

# Advancing Patient Education in Critical Care Nephrology: ChatGPT's Role in CRRT and AKI Information Dissemination



## AKI & CRRT Conference

Mohammad S. Sheikh, MD<sup>1</sup>; Supawadee Suppadungsuk, MD<sup>1</sup>; Charat Thongprayoon, MD<sup>1</sup>; Jing Miao, MD, PhD<sup>1</sup>;  
Fawad M. Qureshi, MD<sup>1</sup>; Kianoush B. Kashani, MD<sup>1,2</sup>; Wisit Cheungpasitporn, MD<sup>1</sup>

<sup>1</sup>Mayo Clinic Minnesota, Division of Nephrology and Hypertension, <sup>2</sup>Mayo Clinic Minnesota, Division of Pulmonary and Critical Care Medicine

### Abstract

This study assesses ChatGPT-4's ability to provide accurate patient education on Acute Kidney Injury (AKI) and Continuous Renal Replacement Therapy (CRRT).

Eighty-nine questions sourced from the Mayo Clinic Handbook were posed to ChatGPT-4 in various formats, including original questions in well-written layperson's terms, paraphrased questions with altered proverbs, paraphrased questions resulting in incomplete sentences, and paraphrased questions containing misspellings.

Results indicate a high accuracy (97-98%) across all questions types. Statistical analysis shows no significant performance difference across question formats or content areas (p-value: 1.00 for AKI and CRRT).

ChatGPT-4's consistent proficiency suggests its potential as a valuable tool for patient education in critical care nephrology

### Introduction

Acute kidney injury (AKI) is a critical global concern, significantly affecting the morbidity and mortality of millions in critical care settings annually. Concurrently, there is a growing reliance on Continuous Renal Replacement Therapy (CRRT) as a vital treatment for AKI among critically ill patients. The complexity of these conditions underscores the crucial need for comprehensive patient and family education, which is essential for enabling informed health decisions. Despite the urgency, the demanding pace of intensive care units often limits the time healthcare professionals can dedicate to education, highlighting the necessity for additional accessible, easily understandable resources. Within this context, artificial intelligence (AI) emerges as a pivotal tool.

AI models like ChatGPT-4, adept at synthesizing and conveying complex information, hold promise in enhancing patient comprehension. Yet, the potential of AI to simplify intricate medical jargon into layperson language for effective patient education, particularly in nephrology, has not been fully realized.

This investigation seeks to discern ChatGPT-4's efficacy in demystifying AKI and CRRT for patients and their families, with the goal of enriching their understanding and participation in treatment decisions.

### Methods

A total of eighty-nine questions were curated from the Mayo Clinic Handbook, which is specifically designed to educate patients on CRRT (50 questions) and AKI (39 questions). These questions were meticulously selected to cover a broad range of topics within these areas to ensure a comprehensive evaluation of ChatGPT-4's capabilities.

The selected questions were modified into four different versions (V) to test ChatGPT-4's ability to handle different linguistic challenges.

- V1: "Original" – questions written in well-crafted layperson's terms
  - How is CRRT different from regular dialysis?
- V2: "Adverb-altered" – paraphrased questions with different interrogative adverbs
  - In what aspects does CRRT diverge from standard dialysis?
- V3: "Incomplete sentence" – paraphrased questions resulting in incomplete sentences
  - How CRRT divergence regular dialysis
- V4: "Misspelling" – paraphrased questions with intentional misspellings
  - Whet azpects doas CRRT divarge frum regular dialyziz?

ChatGPT-4 was prompted to respond to each version. Two critical care nephrologists reviewed its answers for accuracy and relevance in patient education.

For statistical analysis, ChatGPT-4's accuracy was measured in percentages. The McNemar test was utilized to compare the AI's performance across the different question versions. The chi-squared test was used to assess the accuracy between AKI and CRRT-related responses, considering a p-value <0.05 as statistically significant.

### Results

- Overall accuracy for all questions was high, with "original" and "adverb-altered" questions scoring 96.63% and "incomplete sentences" and "misspellings" scoring 97.75%.
- The chi-squared test revealed no statistically significant difference in performance (p-value: 0.94) in accuracy for all questions.
- For CRRT questions, accuracy was 96.00% for "original" and "adverb-altered" questions. Accuracy for "incomplete sentences" and "misspellings" was 98.00%.
- In contrast, AKI questions consistently showed a 97.30% accuracy rate across all question types.
- A comparison of CRRT and AKI question responses revealed no substantial statistical disparity (p-value: 0.10).

Table 1 The percentage of appropriate response of ChatGPT to different versions of questions.

	Original	Adverb altered	p-value*	Incomplete sentence	p-value*	Misspelling	p-value*
All (n=89)	86 (97)	86 (97)	1.00	87 (98)	0.32	87 (98)	0.32
CRRT (n=50)	48 (96)	48 (96)	1.00	49 (98)	0.32	49 (98)	0.32
AKI (n=39)	38 (97)	38 (97)	1.00	38 (97)	1.00	38 (97)	1.00
P-value#	0.71	0.71	-	0.86	-	0.86	-

\*compared with original version

# compared between CRRT and AKI questions

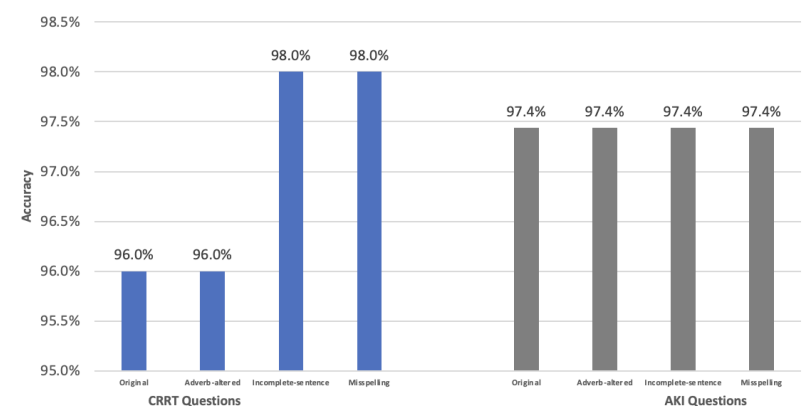


Table 2. ChatGPT-4 accuracy on different versions of patient education questions

#### "Original"

How is CRRT different from regular dialysis?

**Mayo Handbook Answer:** CRRT is continuous, running 24/7. Regular dialysis is intermittent, usually 3-4 hours at a time, 3 days per week. CRRT is slower and gentle.

**GPT-4 Response:** CRRT is slower and gentler, ideal for unstable, critically ill patients, whereas regular dialysis is faster and more intensive.

#### "Adverb-Altered"

In what aspects does CRRT diverge from standard dialysis?

**Mayo Handbook Answer:** CRRT is continuous, running 24/7. Regular dialysis is intermittent, usually 3-4 hours at a time, 3 days per week. CRRT is slower and gentle.

**GPT-4 Response:** CRRT is a slower, gentler approach suitable for unstable patients in comparison to standard dialysis.

#### "Incomplete sentence"

How CRRT divergence regular dialysis

**Mayo Handbook Answer:** CRRT is continuous, running 24/7. Regular dialysis is intermittent, usually 3-4 hours at a time, 3 days per week. CRRT is slower and gentle.

**GPT-4 response:** CRRT differs from standard dialysis in its pace. HD happens over few hours and can be taxing on the body. CRRT is continuous over 24 hours, making it more tolerable for critically ill patients.

#### "Misspellings"

Whet azpects doas CRRT divarge frum regular dialyziz?

**Mayo Handbook Answer:** CRRT is continuous, running 24/7. Regular dialysis is intermittent, usually 3-4 hours at a time, 3 days per week. CRRT is slower and gentle

**GPT-4 Response:** CRRT differs from standard dialysis in its slower and more continuous process, making it suitable for critically ill patients. It's less likely to cause hemodynamic instability compared to the rapid fluid shifts in conventional dialysis.

### Conclusion

ChatGPT-4 exhibits a high level of accuracy in responding to patient education level for CRRT and AKI, maintaining a consistent performance across various linguistic modifications. Future studies must explore its integration into actual practice for patient education. This would provide a more comprehensive understanding of its applicability and effectiveness in real-world medical settings.



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