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PROSPECTS OF USING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN PREDICTING THE OUTCOMES OF BARIATRIC SURGERY

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ABSTRACT:

increasing number of patients with obesity and metabolic syndrome has led to the expansion of bariatric surgery. At the same time, the issue of predicting the results of surgery, assessing individual risk, and selecting the right patients remains relevant. In recent years, artificial intelligence (AI) technologies have been actively used in various areas of medicine , including predicting surgical outcomes .

The aim of this article is to analyze the potential of artificial intelligence technologies in predicting the outcomes of bariatric surgery and assess their prospects in clinical practice. The study analyzed the current literature on the use of machine learning models based on clinical and laboratory parameters of patients undergoing bariatric surgery and assessed the effectiveness of prediction algorithms .

The analyses showed that AI -based models can predict body weight loss, diabetes remission, and postoperative complications with higher accuracy than traditional statistical methods. The superiority of SI algorithms is especially evident when multivariate clinical data is available . However,

data quality, model interpretation, and clinical integration remain important challenges .

Thus, artificial intelligence holds great promise in predicting bariatric surgery outcomes at an individual level, risk stratification, and optimizing clinical decision-making , and it is considered appropriate to gradually introduce it into surgical practice.

Entrance

The global increase in obesity in recent decades has led to a sharp increase in the volume of bariatric surgery. Although sleeve gastrectomy and Roux-en-Y gastric bypass operations are highly effective , the degree of outcome varies from patient to patient . Some patients do not lose enough weight, while others develop complete metabolic remission . Therefore, predicting the outcome of surgery on an individual level is one of the important tasks of modern bariatric surgery.

The predictive capabilities of traditional statistical models are limited in the context of multivariate clinical data. In recent years, artificial intelligence and machine learning algorithms have been widely used in medicine due to their ability to process large amounts of data and identify complex relationships . The importance of SI technologies is increasing, especially in individual risk assessment and clinical decision support systems.

Although there have been a number of studies on the use of SI models in bariatric surgery , their real integration into clinical practice has not yet been sufficiently realized. Therefore, scientific analysis of this area is of great importance.

Research purpose

To analyze the potential of artificial intelligence technologies in predicting bariatric surgery outcomes and assess their prospects in clinical practice.

Materials and methods

included elements of analytical review and modeling . Scientific sources published in 2018–2024 were selected from PubMed, Scopus, and Google Scholar databases. The keywords “bariatric surgery”, “machine learning”, “prediction”, and “outcomes” were used in the search .

The analysis included research in the following areas :

- predicting weight loss
- predicting diabetes remission
- early detection of postoperative complications
- clinical decision support systems

in terms of AUC , sensitivity, and specificity .

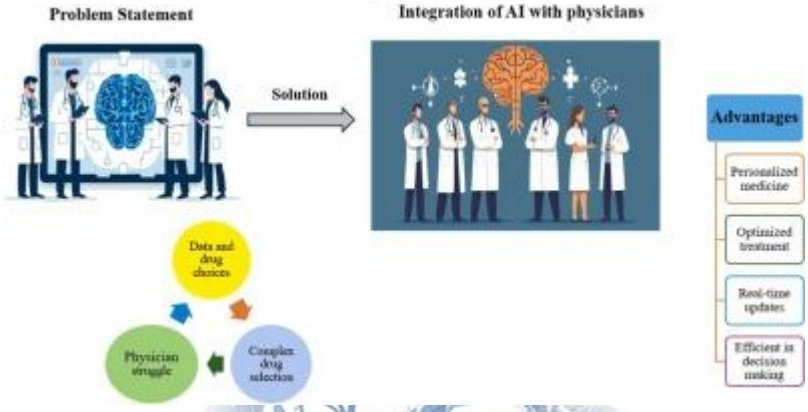
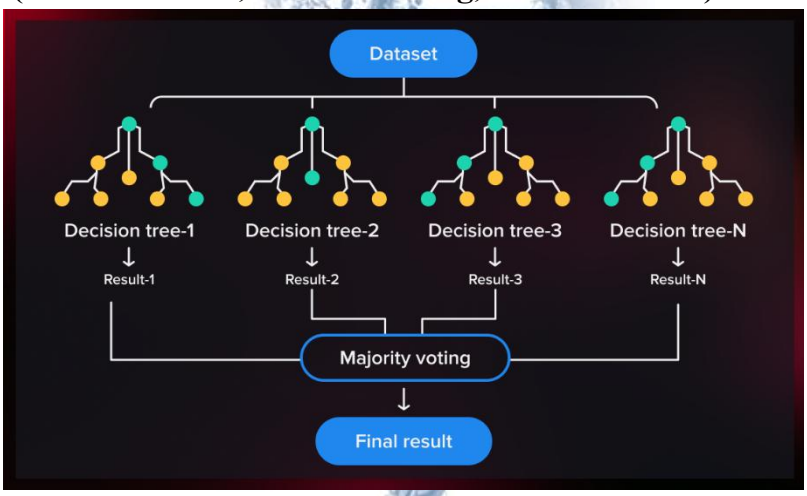
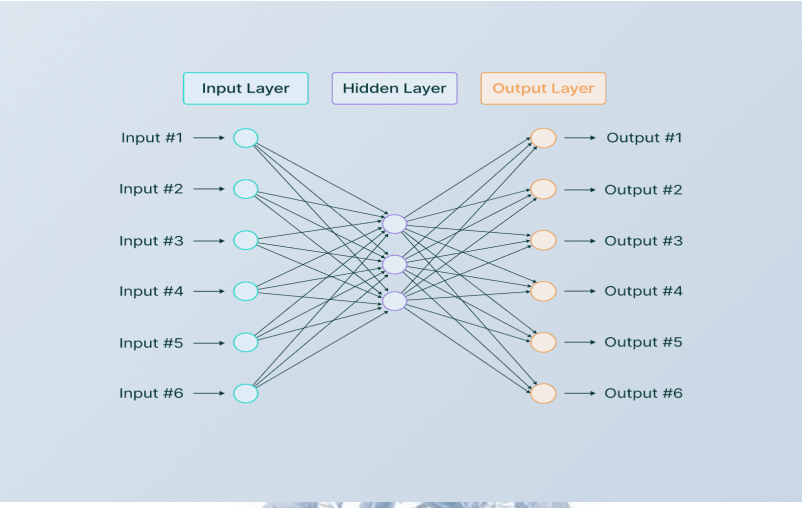
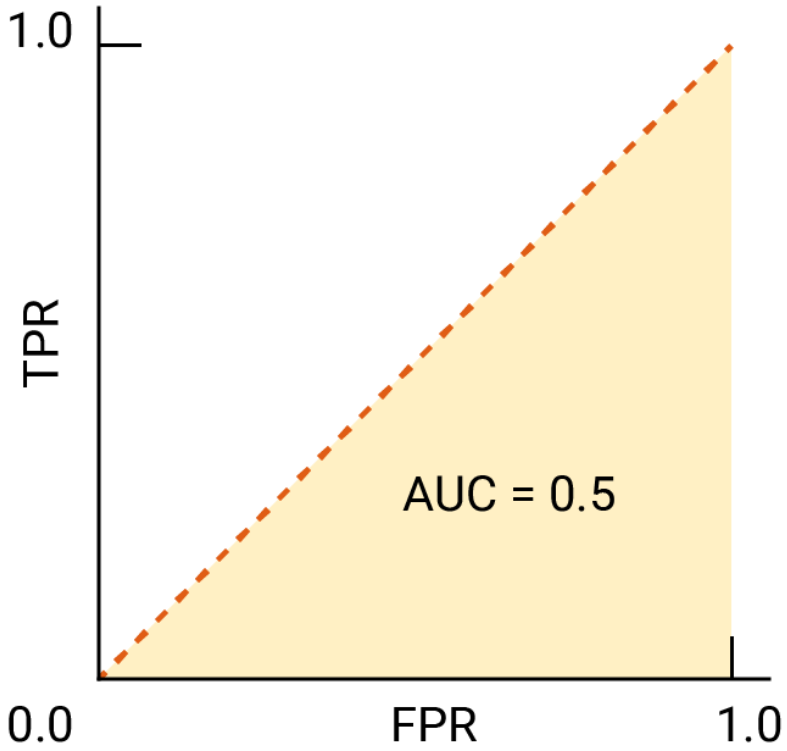


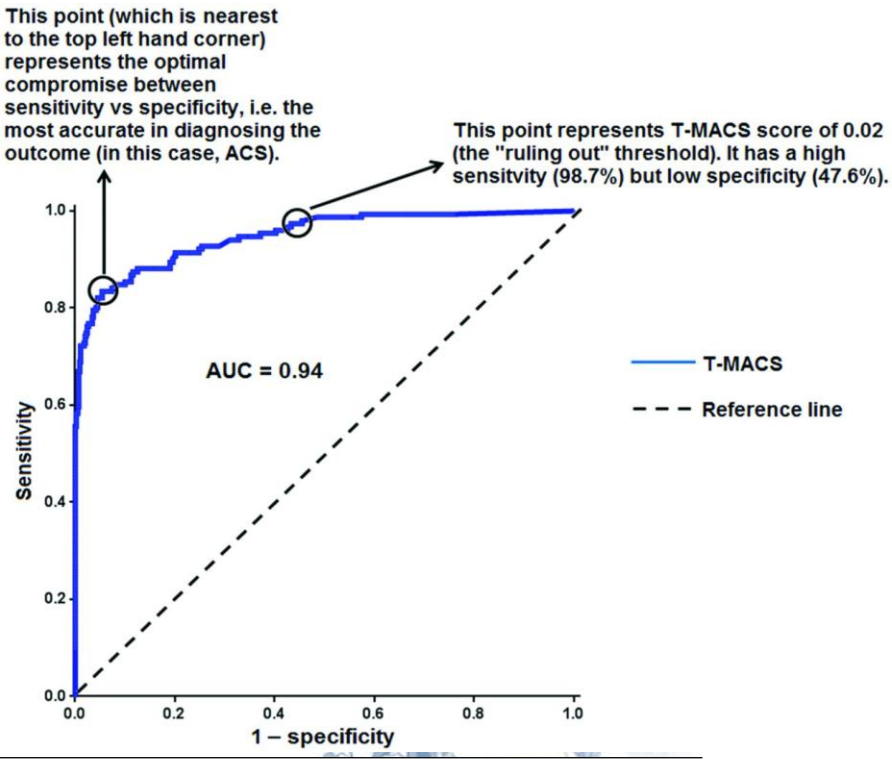
Figure 1. Stages of building an artificial intelligence model in predicting bariatric surgery outcomes (data collection, model training, and validation).

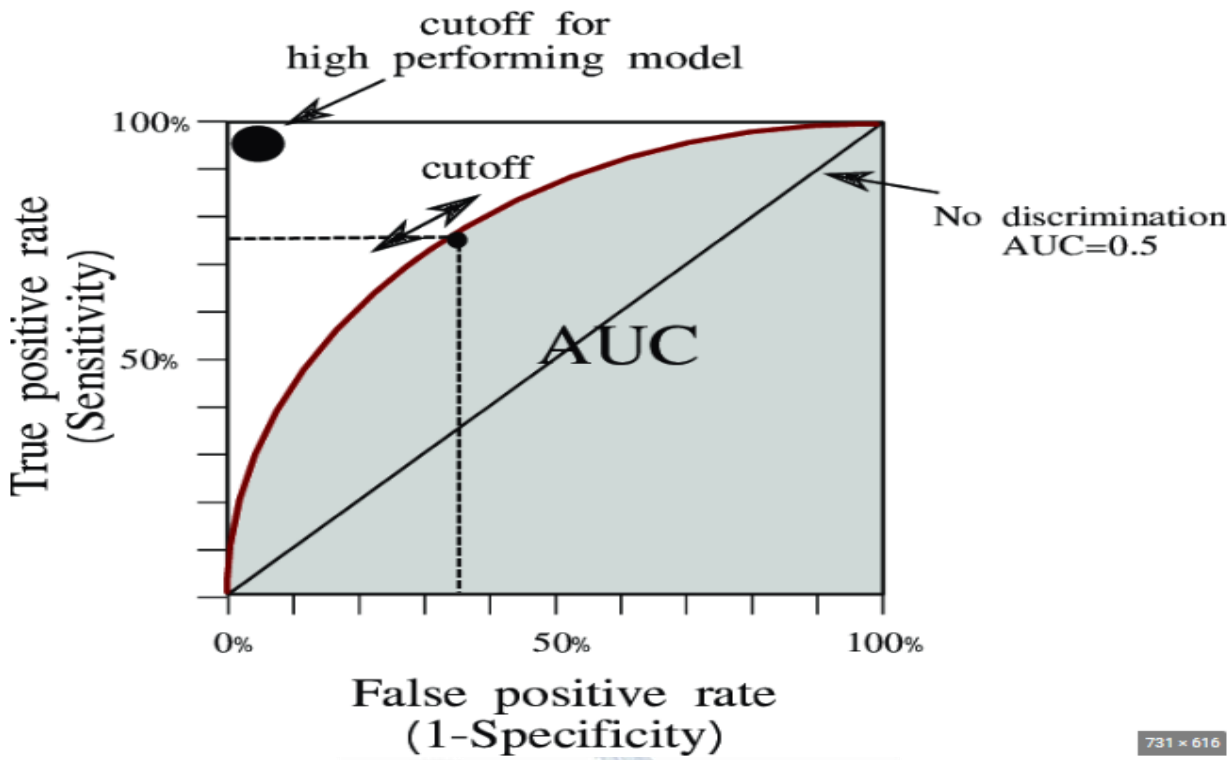




Basic machine learning algorithms used in predicting bariatric surgery outcomes .

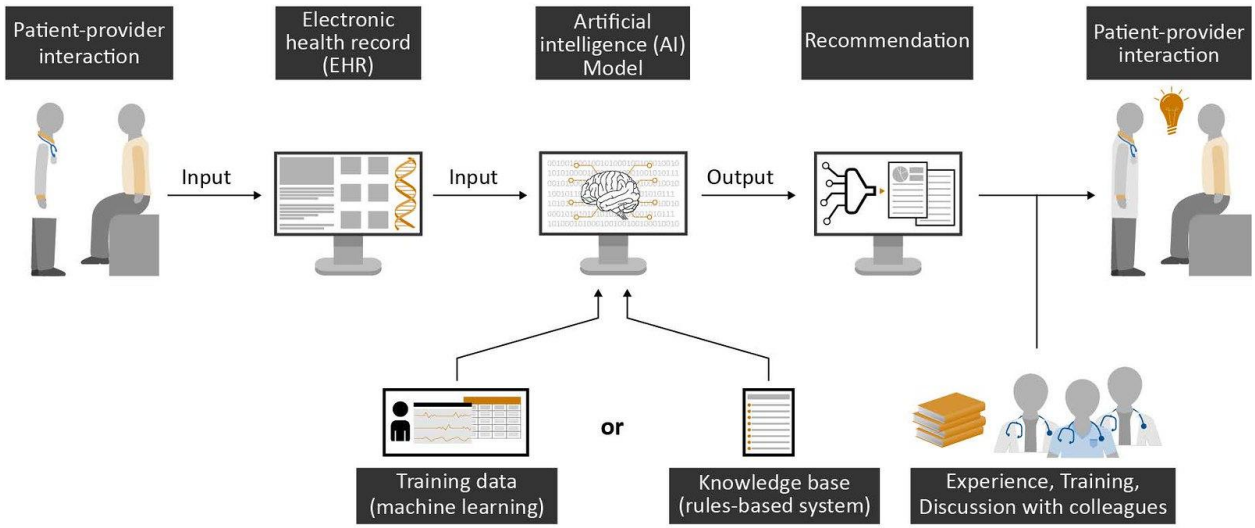



This point (which is nearest to the top left hand corner) represents the optimal compromise between sensitivity vs specificity, i.e. the most accurate in diagnosing the outcome (in this case, ACS).
This point represents T-MACS score of 0.02 (the "ruling out" threshold). It has a high sensitvity (98.7%) but low specificity (47.6%).
AUC = 0.94
T-MACS
Reference line
Sensitivity
1 – specificity
0.0
0.2
0.4
0.6
0.8
1.0


cutoff for high performing model
cutoff
No discrimination AUC=0.5
AUC
True positive rate (Sensitivity)
False positive rate (1-Specificity)
100%
50%
0%
50%
100%
731 × 616

curve and AUC indicator for assessing the diagnostic accuracy of an artificial intelligence model .

Figure 5: Sample workflow for AI-based clinical decision support system



Source: GAO. | GAO-21-7SP

Figure 4. General architecture of an artificial intelligence-based clinical decision support system.

Results

In the majority of studies analyzed, machine learning models (random forest, gradient boosting, neural networks) showed high predictive accuracy . The models had AUCs in the range of 0.78–0.90 in predicting weight loss .

showed higher accuracy than traditional logistic regression in predicting type 2 diabetes remission . The most important predictors were identified as:

- initial BMI
- diabetes duration
- HbA1c level
- young
- type of operation

In models predicting the risk of complications, the duration of surgery, comorbid conditions, and laboratory parameters were important factors .

Discussion

show that artificial intelligence has great potential as an individualized prognostic tool in bariatric surgery . Especially when there are many parameters of clinical data, SI algorithms have the advantage of being able to detect complex nonlinear relationships .

However, there are a number of challenges in implementing SI systems in clinical practice. The most important are data quality, model explainability, and physician acceptance. In addition, validation based on local population data is necessary.

In the future, the creation of real-time predictive models integrated with clinical information systems could further improve the effectiveness of bariatric surgery.

Conclusion

Artificial intelligence technologies are a promising tool for predicting the outcome of bariatric surgery at an individual level with high accuracy. AI-based models allow for optimizing patient selection, reducing the risk of complications, and improving clinical decision-making. The gradual integration of these technologies into surgical practice will improve the quality of modern bariatric care.

Research limitations

it is advisable to conduct prospective studies based on local clinical data .

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