AI Role in Preoperative Assessment, Patient Selection, and Risk Stratification

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Surgery
UNIVERSITY OF TORONTO

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Learning Objectives

- Describe how AI can enhance preoperative assessment
- Explore the role of AI in predicting individual outcomes after bariatric surgery
- Evaluate the use of AI for preoperative risk stratification

Disclosures

- Medtronic: honoraria for speaking and teaching
- Johnson & Johnson: consultant, honoraria for speaking and teaching
- GT Metabolic Solutions: equity ownership
- BariFit Solutions: equity ownership
- Qaelon Medical: equity ownership

https://www.linkedin.com/pulse/artificial-intelligence-healthcare-transforming-medicine-dhakad-beujc

IFSO International Expert Consensus on AI in MBS

Modified Delphi · 68 surgeons, 35 countries · 28 statements · consensus threshold ≥ 70%

DELPHI PROCESS

PANEL

68 expert MBS surgeons from 35 countries; IFSO & ASMBS leaders included

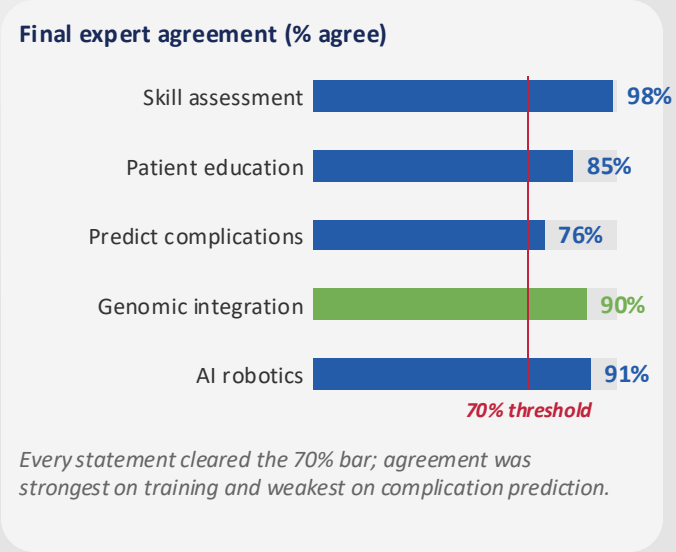
STATEMENTS

28 statements across 6 domains; agree / disagree vote, two rounds

CONSENSUS

All 28 reached ≥ 70% agreement — 25 in round 1, 3 more in round 2

AGREEMENT ON KEY STATEMENTS



Every statement cleared the 70% bar; agreement was strongest on training and weakest on complication prediction.

Results

statements reaching consensus

28 of 28

complete agreement across all six AI domains

WHERE EXPERTS ALIGNED

1. AI education should be mandatory in training
2. AI-driven robotics will reshape MBS
3. Genomic-AI integration is a key frontier
4. But over-reliance on AI is a real risk

Kermansaravi M, et al. Sci Rep. 2025;15(1):9312.

AI Across the Bariatric Surgery Pathway

Where artificial intelligence applies across precision obesity care — from preoperative assessment to long-term follow-up

PREOPERATIVE
Assessment · Selection · Risk

Preop Assessment and Risk
Characterizes patients and personalizes the preop workup

Outcome Prediction
Forecasts weight loss and comorbidity resolution

Procedure Matching
Data-driven guidance on the optimal operation

INTRAOPERATIVE
Intraoperative Guidance

Surgical Step Recognition
Computer vision identifies operative phases on video

Workflow Analysis
Phase recognition supports OR efficiency

Intraoperative Guidance
Real-time decision support flags critical steps

POSTOPERATIVE
Outcomes · Monitoring

Readmission Prediction
Flags high-risk patients for early intervention

Dynamic Digital Follow-Up
Remote monitoring adapts follow-up to recovery

Complication Detection
Imaging and body-composition analysis catch leaks early

PATIENT EDUCATION
Counselling · Communication

LLM Patient Q&A
Language models answer questions on surgery and recovery

Readable Health Content
AI tailors materials to health-literacy levels

Consensus-Guided Use
IFSO guidance frames responsible AI communication

ELSEVIER

Check for updates

SURGERY FOR OBESITY AND RELATED DISEASES

Surgery for Obesity and Related Diseases 22 (2026) 1025–1034

Review article

Applications of artificial intelligence along the perioperative pathway in metabolic and bariatric surgery

Karanbir Brar, M.D., M.Sc.[a], Inaam Chattha[b], Samuel Gobraeil[b], Valentin Mocanu, M.D., Ph.D.[c], Ricard Corcelles, M.D.[c], Matthew Kroh, M.D.[c], Thomas Shin, M.D., Ph.D.[d], Jerry T. Dang, M.D., Ph.D.[c], Yung Lee, M.D., M.P.H.[c,e,*]

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Received 15 January 2026; accepted 4 May 2026

Brar K, et al. Surg Obes Relat Dis. 2026;22:1025–1034.

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A scoping review of AI across the perioperative pathway in MBS

EVIDENCE BASE

58
studies

928 records screened
4 databases, to Nov 2024

STUDY QUALITY

- All retrospective — 58 of 58
- No prospective cohort studies
- No randomized trials
- None implemented in practice

RESULTS: WHERE THE 58 STUDIES SIT ALONG THE PATHWAY

Preoperative phase:
4 of 58 studies (6.9%)

4 studies used a retrospective design, single or limited multicenter data
No external validation, limited generalizability and clinical utility

Brar K, et al. Surg Obes Relat Dis. 2026;22:1025–1034. doi:10.1016/j.soard.2026.05.002

MINIMALLY INVASIVE THERAPY & ALLIED TECHNOLOGIES
2022, VOL. 31, NO. 5, 760–766
https://doi.org/10.1080/13645706.2021.1901120

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Improving pre-bariatric surgery diagnosis of hiatal hernia using machine learning models

Dan Assaf[a,b], Shlomi Rayman[a,b], Lior Segev[a,b], Yair Neuman[c], Douglas Zippel[a,b] and David Goitein[a,b]

[a]Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel; [b]Department of Surgery C, Chaim Sheba Medical Center, Tel Hashomer, Israel; [c]The Department of Cognitive and Brain Sciences, Ben-Gurion University of the Negev, Beer Sheva, Israel

- Retrospective cohort of 2,482 bariatric surgery patients
- All patients had routine pre-op barium swallow
- ML approach using patient characteristics increased sensitivity for detecting hiatal hernia
  - **38.5%** with conventional contrast assessment
  - **60.2%** in selected high-risk groups
- AI could be used to augment pre-op assessment

Assaf D, et al. Minim Invasive Ther Allied Technol. 2022;31:760–767.

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Obesity Surgery (2024) 34:3445–3458
https://doi.org/10.1007/s11695-024-07433-9

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ORIGINAL CONTRIBUTIONS

Check for updates

The Role of Preoperative Abdominal Ultrasound in the Preparation of Patients Undergoing Primary Metabolic and Bariatric Surgery: A Machine Learning Algorithm on 4418 Patients' Records

Mohamed Hany[1,2] · Mohamed El Shafei[3] · Mohamed Ibrahim[1] · Ann Samy Shafiq Agayby[1] · Anwar Ashraf Abouelnasr[1] · Moustafa R. Aboelsoud[1] · Ehab Elmongui[4] · Bart Torensma[5]

- 4,418 bariatric patients from two centres who all had pre-op U/S
- Goal: detect findings that could change treatment or surgical planning

- ML identified patients most likely to benefit from preoperative abdominal ultrasound
- Best model achieved AUC 0.976
- Potential to move from routine testing → individualized preoperative workup
- Model still needs external validation

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Hany M, et al. Obes Surg. 2024;34:3445–3458.

Will This Patient's Diabetes Go Into Remission?

Pedersen 2016: a machine-learning model combining clinical and genomic data to predict T2DM remission after gastric bypass

PATIENTS

457 patients

Geisinger eMERGE · obese T2DM, on medication

METHODS

Neural-network feature ranking

Clinical traits + genomic SNPs ranked together for prediction

OUTPUT

Remission probability

Flags patients unlikely to remit before they undergo surgery

WHAT THE MODEL ADDS

AUC for predicting diabetes remission · 0.50 = chance

ACCURACY

74% → 84%

correct prediction

GENES IMPLICATED

8 SNPs

incl. ABCA1, STXBP5L, PROK2

Pedersen HK, et al. npj Genom Med. 2016;1:16035.

A Convolutional Neural Network (CNN) That Beats the Diabetes Scores

SOReg + Swedish registers · 8,057 RYGB patients with T2D · 2-year diabetes remission

STUDY DESIGN

COHORT

8,057 patients with T2D, primary gastric bypass, Sweden 2007-2017

METHOD

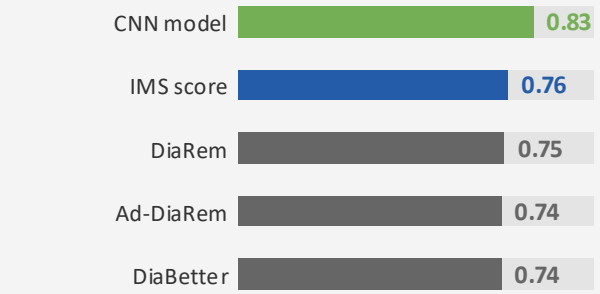
7-layer CNN on pre-op data; 80/20 split; benchmarked vs 4 established scores

OUTCOME

T2D remission at 2 years — antidiabetic drugs stopped, HbA1c normalised

TEST-DATA DISCRIMINATION (AUC)

CNN vs traditional remission scores



HOW MUCH BETTER

CNN vs the best traditional score

0.83 vs 0.76

a 9-12% AUC gain that held in validation and test

WHAT THE CNN DELIVERED

1. Consistent edge over DiaRem, IMS & peers
2. Held up on a separate temporal test set
3. 77% of patients reached drug remission
4. Single-country — external validation pending

Clinical takeaway: CNN had better predictive capability compared to traditional indices for diabetes remission. Further external validation needed

Cao Y, et al. JMIR Med Inform. 2021;9(8):e25612.

Development and validation of an interpretable machine learning-based calculator for predicting 5-year weight trajectories after bariatric surgery: a multinational retrospective cohort SOPHIA study

Patrick Saux, Pierre Bauvin*, Violeta Raverdy, Julien Teigny, Hélène Verkindt, Tomy Soumphonphakdy, Maxence Debert, Anne Jacobs, Daan Jacobs, Valerie Monpellier, Phong Ching Lee, Chin Hong Lim, Johanna C Andersson-Assarsson, Lena Carlsson, Per-Arne Svensson, Florence Galtier, Guelareh Dezfoulian, Mihaela Moldovanu, Severine Andrieux, Julien Couster, Marie Lepage, Erminia Lembo, Ornella Verrastro, Maud Robert, Paulina Salminen, Geltrude Mingrone, Ralph Peterli, Ricardo V Cohen, Carlos Zerrweck, David Nocca, Carel W Le Roux, Robert Caiazzo, Philippe Preux, François Pattou*

Summary

Background Weight loss trajectories after bariatric surgery vary widely between individuals, and predicting weight loss before the operation remains challenging. We aimed to develop a model using machine learning to provide individual preoperative prediction of 5-year weight loss trajectories after surgery.

Lancet Digit Health 2023; 5: e692–702

Published Online August 29, 2023

Saux P, et al. Lancet Digit Health. 2023;5(10):e692–e702.

How Will This Patient's Weight Change Over 5 Years?

SOPHIA: a machine-learning calculator for individual weight-loss trajectories after bariatric surgery

PATIENT COHORT

10,231
patients

12 centres · 10 countries
Europe · Americas · Asia

METHODS

434 attributes

LASSO feature selection

7 variables

interpretable CART trees

CLINICAL PREDICTION

predicted 5-yr trajectory

free interpretable web calculator

SEVEN SIMPLE INPUTS

all routinely available — no laboratory tests required

Weight · Height · Age · Procedure · Diabetes · Diabetes duration · Smoking

VALIDATED 5-YEAR ACCURACY

± 2.8 kg/m² median error in predicted BMI

MOST ACCURATE FOR GASTRIC BYPASS – kg/m² median error in predicted BMI

RYGB	Sleeve	Gastric band
2.8	3.5	4.9

Saux P, et al. Lancet Digit Health. 2023;5(10):e692–e702.

Patient

Weight

110 kg

Height

160 cm

Age

30 years

Non-smoker — Smoker

Type 2 diabetes

No diabetes

Surgery

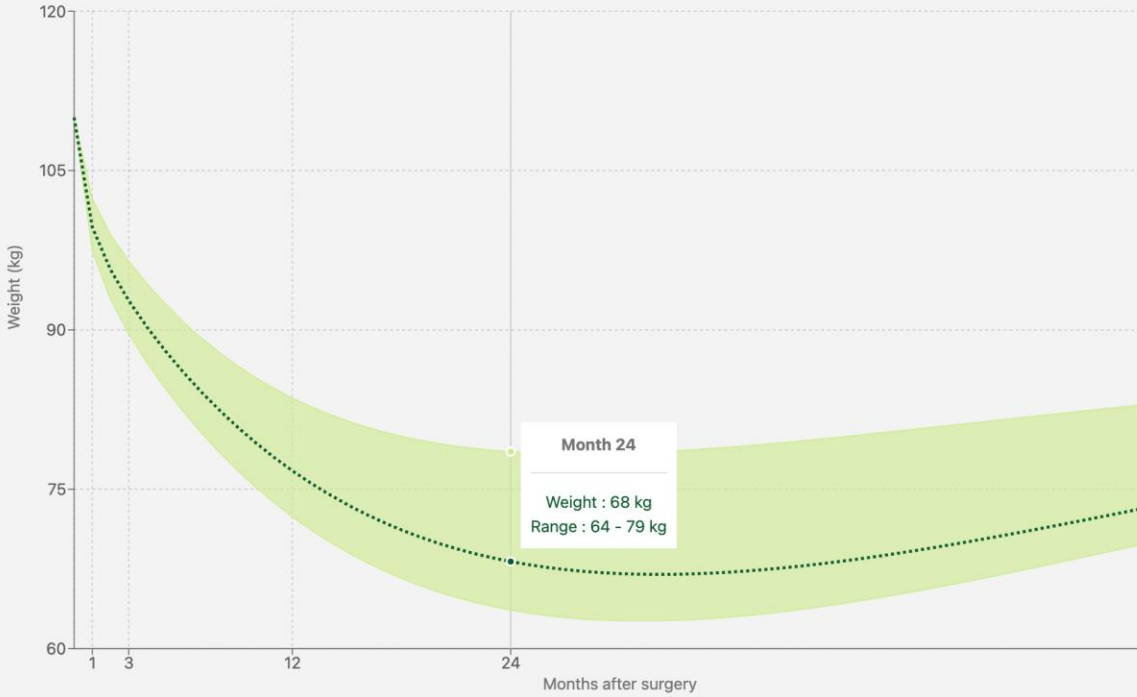
Type of intervention

Gastric Bypass

Predict trajectory

	Weight (kg)	Height (cm)	Age (years)	Smoker	Type 2 diabetes	Diabetes duration (years)	Type of intervention
Current prediction	110	160	30	No	No diabetes	0	Gastric Bypass

Weight



Prediction of weight trajectory after surgery

Patient

Weight

110 kg

Height

160 cm

Age

30 years

Non-smoker Smoker

Type 2 diabetes

No diabetes

Surgery

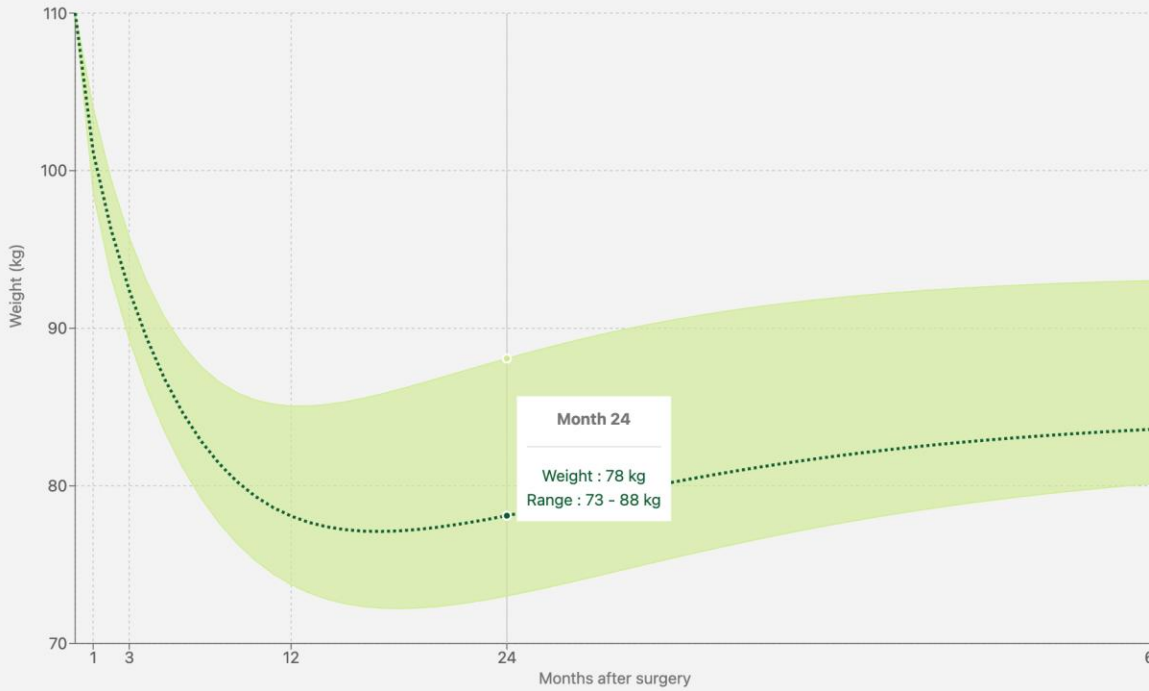
Type of intervention

Sleeve Gastrectomy

Predict trajectory

	Weight (kg)	Height (cm)	Age (years)	Smoker	Type 2 diabetes	Diabetes duration (years)	Type of intervention
Current prediction	110	160	30	No	No diabetes	0	Sleeve Gastrectomy

Weight



Prediction of weight trajectory after surgery

Will This Patient Get Reflux after a Sleeve gastrectomy?

441 sleeve gastrectomy patients · ensemble machine-learning model · predicting de novo GERD after surgery

STUDY DESIGN

COHORT

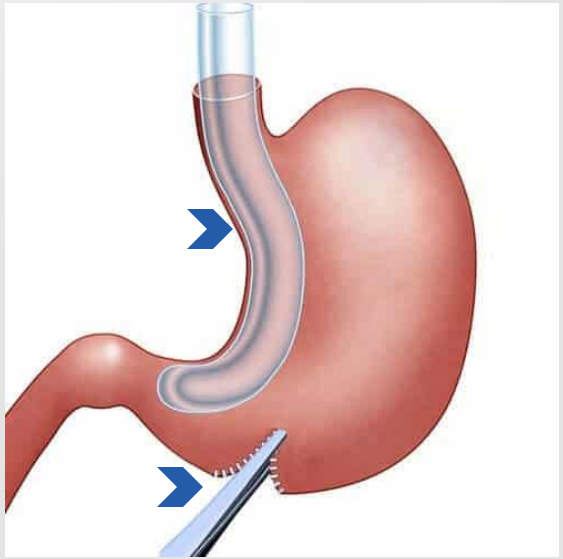
441 sleeve gastrectomy patients; single centre, 2011–2019, Egypt

METHODS

15 algorithms trained; 70/30 train–test split; bagged ensemble best

OUTCOME

Predicts de novo GERD after sleeve; endoscopy-confirmed outcome label



EXCELLENT DISCRIMINATION

area under the ROC curve, test set

0.93

sensitivity 79% — 1 in 5 future-GERD patients missed

WHAT THE STUDY FOUND

1. 87 of 441 patients (19.7%) had GERD after sleeve
2. Top predictors: preop GERD, bougie size, age, weight, pylorus distance
3. Two predictors are modifiable - bougie size and transection distance
4. Risk rose with bougie <38 Fr and pylorus distance <3 cm

Clinical takeaway: A preoperative model could flag patients at risk of reflux and points toward modifiable technique to help, not just patient selection

Emile SH, et al. Obes Surg. 2022;32(8):2537–2547.

Predicting Leak & VTE with Machine Learning

MBSAQIP 2015–2017 · 436,807 patients · leak 0.70% · VTE 0.46%

STUDY DESIGN

COHORT

Elective laparoscopic gastric bypass & sleeve 2015–2017 MBSAQIP

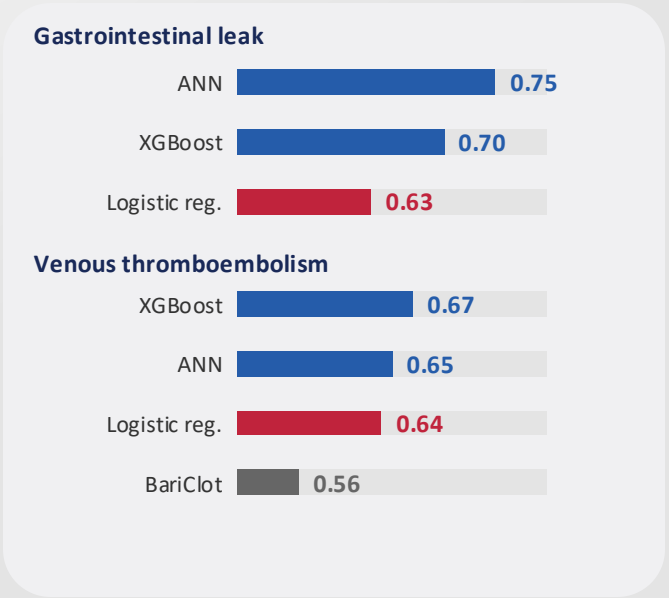
MODELS

Neural network, XGBoost vs logistic regression vs BariClot (VTE)

OUTCOMES

GI leak & venous thromboembolism (30-day, TRIPOD)

MODEL DISCRIMINATION (AUC)



LEAK DETECTION YIELD

at 97.5% specificity

378 vs 103

leaks caught by ANN vs logistic regression (of 767 true leaks)

TOP LEAK PREDICTORS (XGBoost)

1. Age
2. Pre-operative BMI
3. Change in BMI (prior year)
4. Weight & hematocrit

Clinical takeaway: ML clearly improves LEAK prediction (ANN 0.75 vs 0.63); For VTE, all models are only modest

Nudel J, et al. Surg Endosc. 2021;35(1):182–191.

Can AI Tell Us Who Can Go Home the Same Day?

Wu 2026: machine learning for same-day discharge candidacy after bariatric surgery

STUDY GROUP

47,071

patients

MBSAQIP 2023, average risk
12,951 bypass · 34,120 sleeve

WHAT THEY FOUND

70 - 80%

already met same-day discharge criteria

bypass 70.1% · sleeve 80.4%

METHODS

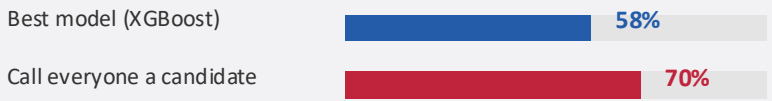
- XGBoost
- LightGBM
- Random forest
- Gradient boosting
- vs logistic regression

RESULTS: NO MODEL PERFORMED BETTER THAN A COIN FLIP

Gastric bypass
XGBoost

Sleeve
Logistic reg.

Accuracy — gastric bypass



MBSAQIP variables alone:
every AUROC 0.50 – 0.54

SUMMARY: Most average-risk patients met SDD criteria, but preoperative registry data could not reliably predict who would.

Wu JL, et al. Obes Surg. 2026 May 1 [online ahead of print]. doi:10.1007/s11695-026-08699-x

What Have We Learned?

1. AI research is expanding rapidly
2. Most evidence focuses on predicting outcomes
3. AI may also enhance and help us tailor how we assess patients
4. Risk prediction is promising, but inconsistent
5. Better algorithms ≠ better clinical care

The goal is not better algorithms but better clinical tools

Conclusion: Where Do We Go From Here?

1. External validation across diverse populations
2. Prospective evaluation in real clinical practice
3. Simple, interpretable tools clinicians can trust
4. Integration with the electronic health record
5. Bring AI to the bedside, with the patient

AI should augment clinical judgment, not replace it

Thank you

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Machine Learning to Identify Metabolic Subtypes of Obesity: A Multi-Center Study

Ziwei Lin[1,2†], Wenhuan Feng[3†], Yanjun Liu[4†], Chiye Ma[5], Dooman Arefan[2], Donglei Zhou[1], Xiaoyun Cheng[1], Jiahui Yu[4], Long Gao[2,6], Lei Du[1], Hui You[1], Jiangfan Zhu[1,5], Dalong Zhu[3], Shandong Wu[2,7‡] and Shen Qu[1*‡]*

- Unsupervised ML identified 4 distinct metabolic obesity phenotypes
- Based on only **3 variables:** glucose AUC, insulin AUC & uric acid
- Phenotypes had markedly different **metabolic and comorbidity profiles**
- Validated across **3 independent cohorts – 94% classification accuracy**
- **Potential for more individualized assessment and treatment**

Lin et al. Front Endocrinol. 2021;12:713592

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Conclusion

- AI is beginning to outperform traditional prediction models in several bariatric applications
- Need extra bullets here

- Responsible implementation will require validation, transparency, equity, and AI literacy
- The future of precision obesity care will likely involve collaborative intelligence: AI augmenting, not replacing, the bariatric team

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Learning Objectives-remove

- Describe how AI can enhance preoperative assessment
- Evaluate the role of AI in predicting outcomes and stratifying risk
- Discuss how AI-derived predications may inform patient selection
- Examine the role of large language models in patient education and clinical support
- Identify opportunities for AI to support preoperative patient education and preparation