AI in Action: Integrating ChatGPT in a Second-Year Drug Information Course at the Gregory School of Pharmacy

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Purpose

- ChatGPT (Chat Generative Pre-trained Transformer) is an artificial intelligence (AI) tool that has prompted discussion for its potential use in pharmacy education and healthcare.[1]
- Previous studies have shown that ChatGPT-4 excels in providing responses to drug information (DI) inquiries.[2-3]
- To encourage technological literacy among student pharmacists, ChatGPT-3.5 (free version) was intentionally integrated into a second-year DI course for the first time at the Gregory School of Pharmacy (GSOP) in Fall 2023.
- The objective was for students to evaluate the accuracy, completeness, and elegance of information provided by ChatGPT-3.5 when compared with information within standard DI resources (e.g. tertiary references).

Methods

- The DI course employs a process-oriented guided inquiry learning (POGIL) pedagogy, which is a fully active learning approach.
- Students in six groups of five, engaged in comparative analyses evaluating responses generated from ChatGPT for:
  - Depth of information (accuracy)
  - Relevance to DI inquiry and/or omission of content (completeness)
  - Ability to articulate an intelligent response (elegance)
- Ten questions throughout four different modules were assigned for students to answer during in-class exercises (Table 1).
- Students were required to submit their responses via a Microsoft Office Forms using a 5-point Likert scale (1-poor to 5-excellent).
- Students were also asked to give feedback on the process via course evaluations.
- Descriptive statistics were used to analyze the data.
- The project received exemption from the University's institutional review board.

Methods

Category	Question
Adverse drug reactions	What is the risk of falls, dizziness, or impaired balance with zolpidem?
Alternative medicines	Is fenugreek used for diabetes? Does it work, and is it safe?
Cost	What is the monthly cost of elexacaftor/ivacaftor/tezacaftor (Trikafta®)?
Dosage adjustment	What is the maximum dose of metformin? Should it be adjusted in a patient whose renal function is 40 mL/min?
Drug interactions	A patient picks up a new prescription for tramadol (as needed for pain), post-surgery. An interaction alert pops up between tramadol and fluoxetine for major depressive disorder. How do you counsel?
First line/drug of choice	What is the preferred initial pharmacologic agent for the treatment of type 2 diabetes in a patient with comorbid obesity? The patient has no other risk factors for cardiovascular disease and no diagnosis of heart failure or chronic kidney disease.
Monitoring parameters	Which monitoring parameter should be checked before initiating treatment with a sodium-glucose transport protein-2 inhibitor (SGLT2i)?
Ongoing studies	Are there any ongoing studies investigating if there is a positive effect of Rybelsus® (oral semaglutide) in patients with type 2 diabetes and heart disease?
Patient education	A patient is picking up a prescription for Simbrinza® (brinzolamide/brimonidine) eye drops for the first time. How should the pharmacist counsel the patient to administer this medication?
Vaccines	Which vaccinations are needed prior to going on a mission trip to Uganda? Is a rabies vaccine required?

Table 1. Ten Questions Asked During Group Exercises

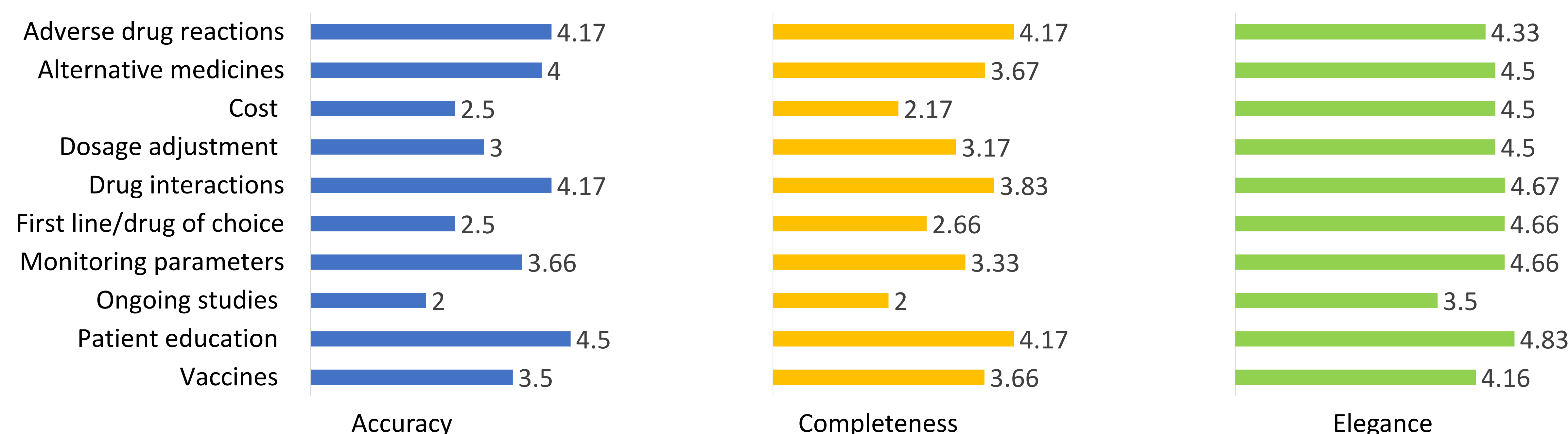## Results

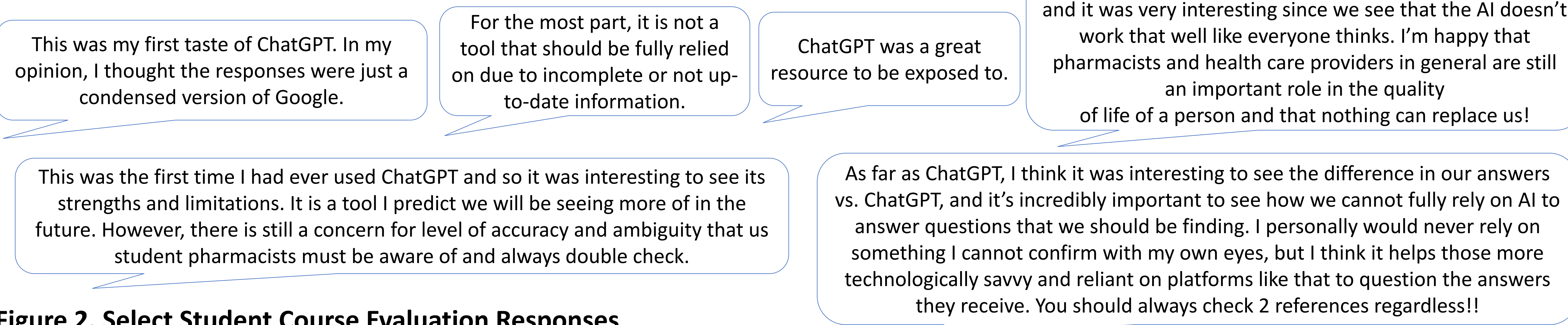**Figure 1. Results of ChatGPT-3.5 Group Responses to Survey (N=30)**

Accuracy
- Adverse drug reactions 4.17
- Alternative medicines 4
- Cost 2.5
- Dosage adjustment 3
- Drug interactions 4.17
- First line/drug of choice 2.5
- Monitoring parameters 3.66
- Ongoing studies 2
- Patient education 4.5
- Vaccines 3.5

Completeness
- Adverse drug reactions 4.17
- Alternative medicines 3.67
- Cost 2.17
- Dosage adjustment 3.17
- Drug interactions 3.83
- First line/drug of choice 2.66
- Monitoring parameters 3.33
- Ongoing studies 2
- Patient education 4.17
- Vaccines 3.66

Elegance
- Adverse drug reactions 4.33
- Alternative medicines 4.5
- Cost 4.5
- Dosage adjustment 4.5
- Drug interactions 4.67
- First line/drug of choice 4.66
- Monitoring parameters 4.66
- Ongoing studies 3.5
- Patient education 4.83
- Vaccines 4.16

Figure 2. Select Student Course Evaluation Responses

- This was my first taste of ChatGPT. In my opinion, I thought the responses were just a condensed version of Google.
- For the most part, it is not a tool that should be fully relied on due to incomplete or not up-to-date information.
- ChatGPT was a great resource to be exposed to.
- Honestly, before the class, I never used ChatGPT before, and it was very interesting since we see that the AI doesn't work that well like everyone thinks. I'm happy that pharmacists and health care providers in general are still an important role in the quality of life of a person and that nothing can replace us!
- This was the first time I had ever used ChatGPT and so it was interesting to see its strengths and limitations. It is a tool I predict we will be seeing more of in the future. However, there is still a concern for level of accuracy and ambiguity that us student pharmacists must be aware of and always double check.
- As far as ChatGPT, I think it was interesting to see the difference in our answers vs. ChatGPT, and it's incredibly important to see how we cannot fully rely on AI to answer questions that we should be finding. I personally would never rely on something I cannot confirm with my own eyes, but I think it helps those more technologically savvy and reliant on platforms like that to question the answers they receive. You should always check 2 references regardless!!

Discussion

- When compared with standard drug references, students detected limitations in the accuracy and completeness of ChatGPT-3.5's responses across several categories.
- Accuracy and completeness ratings were lowest for DI inquiries that required recently updated information, such as those found in clinical practice guidelines and ongoing studies.
- Students were not provided explicit instructions on optimizing question prompts which could have impacted the response ratings.
- In course evaluations, students reflected on the essential role of pharmacists, as the 'medication expert,' to verify information from AI tools.
- ChatGPT was creatively integrated without increasing curricular overload.

Conclusion

- Access, capability, and familiarity with AI tools will increase. Thus, exposure is valuable in the training of pharmacists.
- This exercise integrated an AI tool in GSOP's didactic curriculum highlighting positive value and reinforcing that:
  - Pharmacists must authenticate accuracy and completeness from AI tools and similar information sources.
  - Pharmacists should be adept at technological advancements.

References

1. Cain J, Malcom DR, Aungst TD. The Role of Artificial Intelligence in the Future of Pharmacy Education. Am J Pharm Educ. 2023;87(10):100135.
2. Morath B, Chiriac U, Jaszkowski E, et al. Performance and risks of ChatGPT used in drug information: an exploratory real-world analysis. Eur J Hosp Pharm. 2023;ejhpharm-2023-003750.
3. He N, Yan Y, Wu Z, et al. Chat GPT-4 significantly surpasses GPT-3.5 in drug information queries. J Telemed Telecare. 2023;1357633X231181922.