## Supplementary

**Table S1** AI and cardiac surgery

| Method | Application scenarios | Evaluation |
|---|---|---|
| Data collection | | |
| Machine learning | Automatically extract information about cardiothoracic surgery from unstructured medical records | Improve data collection efficiency and reduce manual errors |
| Natural language | Automatic analysis and recognition of medical images, such as cardiothoracic surgery markers in CT and MRI | Improve the accuracy and speed of diagnosis |
| Data analysis | | |
| Machine learning | Genomics data were analyzed to identify genetic variants associated with cardiothoracic surgery | Capable of handling large-scale datasets and revealing complex biomarkers |
| Deep learning | For automatic classification of cardiothoracic surgery subtypes and prediction of treatment response | Provide personalized treatment recommendations to improve patient outcomes |
| Predictive modeling | | |
| Time series analysis | Predicting temporal trends in cardiothoracic surgery development and response to therapy | Help develop a more effective treatment plan |
| Recurrent neural network | Used to analyze sequentially generated medical data, such as continuous monitoring data during treatment | Optimize the treatment process to achieve real-time adjustment |
| Personalized interventions | | |
| Machine learning | The personalized treatment plan is customized according to the multi-dimensional data of the patient | Improve the therapeutic effect and reduce adverse reactions. Improve the therapeutic effect and reduce adverse reactions |
| Recommendation system | Provide doctors with evidence-based treatment options and medication recommendations | Support decision making and improve the accuracy of treatment |
| Monitoring platform | | |
| Sensor network | Patient physiological parameters such as cardiothoracic surgery marker levels were monitored in real time | Timely detection of changes in the condition supports early intervention. |
| Prediction model | Analyze patient data to predict disease progression and possible complications | To prevent serious incidents, take preventive measures in advance |
| Interactive visualization | | |
| Data visualization | It enables researchers, doctors, and patients to intuitively understand complex data and predictive models | Enhance data accessibility and understanding to facilitate shared decision making |
| Decision support | | |
| Decision support | Clinical guidelines and patient-specific data are combined to assist physicians in making treatment choices. | Improve the scientific and personalized level of treatment decision-making |

AI, artificial intelligence; CT, computed tomography; MRI, magnetic resonance imaging.

© Journal of Thoracic Disease. All rights reserved.
https://dx.doi.org/10.21037/jtd-24-990

**Table S2** AI and supervision and cardiac surgery

| Method | Methods/Application scenarios | Evaluation |
|---|---|---|
| Data quality | | |
| Ensure data accuracy and consistency | Data quality and reliability are ensured through data validation and cleaning procedures | Improve the accuracy and confidence of AI models |
| Protect patient privacy | Implement data de-identification and encryption measures to protect patient information | Comply with ethical and legal requirements and enhance patient trust |
| Algorithmic transparency | | |
| Improve algorithm transparency | Adopt interpretable AI models such as decision trees and logistic regression | Promotes understanding and trust, facilitates auditing and verification |
| Reduce bias and unfairness | The unfairness is reduced by diversity training data and bias detection algorithm | Ensure fairness and justice and avoid discrimination |
| Model verification | | |
| Rigorous model validation | Cross-validation, A/B testing, etc., are used to evaluate model performance | Ensure the generalization ability and effectiveness of the model |
| Clinical trials | Conduct clinical trials to evaluate the efficacy and safety of AI systems before practical application | Provide scientific evidence to support the application of AI systems |
| Regulatory approval | | |
| Get regulatory approval | Through FDA pre-market review or CE mark certification and other processes | Ensure product compliance with international and regional regulations |
| Continuous monitoring and auditing | Implement continuous quality monitoring and regular audit to maintain product quality | Maintain product performance, detect and correct problems in time |
| Market regulation | | |
| Real-time security monitoring | Long-term safety and efficacy monitoring using real-world data | Timely detection of potential risks to ensure patient safety |
| User feedback mechanism | A feedback system was established to collect feedback from doctors and patients on the AI system | Continuously improve products to meet user needs |
| Ethics regulation | | |
| Ethical review | AI research is reviewed by ethics committees to ensure ethical standards are met | Protect the rights and interests of participants and enhance the ethics of research |
| Social impact assessment | Assess the impact of AI technologies on society, including employment, privacy, and social welfare | Promoting social justice and sustainable development |

AI, artificial intelligence; FDA, Flight Data Analysis; CE, Conformite Europeenne.

© Journal of Thoracic Disease. All rights reserved.
https://dx.doi.org/10.21037/jtd-24-990