

# XXVIII IFSO World Congress

9-12 September 2025 | Santiago, Chile



## Prediction of Hepatic Fibrosis in Obesity Using Simple Pre-operative Variables

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# IFSO 2025 Santiago

Combined Therapies, The Dawn of a New Era

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# Disclosures



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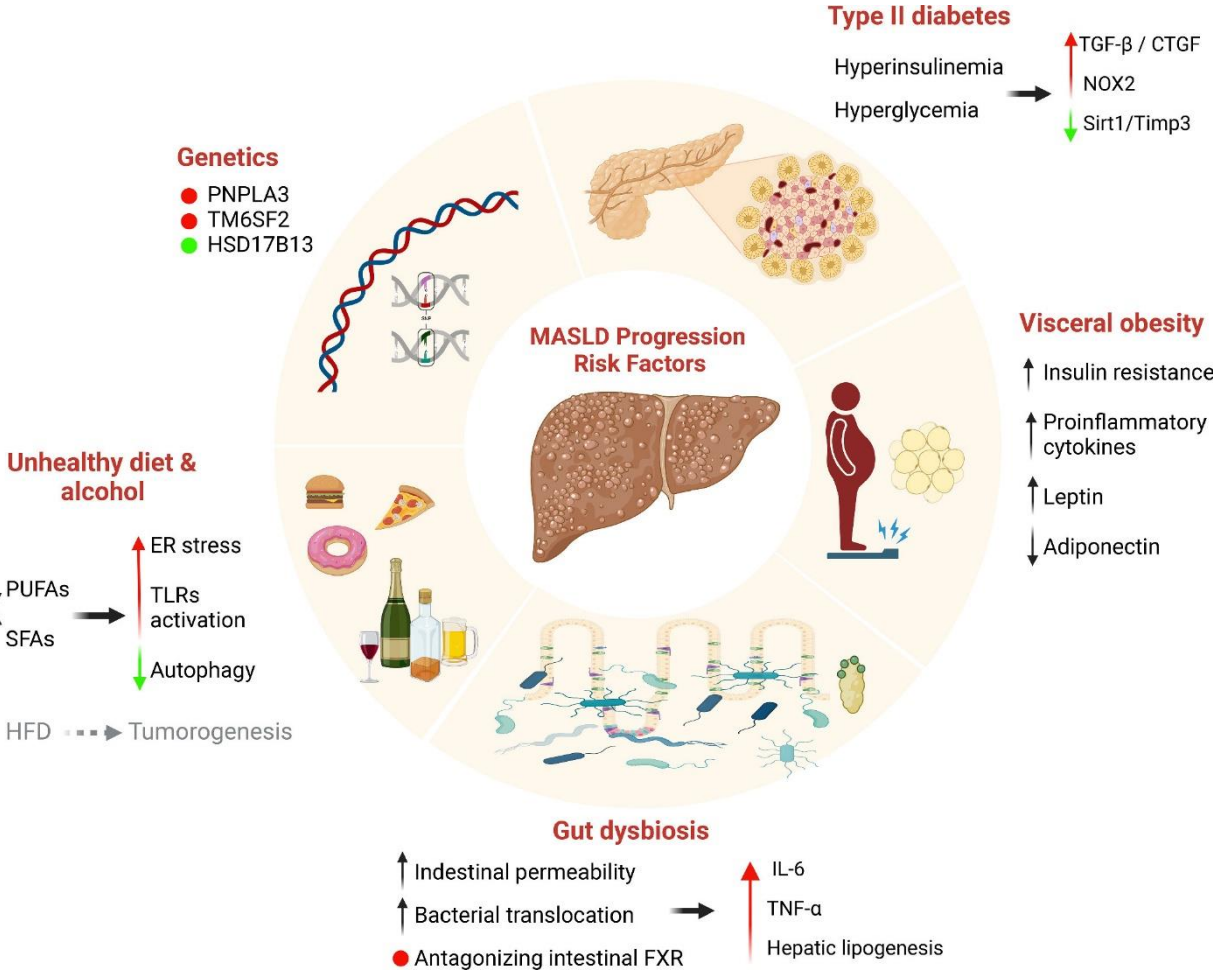
No, nothing to disclose
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# Metabolic dysfunction-associated steatotic liver disease



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Vasileios Lekakis and Papatheodoridis, G.V. (2024). Natural history of metabolic dysfunction-associated steatotic liver disease. European journal of internal medicine, 122, pp.3–10. doi:<https://doi.org/10.1016/j.ejim.2023.11.005>.

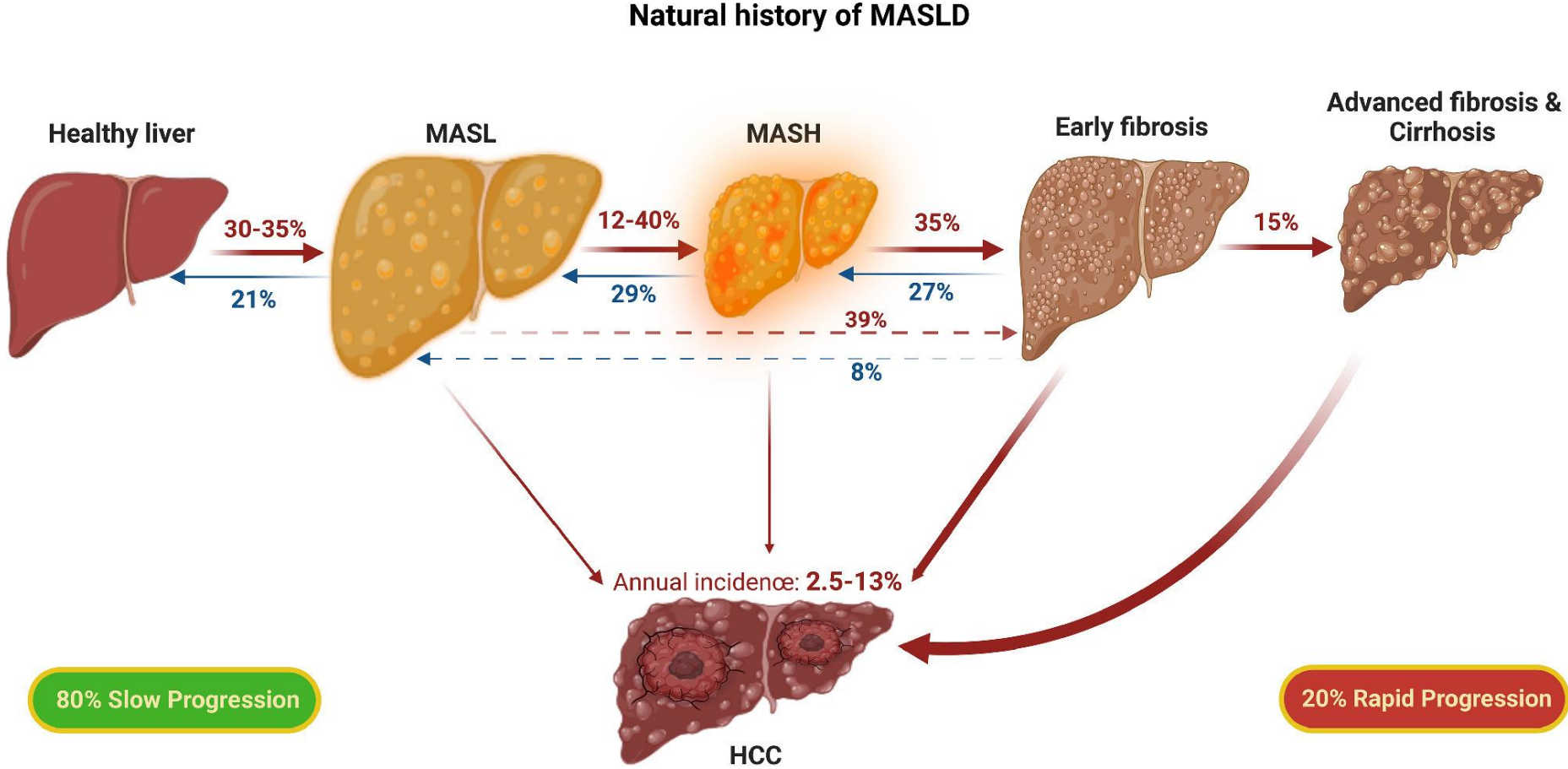


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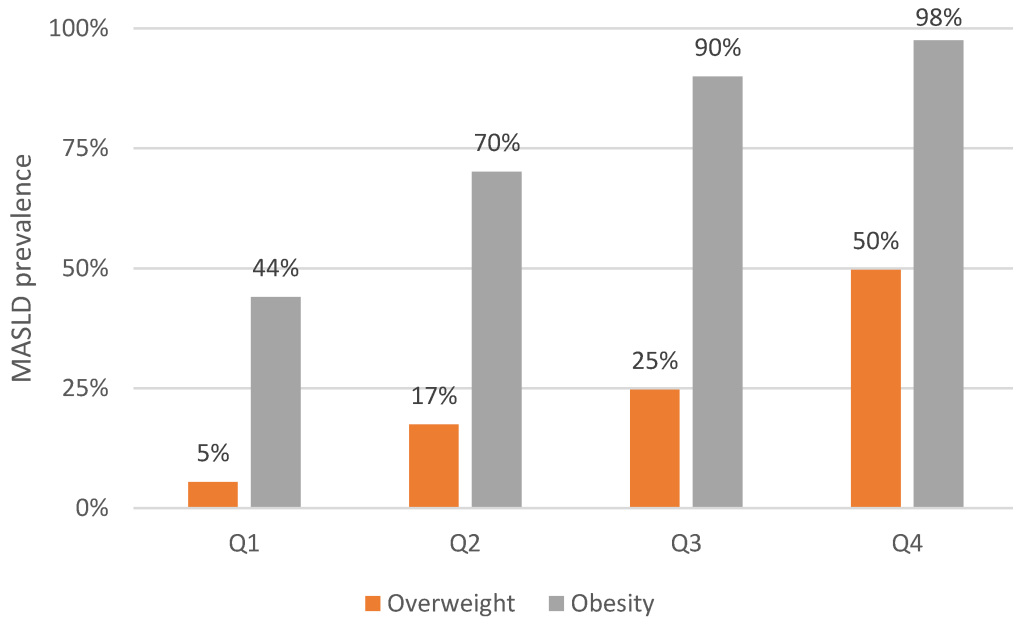
Vasileios Lekakis and Papatheodoridis, G.V. (2024). Natural history of metabolic dysfunction-associated steatotic liver disease. *European journal of internal medicine*, 122, pp.3–10. doi:<https://doi.org/10.1016/j.ejim.2023.11.005>.

# Prevalence of MASLD and hepatic fibrosis in patients with obesity

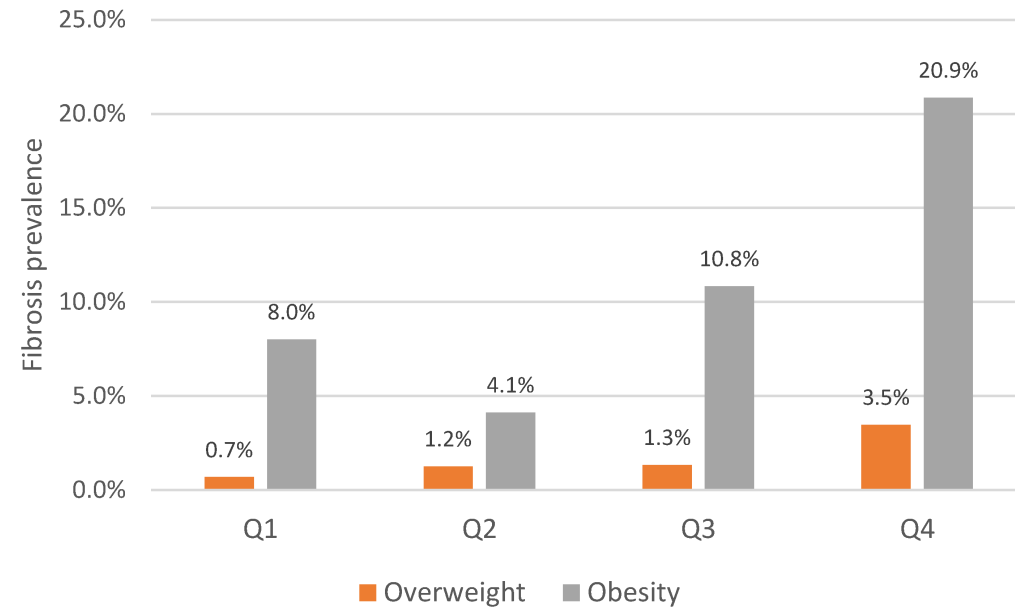


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(a)



(b)

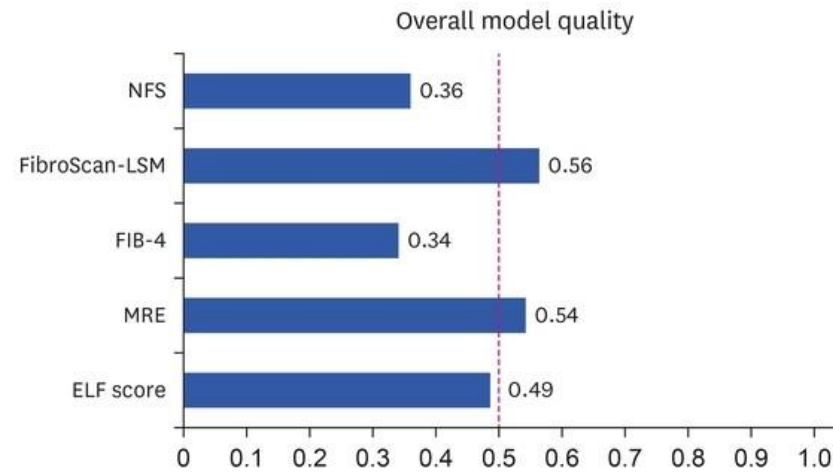
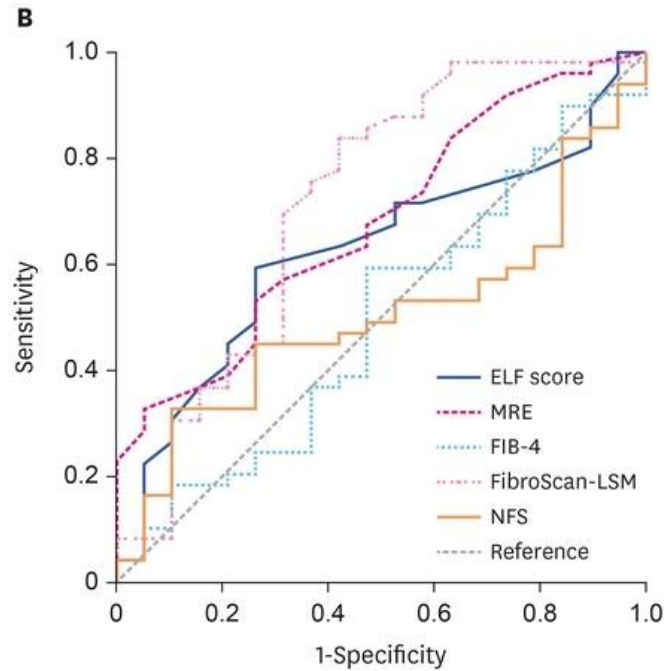
Julián, M.T. *et al.* (2024) 'The link between abdominal obesity indices and the progression of liver fibrosis: Insights from a population-based study', *Nutrients*, 16(11), p. 1586. doi:10.3390/nu16111586.

# Non-invasive tools



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Diagnosis methods for liver fibrosis	AUROC (95% CI)	Cut-off (Youden' J)	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Accuracy
ELF score	0.625	8.25	59.18	73.68	85.29	41.18	63.24
NFS	0.501	-1.88	32.65	89.47	88.89	34.00	48.26
FIB-4	0.494	0.46	57.14	52.63	75.68	32.26	55.88
FibroScan-LSM (kPa)	0.714	4.85	83.67	57.89	83.67	57.90	76.47
MRE	0.677	3.55	32.65	94.74	94.12	35.29	50.00

Park, J.-H., Kim, S.M. and Lee, D.H. (2025). Comparison of Non-invasive Methods for Diagnosis of Non-alcoholic Fatty Liver Disease Before Bariatric Surgery and Postoperative Follow-up in Obese Patients. *Journal of Metabolic and Bariatric Surgery*



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# Objectives

- Identify independent pre-op predictors of hepatic fibrosis (F1–F4)
- Build a multivariable model
- Quantify discrimination (ROC/AUC) and diagnostic agreement



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# Study Design and Population



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## Design

- Cross-sectional, pre-operative cohort
- Analytic unit: patient
- Outcome: any fibrosis (F1–F4) vs F0

## Setting & Period

- Hospital São Francisco na Providência de Deus
- Rio de Janeiro, Brazil
- Oct 2024 – Mar 2025

## Population & Recruitment

- MBS candidates via state referral (SUS)
- Age 16–65 years
- BMI thresholds per CFM 2.131 / 2.172

## Inclusion Criteria

- BMI >30 kg/m<sup>2</sup> + uncontrolled T2D
- BMI >35 kg/m<sup>2</sup> + comorbidities
- BMI >40 kg/m<sup>2</sup> (any comorbidity)

## Exclusion Criteria

- Inconclusive FibroScan®/histology
- HBV, HCV and/or HIV infection
- Alcohol >20 g/d (women) or >30 g/d (men)
- Chronic autoimmune diseases
- Decompensated cirrhosis

## Reference Standard

- Left-lobe liver biopsy (intra-operative)
- Kleiner classification

# Variables Analyzed (Pre-operative)



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## Clinical Variables

- Age
- Sex
- BMI
- Waist circumference
- Neck circumference
- Diabetes mellitus status

## Laboratory Variables

- HbA1c
- AST
- ALT
- Platelet count
- Albumin
- Creatinine
- INR

# Statistical Analysis



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## Descriptive Statistics

- Continuous (normal): mean  $\pm$  standard deviation
- Continuous (non-normal): median [interquartile range]
- Categorical: counts and percentages, n (%)

## Variable Selection for Multivariable Model

- Univariable screening: include variables with  $P < 0.10$
- Plus clinically relevant covariates:
  - age, sex, BMI, neck circumference, type 2 diabetes status, platelets, AST, ALT, albumin, creatinine, HbA1c, INR

## Multivariable Modeling

- Binary logistic regression
- Outcome: any fibrosis (F1–F4) vs none (F0)
- Report adjusted associations (odds ratios)

## Model Performance & Calibration

- Receiver Operating Characteristic (ROC) curve
- Area under the curve (AUC) with 95% CI
- Sensitivity and specificity with 95% CI
- Calibration: Hosmer–Lemeshow goodness-of-fit test



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# Results

# Independent Predictors of Hepatic Fibrosis



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Characteristic	OR <sup>12</sup>	95% CI <sup>2</sup>	p-value
Age	1.04*	1.01, 1.08	<b>0.012</b>
Sex			
Female / Male	0.94	0.35, 2.52	0.895
Weight.Kg	0.99	0.97, 1.01	0.393
Height.cm	1.00	1.00, 1.01	0.417
BMI	1.03	0.96, 1.10	0.382
Abdominal.Circumference.cm	1.00	0.98, 1.03	0.822
Duration.of.Obesity.months	1.00	1.00, 1.00	0.749
Time.on.Waiting.List.months	1.00	0.98, 1.01	0.564
Systolic.Blood.Pressure.mmHg	1.00	0.98, 1.03	0.807
Diastolic.Blood.Pressure.mmHg	1.00	0.95, 1.04	0.891
Diabetes.Mellitus			
No / Yes	0.43*	0.23, 0.82	<b>0.010</b>

<sup>1</sup>\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

<sup>2</sup>OR = Odds Ratio, CI = Confidence Interval

Characteristic	OR <sup>12</sup>	95% CI <sup>2</sup>	p-value
Smoker			
No / Yes	0.71	0.26, 1.89	0.488
Neck.Circumference.cm	1.23***	1.12, 1.36	<b>&lt;0.001</b>
Family.History.of.Liver.Disease			
No / Yes	0.58	0.29, 1.14	0.112
TGO.AST	1.01	0.98, 1.05	0.511
TGP.ALT	1.02	1.00, 1.04	0.113
Platelets	1.00*	1.00, 1.01	<b>0.021</b>
PT.INR	0.77	0.06, 1.46	0.741
Cortisol	0.97	0.91, 1.02	0.219
Creatinine	1.05	0.98, NA	0.427
Glycated.Hemoglobin.HbA1c	0.89	0.69, 1.15	0.382
Albumin	0.96	0.51, 1.79	0.891
Urea	1.00	0.96, 1.03	0.789
Hemoglobin.Hb	0.97	0.86, 1.01	0.265

<sup>1</sup>\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

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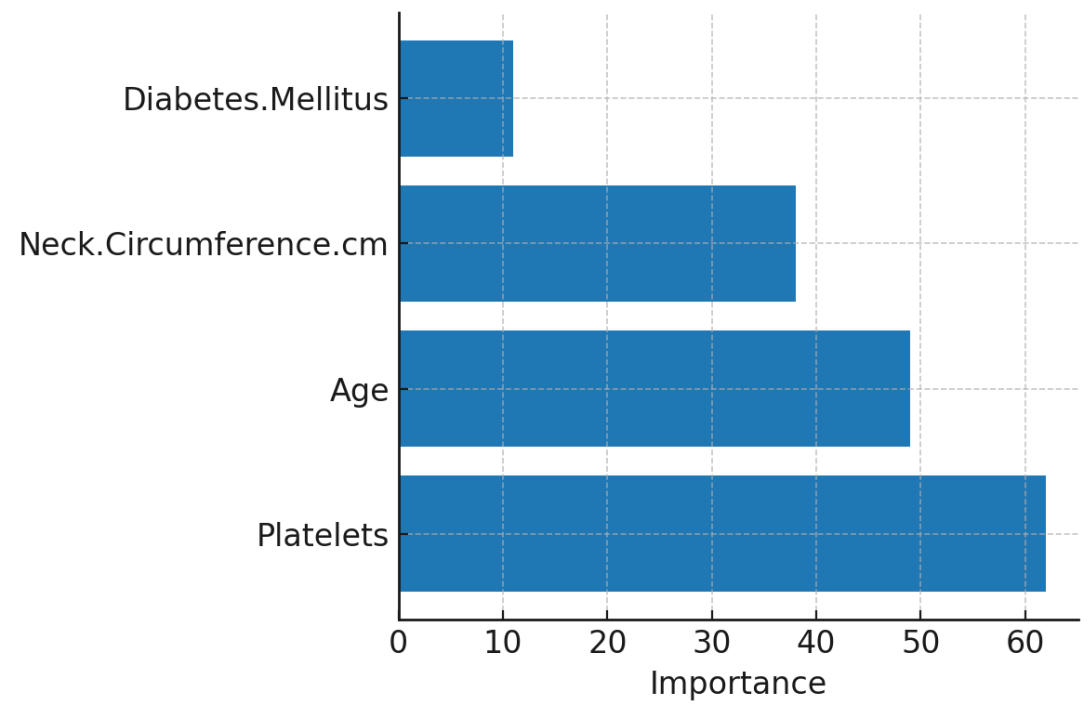
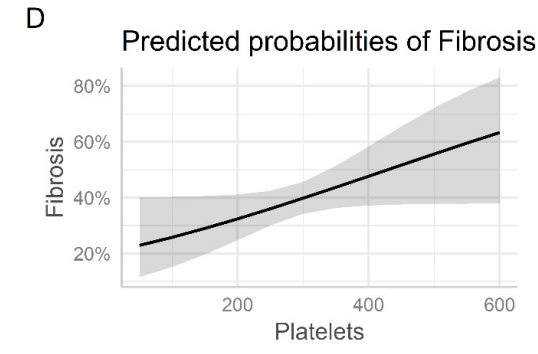
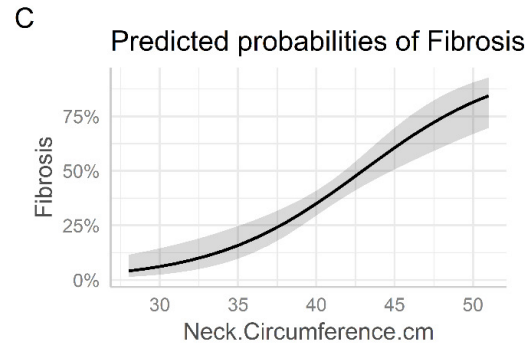
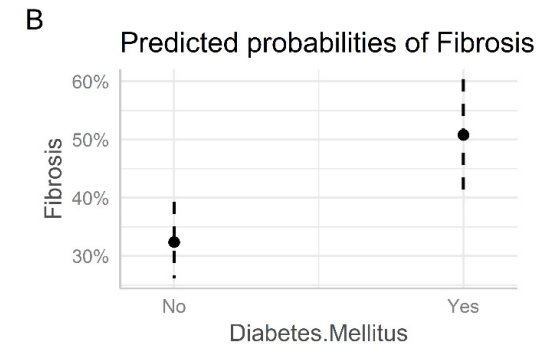
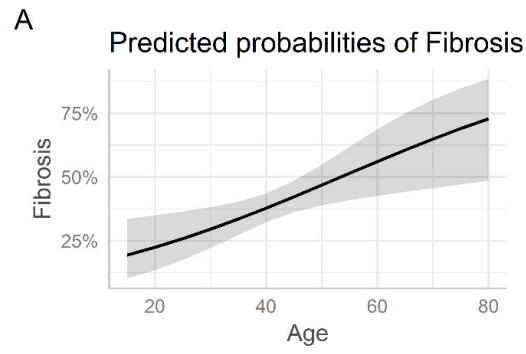


# Independent Predictors of Hepatic Fibrosis



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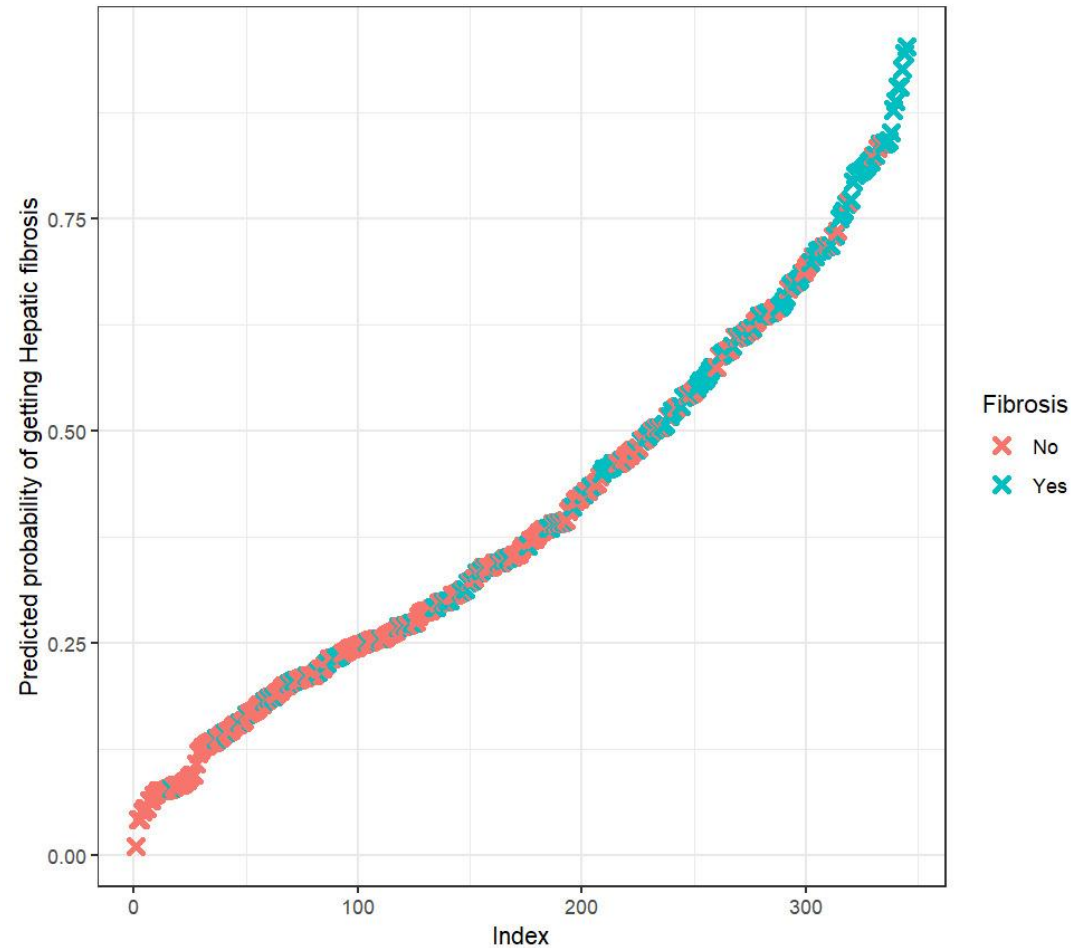
# Model Performance



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$$\log \left[ \frac{P(\text{Fibrosis} = \text{Yes})}{1 - P(\text{Fibrosis} = \text{Yes})} \right] = \alpha + \beta_1(\text{Age}) + \beta_2(\text{DiabetesMellitus}_{\text{Yes}}) + \beta_3(\text{NeckCircumference}(\text{cm})) + \beta_4(\text{Platelets})$$

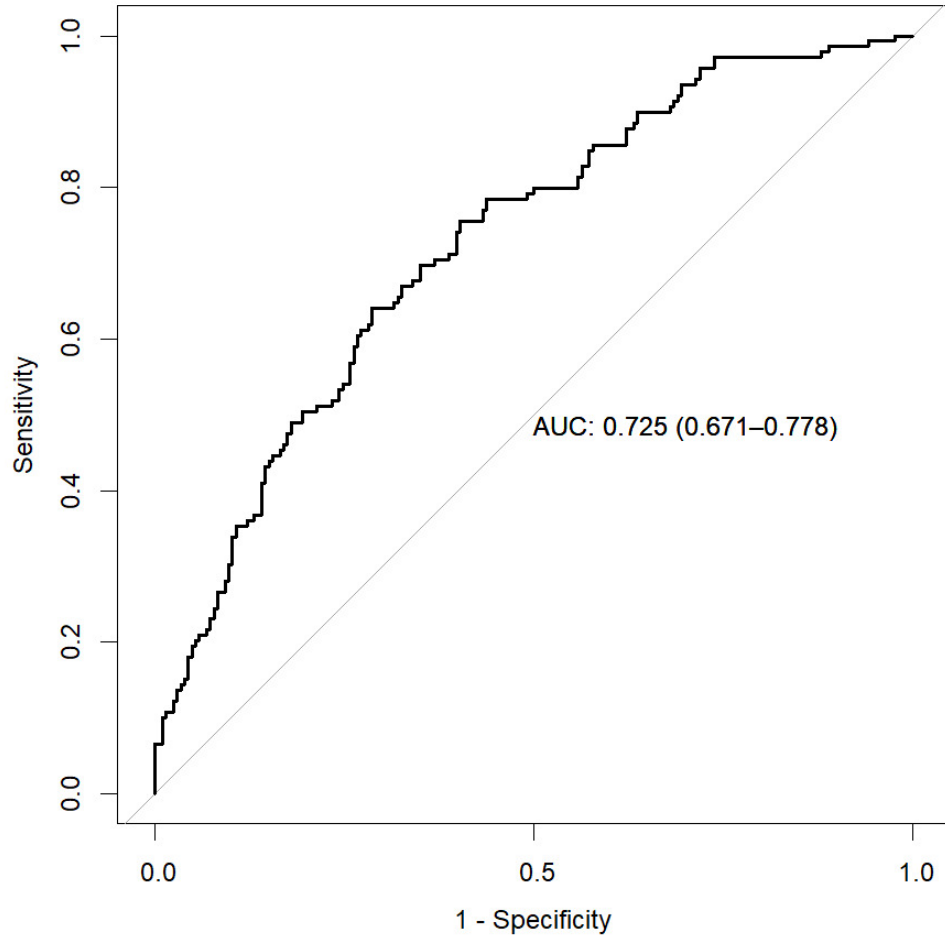


# Model Performance



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## Confusion Matrix and Statistics

	No	Yes
No	166	40
Yes	71	68

Accuracy : 0.6783

95% CI : (0.6261, 0.7273)

No Information Rate : 0.687

P-Value [Acc > NIR] : 0.659940

Kappa : 0.3061

Mcnemar's Test P-Value : 0.004407

Sensitivity : 0.7004

Specificity : 0.6296

Pos Pred Value : 0.8058

Neg Pred Value : 0.4892

Prevalence : 0.6870

Detection Rate : 0.4812

Detection Prevalence : 0.5971

Balanced Accuracy : 0.6650

'Positive' Class : No



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# Discussion & Limitations



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## Strengths

- Simple and low-cost model
- Data collected before surgery
- Biopsy used as gold standard
- Targets obese population
- Good PPV for biopsy decision

## Limitations

- Cross-sectional study
- Low negative predictive value
- Still needs external validation
- Single center, mostly female

# Conclusions



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1. MASLD is common in bariatric patients
2. Standard fibrosis tools underperform in obesity
3. Our model uses routine data only
4. Good at detect patients who may need biopsy
5. Simple, low-cost, and ready for next steps



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