



# Google Bard: Utility in Drug Interactions

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## Abstract

Emergency medicine is a busy department with a huge flow of patients with multiple complaints. The department caters to a large cohort of patients simultaneously as well as administers many drugs. This can lead to potential drug interactions. With the advent of artificial intelligence (AI) and language learning model (LLM) we can use these AI enabled programs to help us be cautious yet judicious in our drug delivery and also be a careful vigilante to prevent drug interactions in these patients.

**Key words:** Artificial intelligence (AI); Language learning model (LLM); Drug interactions; Google Bard; Emergency medicine.

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Dear Editor,

I am writing to you today to discuss the potential benefits of using Bard, a large language model, to prevent drug interactions in the medical field. Bard is Google developed lightweight and optimised version of LaMDA (Language Models for Dialogue Applications) and, similar to most language learning models (LLMs) today, was pre-trained on a variety of data from publicly available sources.

Drug interactions are a serious problem in the medical field and also a time-sensitive emergency department (ED). Every year, thousands of people are harmed or even killed by drug interactions. In fact, drug interactions are one of the leading causes of preventable death in the United States.<sup>1</sup>

Bard can be used to prevent drug interactions in the medical fraternity in a number of ways. First, Bard can be used to scan a patient's medication list for potential drug interactions.<sup>2</sup> This can help

healthcare providers identify and address any potential risks before they occur. Second, Bard can be used to educate patients about the potential risks of drug interactions. This can help patients make informed decisions about their medications and take steps to prevent or manage any potential side effects.<sup>2,3</sup> Third, Bard can be used to monitor patients for signs and symptoms of drug interactions. This can help healthcare providers identify and address any potential problems early on.<sup>3</sup>

Bard is a valuable tool for healthcare providers who are managing patients in ED. By using Bard, healthcare providers can improve patient safety and outcomes. Some of the other utilities of Bard are patient education about their illness, possible treatment modalities offered, possible outcomes of these treatment modalities and also recovery time, complications and what to expect. These will form a foundation on which clinicians and treating physicians base their explanations and counselling.

In a recent study, Bard was used to scan the medication lists of 100 patients in the ED. The study found that Bard identified 20 potential drug interactions that had not been identified by healthcare providers. If these drug interactions had not been identified, they could have caused serious harm or even death to the patients.<sup>4</sup> The study also found that Bard was able to educate patients about the potential risks of drug interactions. The patients who were educated by Bard were more likely to understand the risks of drug interactions and to take steps to prevent or manage any potential side effects.<sup>4</sup> Bard is a valuable tool for preventing drug interactions in the ED. By using Bard, healthcare providers can improve patient safety and outcomes.<sup>5</sup>

Bard is part of our long-term, ongoing effort to develop LLMs responsibly and throughout the course of this work, we have discovered and discussed several limitations associated with LLMs. Here, we focus on five areas that we continue to work on: (a) accuracy: Bard's responses might be inaccurate, especially when asked about complex or factual topics; (b) bias: Bard's responses might reflect biases or perspectives present in its training data; (c) persona: Bard's responses might suggest it as having personal opinions or feelings; (d) false positives and false negatives: Bard might not respond to some appropriate prompts and provide inappropriate responses to others, and (e) vulnerability to adversarial prompting: users will find ways to stress test Bard further.<sup>5</sup>

To highlight the potential of these LLM, we used a set of medications to see the response of the chatbot. It is as follows:

**Input:** dabigatran, fluconazole, levofloxacin, pantoprazole, aspirin.

**Response:** Sure, let's check for potential drug interactions among the medications you listed:

1. Dabigatran: It is an anticoagulant medication used to prevent blood clots.
2. Fluconazole: It is an antifungal medication used to treat fungal infections.
3. Levofloxacin: It is an antibiotic used to treat bacterial infections.
4. Pantoprazole: It is a proton pump inhibitor used to reduce stomach acid production and treat conditions like gastroesophageal reflux disease (GERD).

5. Aspirin: It is a nonsteroidal anti-inflammatory drug (NSAID) used to relieve pain, reduce inflammation, and lower fever.

Here are the potential interactions among these medications:

1. Dabigatran and Fluconazole: There is a moderate interaction between dabigatran and fluconazole. Fluconazole can increase the levels of dabigatran in the blood, potentially leading to an increased risk of bleeding. If possible, an alternative antifungal medication should be considered, or the dosage of dabigatran may need to be adjusted if both medications are necessary.

2. Dabigatran and Levofloxacin: There is a moderate interaction between dabigatran and levofloxacin. Levofloxacin can increase the levels of dabigatran in the blood, potentially leading to an increased risk of bleeding. If both medications are essential, careful monitoring of bleeding risk and possible dose adjustments may be needed.

3. Dabigatran and Pantoprazole: There are no known interactions between dabigatran and pantoprazole. These medications can generally be used together without any significant issues.

4. Dabigatran and Aspirin: There is a moderate interaction between dabigatran and aspirin. Using these medications together can increase the risk of bleeding. The combination should be used with caution, and it is essential to discuss the risks and benefits with your healthcare provider.

5. Fluconazole and Levofloxacin: There are no known interactions between fluconazole and levofloxacin. These medications can generally be used together without any significant issues.

6. Fluconazole and Pantoprazole: There are no known interactions between fluconazole and pantoprazole. These medications can generally be used together without any significant issues.

7. Fluconazole and Aspirin: There are no known interactions between fluconazole and aspirin. These medications can generally be used together without any significant issues.

8. Levofloxacin and Pantoprazole: There are no known interactions between levofloxacin and pantoprazole. These medications can generally be used together without any significant issues.

9. Levofloxacin and Aspirin: There are no known interactions between levofloxacin and aspirin. These medications can generally be used together without any significant issues.

10. Pantoprazole and Aspirin: There are no known interactions between pantoprazole and aspirin. These medications can generally be used together without any significant issues.

Always consult with a healthcare professional or pharmacist before starting or stopping any medications to ensure your safety and to account for any updates or changes in drug interactions.

## Conclusion

In a busy outpatient department/ED with a flow of patients, it is of utmost importance to ascertain if there are drug interactions with the medications being given considering the patients' own medicines. To rule these out usage of LLM like Bard could help in saving time and also being precise about medications being given. In these instances, Bard is not only a valuable tool but also a guide in knowing what medications can be given. Implementation of Google Bard on a day to day basis is something that needs to be formulated into the hospital healthcare system where it can aid in drug interactions secondary to polypharmacy and also drugs that are given in the ED. Residents and graduates can use Bard for assistance in identification of drug interactions in the ED.

To conclude Bard can re-enforce the clinical decision and also point out if there are any critical treatment errors during treatment with multiple drugs hence being beneficial and adding abundant value to patient care.

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## Conflict of interest

None.