

Artificial intelligence in critical illness and its impact on patient care: a comprehensive review

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What is AI? ChatGPT:

1. Narrow AI (Weak AI):

- a. Designed and trained for a specific task or a narrow range of tasks.
- b. Examples include virtual personal assistants like Siri or Alexa, recommendation systems, and facial recognition software.

2. General AI (Strong AI):

- a. Possesses the ability to understand, learn, and apply intelligence across a wide range of tasks, similar to human cognitive abilities.
- b. This level of AI is still theoretical and not yet realized in practice.

3. Artificial Superintelligence (ASI):

- a. Hypothetical AI that surpasses human intelligence and capability in all aspects.
- b. ASI could potentially solve complex problems beyond human comprehension.



ChatGPT: Weet alles, Begrijpt niets



Generative vs Following Strict Rules

Write a vb.net script that uses smoothing to remove outliers in a collection of values



To create a VB.NET script that smooths a collection of values to remove outliers, you can implement a simple smoothing technique like moving average or median filtering. Below is an example of a VB.NET script that uses a median filter to remove outliers from a collection of values.

The median filter is a non-linear digital filtering technique, often used to remove noise from an image or signal. It works by moving through the signal and replacing each value with the median of the neighboring values.

Here's a VB.NET script:

```
vb.net Code kopieren  
  
Imports System  
Imports System.Collections.Generic  
  
Module Module1  
    Sub Main()  
        ' Example data  
        Dim values As List(Of Double) = New List(Of Double) From {10, 12, 14, 1000, 15, 17}  
  
        Console.WriteLine("Original Values:")  
        For Each value In values  
            Console.Write(value & " ")  
        Next  
  
        Dim smoothedValues As List(Of Double) = MedianFilter(values, 3)  
  
        Console.WriteLine(vbCrLf & "Smoothed Values:")  
        For Each value In smoothedValues  
            Console.Write(value & " ")  
        Next  
    End Sub  
End Module
```

What forms of AI?

- **Machine Learning (ML):**
 - A subset of AI focused on developing algorithms that enable computers to learn from and make predictions or decisions based on data.
 - Techniques include supervised learning, unsupervised learning, and reinforcement learning.
- **Deep Learning:**
 - A specialized form of machine learning that uses neural networks with many layers (deep neural networks) to analyze various factors of data.
 - Particularly effective in image and speech recognition tasks.
- **Natural Language Processing (NLP):**
 - Enables machines to understand, interpret, and generate human language.
 - Applications include language translation, sentiment analysis, and chatbots.
- **Computer Vision:**
 - Allows machines to interpret and make decisions based on visual data from the world.
 - Used in facial recognition, object detection, and autonomous vehicles.
- **Robotics:**
 - Integrates AI to enable robots to perform tasks autonomously or semi-autonomously.
 - Applications range from manufacturing to surgery and exploration.

The Turing Test

- **Proposed by:** Alan Turing in 1950
- **Purpose:** Evaluate if a machine can exhibit human-like intelligence
- **Process:** A human evaluator interacts with a machine and a human via a computer
- **Criteria:** The machine passes if the evaluator cannot distinguish it from the human
- **Relation to AI:** Measures a machine's ability to demonstrate human-like intelligence, focusing on natural language, reasoning, and learning.

Illness and its impact on critical care: a comprehensive review

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Artificial intelligence (AI) has great potential to improve and enhance patient outcomes. This paper provides a comprehensive review of future applications of AI in critical illness and its impact on its use in perceiving disease, predicting changes in disease, and assisting in clinical decision-making. To achieve this, the paper discusses the reasoning behind AI-generated recommendations, ensuring they are transparent and that AI systems are designed to be safe for critically ill patients. These challenges must be addressed through the development of quality control measures to ensure AI is used in an effective manner. In conclusion, this paper highlights the current and potential applications of AI in critical care and encourages further research and development in this field. By enabling the prediction of changes in pathological processes, and supporting clinical decisions, AI has the potential to revolutionize critical care and improve the efficiency of health systems.

KEYWORDS

artificial intelligence, intensive care units, critical illness

- **Interpretability:** Ensuring AI systems are understandable and trustworthy for clinicians.
- **Reproducibility:** Challenges in clinical trials and experiments leading to low reproducibility of AI solutions.

Slide 7: Ethical Concerns

- **Data Privacy:** Risks associated with data collection and manipulation.
- **Safety of AI Models:** Ensuring AI recommendations align with patient preferences and are safe for use.

Slide 8: Conclusion and Future Guidance

- **Conclusion:** AI has the potential to revolutionize critical care by improving disease perception, prediction, and clinical decision-making.
- **Future Steps:** Focus on data de-identification, standardization, federated learning, and real-time AI model integration in clinical settings.

I'll create the PowerPoint again and provide you with a link to download it.

(-)



Analyzing



Message ChatGPT

Introduction

- Definition of AI: Simulation of human cognitive functions by machines.
- Purpose of the Paper: Overview of AI applications in critical care and its impact on patient outcomes.

Methods

- Literature Review: Comprehensive search in PubMed, Google Scholar, PLOS One, and Scopus.
- Keywords Used: “Critical care,” “intensive care medicine,” “ICU medicine,” “artificial intelligence,” “AI,” “machine learning,” “critical illness.”
- Time Frame: January 2018 - February 2023.

Applications of AI in Critical Care

1. Recognition of Disease: AI aids in diagnosing the source of clinical decline using advanced text and image processing.
2. Prediction of Disease Progression: AI models like random forest predict outcomes such as cardiorespiratory instability and tachycardia.

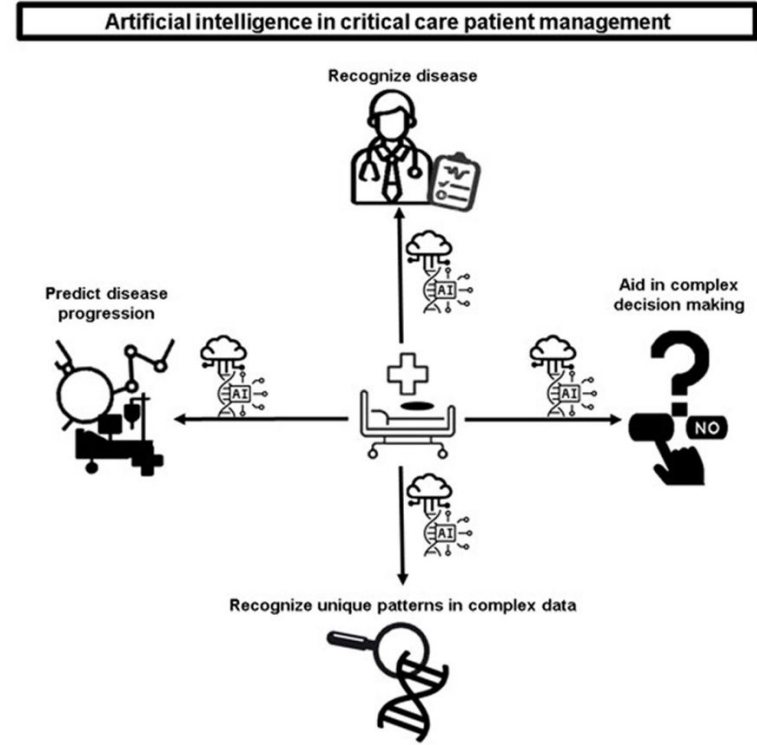
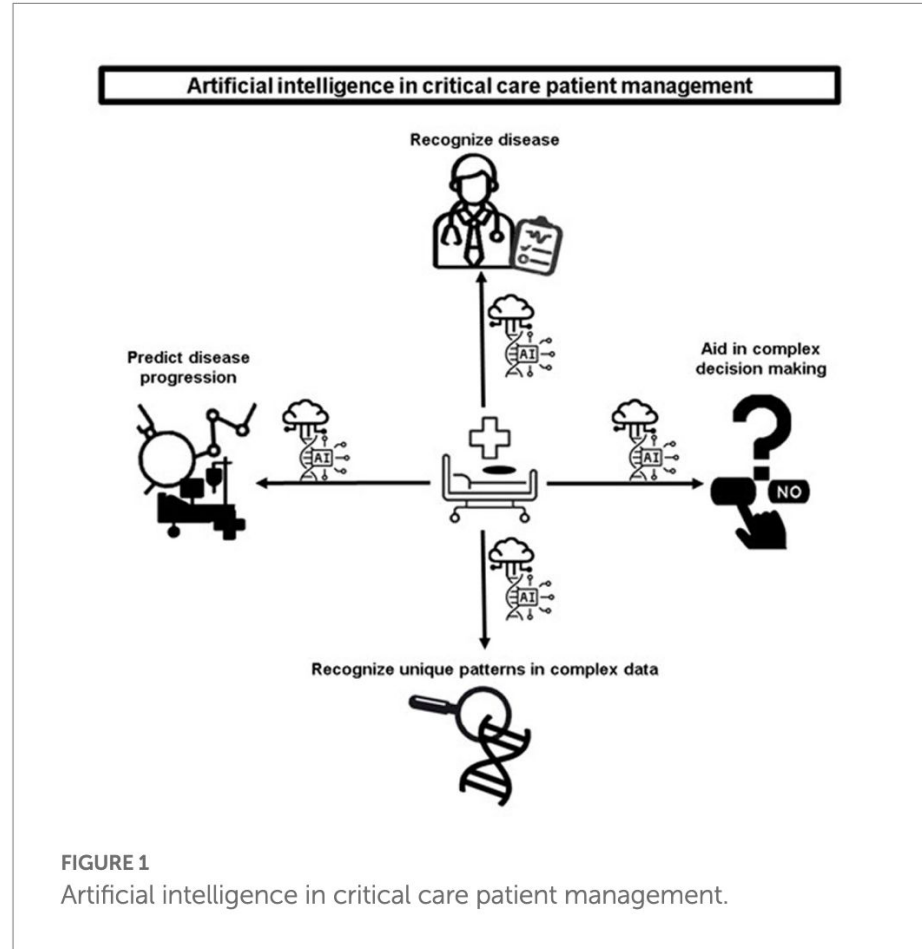


FIGURE 1

Artificial intelligence in critical care patient management.

Decision-Making

- Recognition of Patterns: AI identifies unique patterns in complex data for personalized treatment plans.
- Decision Support: AI assists in risk assessment, predicting patient deterioration, and enhancing clinical decision-making.



Challenges and Obstacles

- Interpretability: Ensuring AI systems are understandable and trustworthy for clinicians.
- Reproducibility: Challenges in clinical trials and experiments leading to low reproducibility of AI solutions.

Challenges and ethical concerns about artificial intelligence in critical care patient management

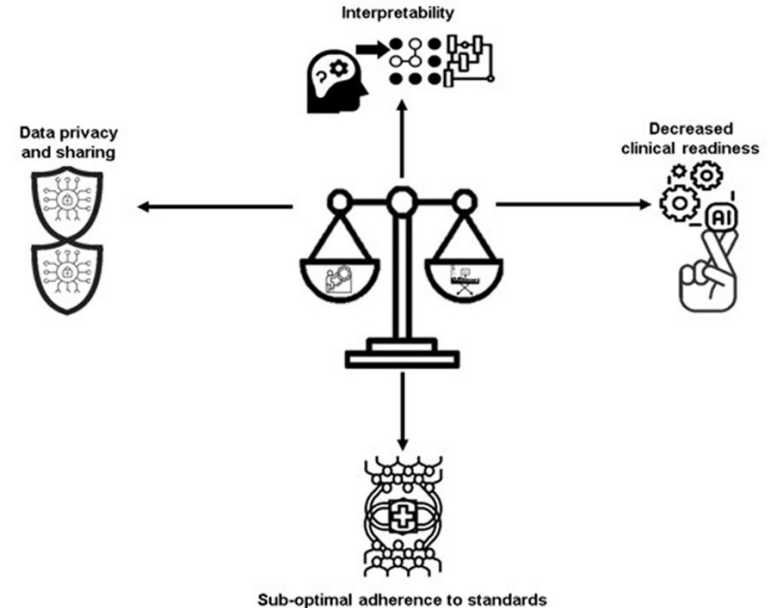


FIGURE 2

Challenges and ethical concerns of AI in critical care patient management.

Ethical Concerns

- Data Privacy: Risks associated with data collection and manipulation.
- Safety of AI Models: Ensuring AI recommendations align with patient preferences and are safe for use.

Challenges and ethical concerns about artificial intelligence in critical care patient management

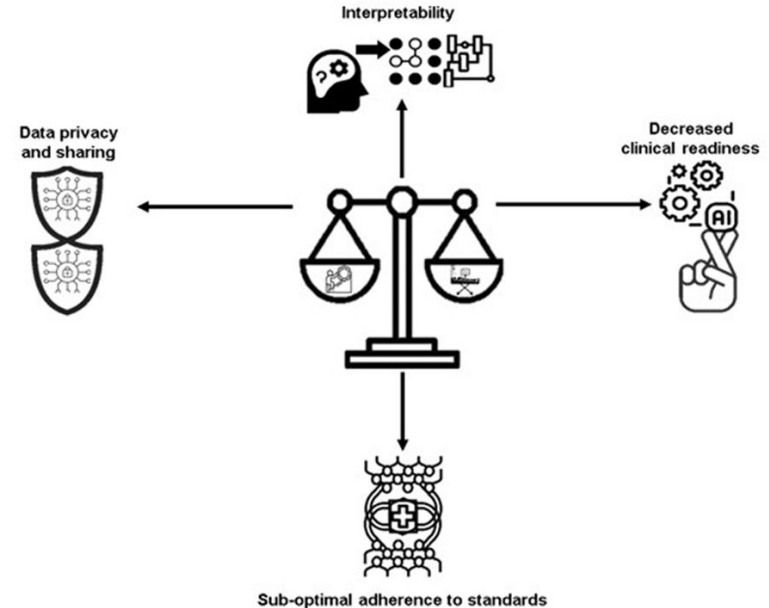
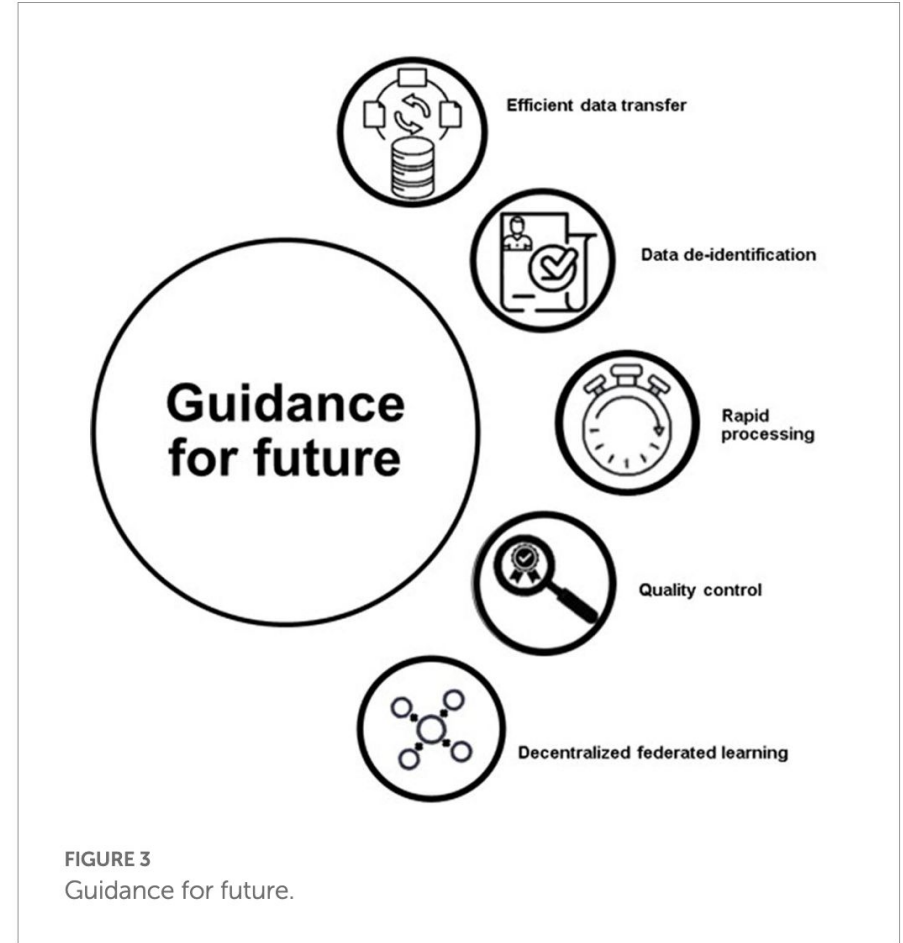


FIGURE 2

Challenges and ethical concerns of AI in critical care patient management.

Conclusion and Future Guidance

- Conclusion: AI has the potential to revolutionize critical care by improving disease perception, prediction, and clinical decision-making.
- Future Steps: Focus on data de-identification, standardization, federated learning, and real-time AI model integration in clinical settings.





A Strategy for Artificial Intelligence With Clinical Impact—Eyes on the Prize

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Strategy

What's the problem?

Which problem does my model need to solve? And do I need AI for it?

Good-quality training data

The quality of training data influences the output. It is essential to address biases⁶ and heterogeneity.⁷

Selecting the right AI technique

AI methods have unique strengths and limitations that are crucial to establish the model's boundaries.

Performance evaluation

A validation study should consider both mathematical performance metrics and qualitative measures.

Certification and distribution

FAIR⁹ data distribution, model publication, mandatory certification, and adherence to guidelines are essential.

Deployment and continuous improvement

An implementation team⁸ can assist in workflow adoption and ease impact. Model performance should be monitored after deployment along with regular updates of the model.



Multidisciplinary team-During every stage of development and deployment, it is crucial to include experts with diverse viewpoints

IT infrastructure-Creating real-time, actionable, and secure data streams and an environment for model deployment

Documentation-Annotation of (meta)data and model(s) supports evaluation, reproducibility, and certification

Postmarket surveillance

Change management-An implementation team eases workflow changes and promotes adoption

Use case

How can we assess clinical stability in high-risk patients with critical congenital heart disease with large amounts of heterogeneous clinical data?

Biases,⁶ including measurement error (eg, patient was moving) and treatment effects, were evaluated, visualized, and dealt with to maintain data quality.

The model needs to be able to handle time-dependency and heterogeneity (eg, oxygen saturation of 75% can be normal). A dual approach was chosen.⁴

A diagnostic trial was performed to assess the performance of the model and interface initially in hospital and later through a consortium of hospitals.

To comply with the MDR,⁵ all steps were documented. The scripts of the model and the underlying datasets were distributed according to the FAIR principles.⁹

The model is deployed in the clinical workflow through a change-management plan.⁸ Performance is periodically assessed, and when below baseline, the model is updated.