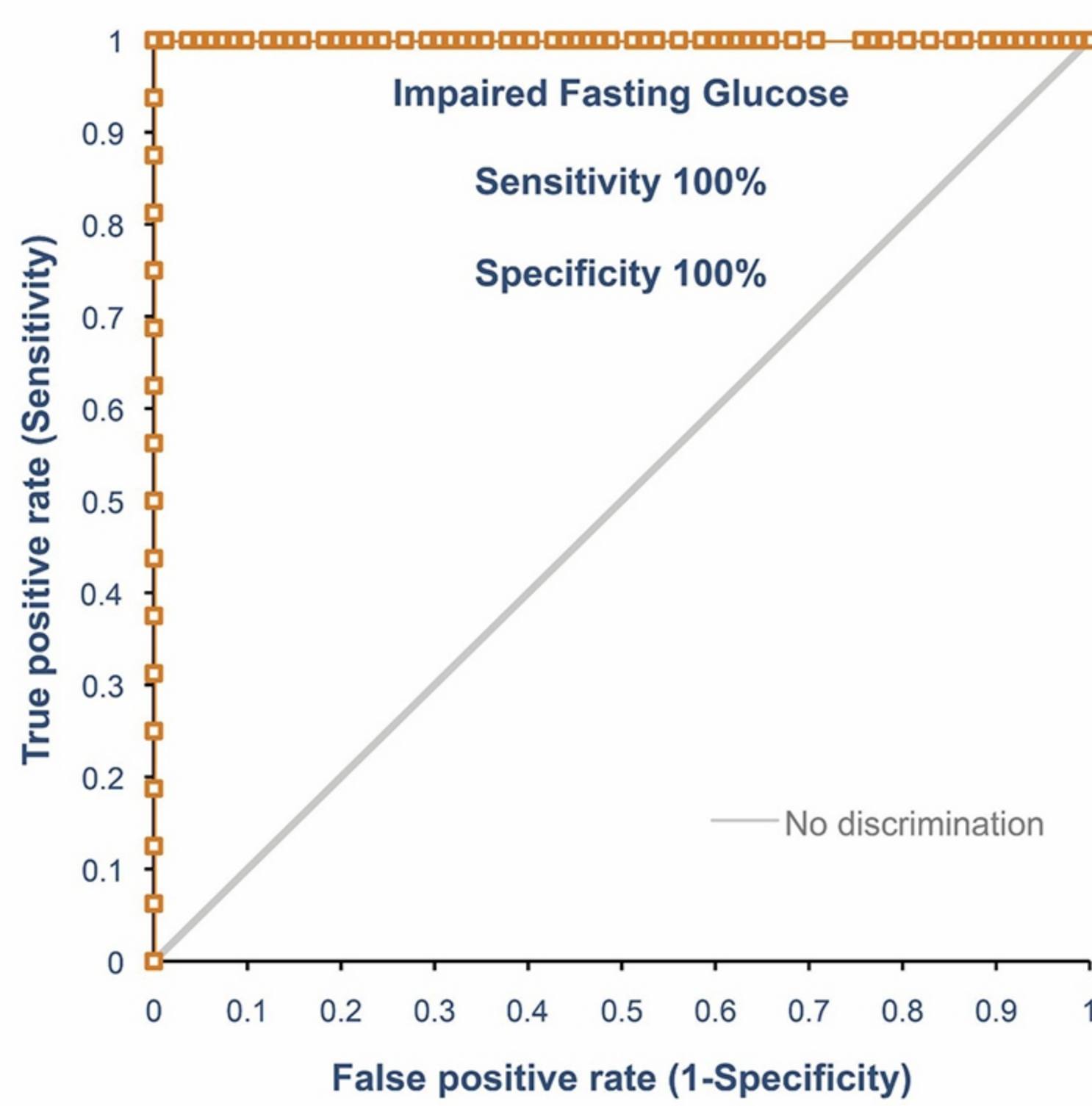
Methodology

One hundred women (19 to 48 years), with and without known glucose intolerance were recruited. Following overnight fasting, participants attended for a 75g OGTT.

A fasting capillary sample was applied to the GTT@home test device with a corresponding venous sample collected and measured immediately on the reference YSI 2300 stat plus analyser. The sampling process was repeated 2 hours after the oral glucose load. GTT@home test results were accessed through an online portal.
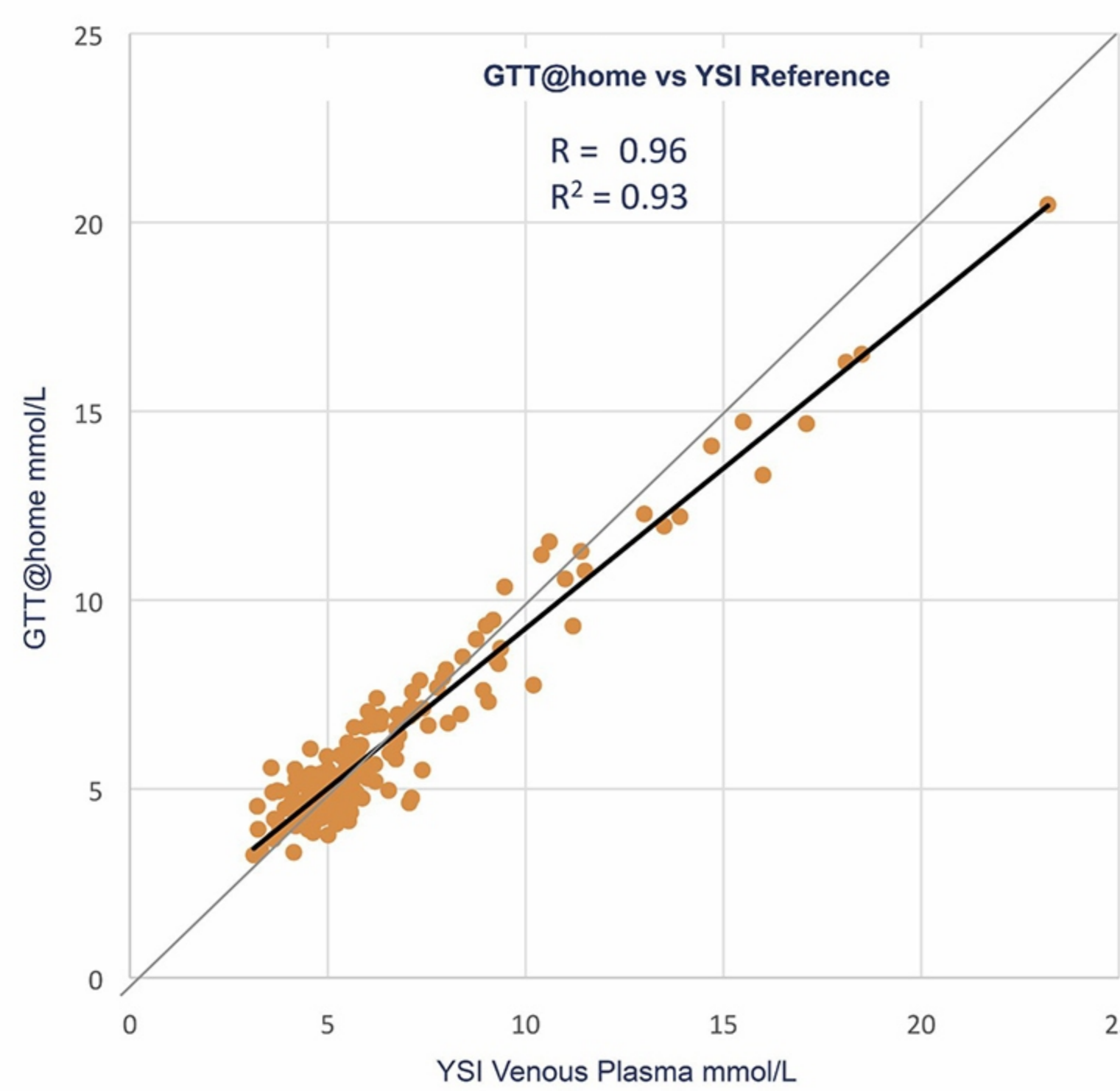
Results

Very good agreement was observed between the reference glucose analyser and the GTT@home device, with GTT@home showing a small negative bias. When classified as normal glucose tolerant or glucose intolerant, GTT@home showed high sensitivity and very high specificity.

Receiver Operating Characteristic Curves

Impaired Fasting Glucose
Sensitivity 100%
Specificity 100%
No discrimination
True positive rate (Sensitivity)
False positive rate (1-Specificity)

Impaired Glucose Tolerance
Sensitivity 90%
Specificity 99%
No discrimination
True positive rate (Sensitivity)
False positive rate (1-Specificity)

Type 2 Diabetes
Sensitivity 93%
Specificity 99%
No discrimination
True positive rate (Sensitivity)
False positive rate (1-Specificity)

Method Comparison

GTT@home vs YSI Reference
R = 0.96
R² = 0.93
GTT@home mmol/L
YSI Venous Plasma mmol/L

Overall Bias
Fasting - 1.4%
2 Hour - 0.5%
Combined - 1.0%

Kappa Reliability Statistic
Fasting - 0.96
2 Hour - 0.90
Combined - 0.88

Implications for Prevention

A UK study published in 2020, using UK Biobank data from 357,833 people, found HbA1c to be of little value in predicting CVD risk. A Danish study published in 2018 found OGTT to be highly predictive of CVD, diabetes and all mortality risk (5861 subjects).

Reviews by NICE and Oxford University indicate the sensitivity of HbA1c for impaired glucose tolerance is in the range 39% to 66%, with some studies indicating sensitivity below 30%. Specificity is reportedly around 60% to 70% at optimal sensitivity. HbA1c has to date underpinned many diabetes prevention efforts.

With clinical performance equivalent to in-clinic OGTT, the ease and convenience of GTT@home could deliver substantial benefits to CVD and diabetes prevention.

GTT@home

GTT@home is a self-contained OGTT test device incorporating biosensors and wireless electronics. The unique design guides the untrained user to complete a full clinic-standard OGTT without the need for equipment.

After use, the device can be scanned by smartphone for data processing, with test results available in a shareable electronic record.

Remove cover A and add 1st blood spot.

Take glucose drink and start the timer. Rest for 2 hours.

Remove cover B and add 2nd blood spot.

Snap off the Data Record.

NFC