Comparative evaluation of ChatGTP-4o and ChatGTP-3.5 in clinical rule-guided dose interventions in hospitalized patients with renal dysfunction

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Aim

To evaluate the effectiveness of ChatGPT-4o compared to ChatGTP-3.5 in providing clinical rule-guided dose interventions for patients with renal impairment.

Background

- Clinical decision support systems (CDSS) play a crucial role in identifying medications that require dose modifications for patients with renal impairment.
- Large Language Models (LLM) like ChatGTP has potential for providing such dose recommendations.
- Performance of ChatGTP-3.5 was however subobtimal[1].
- Recently release of ChatGTP-4o

Methods

CDSS alerts related to renal dysfunction:
- Withouth patient specific information
- With patient specific information

Presented to

ChatGTP-3.5 and **ChatGTP-4o**

Expert panel:
- Hospital pharmacist
- Nephrologist

Advices

Determing accuracy of answers:

1. Dose advice by ChatGPT is correct and identical to the dose advice given by the expert panel,
2. Dose advice is correct but different from expert panel
3. Dose advice by ChatGPT is incorrect.

Results

- 172 CDSS alerts for 80 patients.

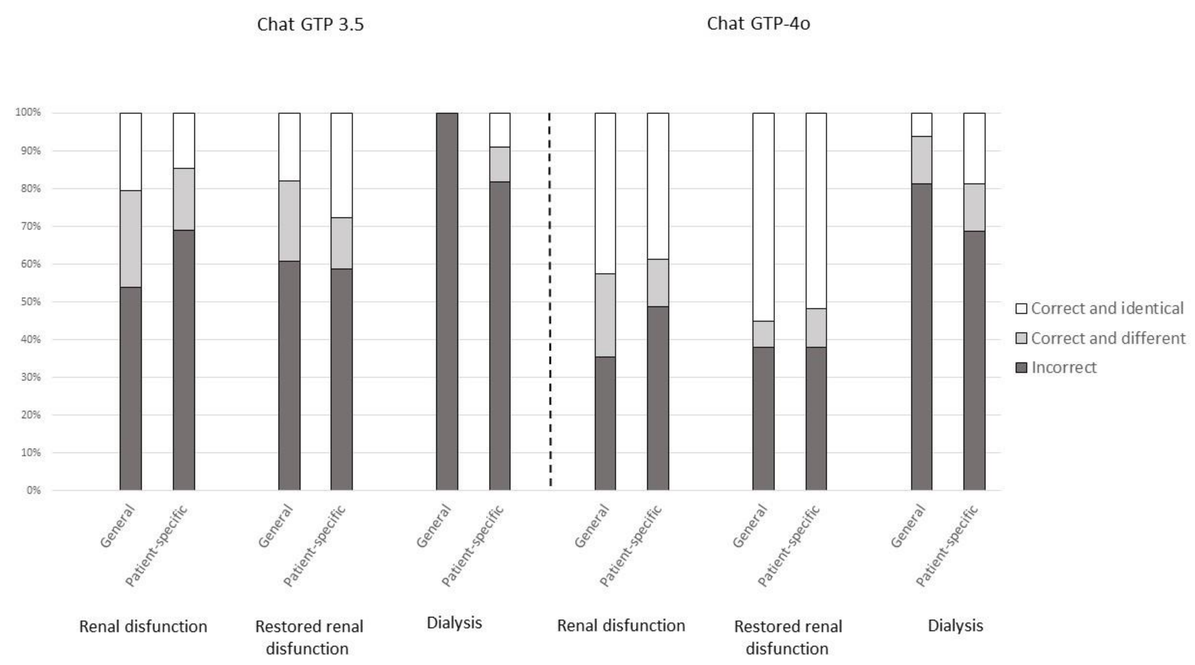
Performance ChatGTP-3.5

	Simple question	Complex question
“correct and identical”	19.9 %	16.7 %
“correct and different”	26.7 %	16.0 %
“incorrect responses”	53.4 %	67.3 %

Performance ChatGTP-4o

	Simple question	Complex question
“correct and identical”	41.3 %	39.0 %
“correct and different”	18.6 %	12.2 %
“incorrect responses”	40.1 %	48.8 %

Figure 1. Accuracy of ChatGPT answers per alert type.



Example of general and patient-specific presentation and responses for decreased renal function as presented to ChatGPT, including an example of both with metformin

Format general question	A patient with an eGFR (CKD-EPI) of [eGFR] ml/min/1.73m2 is treated with [DRUG] [DOSE]mg [FREQUENCY]. What dose would a healthcare professional recommend?
Example general question	A patient with an eGFR (CKD-EPI) of 45 ml/min/1.73m2 is treated with metformin 1000mg twice daily. What would a healthcare professional recommend regarding the metformin dose?
Response general question	For a patient with an eGFR of 45 mL/min, I recommend reducing the metformin dose to 1000 mg per day to minimize the risk of lactic acidosis while ensuring safety in renal function.
Format patient specific question	A [AGE]-year old [GENDER] with an eGFR (CKD-EPI) of [eGFR] ml/min is admitted to the [DEPARTMENT] with [REASON FOR ADMISSION]. She is treated with [DRUG] [DOSE]mg [FREQUENCY] for [DIAGNOSIS]. Her renal function prior to hospitalization was [eGFR] ml/min and the reason for decline in eGFR is [REASON FOR RENAL DYSFUNCTION]. [YES/NO] co-medication affecting renal function is being used [, BEING]. What dose would a healthcare professional recommend?
Example patient specific question	A 88-year old female with an eGFR (CKD-EPI) of 45 ml/mi is admitted to the orthopedic surgery department with a broken hip at the surgery department. She is treated with metformin 1000 mg twice daily for type 2 diabetes mellitus. Her renal function prior to hospitalization was 70 ml/min and the reason for decline in eGFR is prerenal renal failure due to dehydration. No co-medication affecting renal function is being used. What would a healthcare professional recommend regarding the metformin dose?
Response patient specific question	For an 88-year-old male with an eGFR of 45 mL/min, the recommended metformin dose is 500 mg twice a day (total 1000 mg/day) to minimize the risk of lactic acidosis while managing diabetes.

Conclusion

The performance of ChatGPT-4o in clinical rule-guided dose interventions in hospitalized patients with renal dysfunction was much better than ChatGPT-3.5. However, it is not appropriate for automatic integration into our EHR to handle CDSS alerts related to renal dysfunction.

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[1]van Nuland M, Snoep JD, Egberts T, Erdogan A, Wassink R, van der Linden PD. Poor performance of ChatGPT in clinical rule-guided dose interventions in hospitalized patients with renal dysfunction. Eur J Clin Pharmacol. 2024 Aug;80(8):1133-1140. doi: 10.1007/s00228-024-03687-5.

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