Evaluating Generative Artificial Intelligence (GenAl) in Health Technology Assessment (HTA) Content Generation: A Proof-Of-**Concept Study Using Canadian Agency for Drugs and** Technologies in Health (CADTH) Reimbursement Dossier Forms



Jessica Walters¹, Inês Guerra¹, Ketevan Rtveladze¹, Joe Joseph¹, Raja Shankar¹, Timothy Wiemken², Pierre-André Dubé³, Tatia Woodward² 1QVIA, London, United Kingdom; ²Pfizer Inc, New York, New York, United States of America; ³Pfizer Canada Inc, Quebec, Canada

OBJECTIVES

- When submitting a Health Technology Assessment (HTA) in Canada, sponsors are required to complete three CDA (Canada's Drug Agency), previously CADTH, templates: Pre-Submission Meeting Request Form, Pre-Submission Meeting Briefing Paper, and Advance Notification Form (Figure 1), as part of the Canadian reimbursement process for new drugs. However, completing these forms can be time consuming.
- Generative Artificial Intelligence (GenAl) has the potential to assist in HTA content generation, ultimately saving human time and improving efficiencies
- This proof-of-concept (PoC) study explored the use of GenAI in creating initial drafts of the reimbursement dossier forms submitted to CDA and investigated the potential for reducing time spent on HTA submissions.

Figure 1. CDA (previously CADTH) pre-submission templates



Source: CADTH (2023)1,2,3

METHODS

For three separate drugs, subject matter experts (SMEs) in HTA mapped information from the respective global value dossiers (GVDs) to sections of CDA pre-submission forms using a traffic light system, to identify where GenAl (specifically OpenAl's GPT-4) could be used to draft sections:





unada-specific documentation supplemented e evidence gaps, and further mapping vealed more sections that could be completed GPT-4.

GPT-4 then filled in the identified template sections using the provided source documents and all outputs were reviewed by Al engineers and SMEs to improve performance (Figure 2).

e-shot' or 'few-shot' (depending on the iplexity of the section) examples of pre-mission form answers were utilised to guide model's style and information retrieval from source documents, facilitating retrieval-mented generation (RAG).

Figure 2. Overall CDA pre-submission template generation architecture

1) Document Vector Embedding

GVD / Canadian documents split up and text represented numerically

First, the documents are split up into text ws" of three sentences each



Then, each text window is converted to a "vector embedding" (numerical representation) used by the algorithm*



Finally, the "embedding vectors" are saved for future referencing

2) Template Section Similarity

GVD / Canadian document sections similar to the template section are

User asks the large language model (LLM) to fill the template section; the query is also converted to a "vector embedding" through the same algorithm



Then, text vector embeddings (representations) which point in a similar direction to the question are selected



3) Answer Provided by LLM

LLM fills the template section with context from the relevant parts of documents

The LLM is fed the user query, the closest matching text windows from the documents and a standard prompt



LLM generates text response to the user



SMEs and AI engineers review the LLM response, making necessary RAG change improve performance

RESULTS

- When provided with the most relevant Canada-specific documentation and 'few-shot' examples of required outputs, GPT-4 produced high-quality drafts of CDA pre-submission
- submission form sections were found to impact output quality and feeding GPT-4 irrelevant documents diluted the quality of

Figure 3. Key learnings from the PoC

Complexity of documents/questions impacts GPT output quality (e.g., multiple indications, large

number of clinical trials, long template answer)

<u>Solution:</u> To improve performance, a bespoke architecture could be built for the CDA templates with

few-shot examples of structure and level of detail, etc

QUALITY OF EVIDENCE

Canadian documents are more suitable than the GVD for the CDA forms

Solution: Ensure all individual documents are vailable/ Include specific Canadian appendices







RELEVANCE

Feeding GPT additional irrelevant documents dilutes the quality of responses and can make it harder to retrieve the required information

<u>Solution:</u> Identify all necessary documents in advance; GPT does a good job at analysing and extracting information when the relevant documents are provided

STYLE, TONE, FORMAT

REFERENCES

Giving GPT an example of style, tone, format within the prompt improves the quality of the output



COMPLEXITY

Key Learnings

When used optimally with compulsory SME review, GPT could reduce human time spent on the CDA forms

TABLES & FIGURES

Extracting from and creating tables & figures needs to be done by a human

ADVANTAGE IN CONVERSATION



Conversational generation could be an advantage if the user wants to alter the response; could be used as a co-pilot rather than an automated solution

CONCLUSIONS

- When used optimally and with compulsory SME review, GenAl can be used to create acceptable first drafts of CDA reimbursement dossier forms.
- There is high potential that use of GenAl will reduce human time spent on submissions.
- However, it is essential that documentation required for the forms is optimised with the most relevant data in advance of use by GenAl.
- Improving prompting and increasing 'few-shot' examples for more complex sections of the forms will further help to improve time savings.

Abbreviations: CADTH: Canadian Agency for Drugs and Technologies in Health; CDA: Canada's Drug Agency; GenAl: Generative Artificial Intelligence; GPT: Generative Pre-Trained Transformer; GVD: Global Value Dossier; HTA: Health Technology Assessment; LLM: Large Language Model; PoC: Proof-of-concept; RAG: Retrieval Augmented Generation; SME: Subject Matter Expert.

References: 1. CADTH (2023). Pre-submission Meeting Request Form. Available at: https://www.cadth.ca/sites/default/files/Drug Review Process/CADTH Pre-Submission Meeting Request Form.docx (Acc November 2023); 2. CADTH (2023). Pre-submission Meeting Briefing Paper. Available at: https://www.cadth.ca/sites/default/files/Drug Review Process/CADTH Pre-submission Meeting Briefing.docx (Access 2023); 3. CADTH (2023). Advance Notification Form. Available at: https://www.cadth.ca/sites/default/files/Drug Review Process/CADTH Advance Notification Form.docx (Accessed November 2023).

International Society for Pharmacoeconomics and Outcomes Research Europe 2024, November 17-20, 2024, Barcelona, Spain