

Letter to the Editor

ChatGPT in Clinical Toxicology

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Abstract

ChatGPT has recently been shown to pass the United States Medical Licensing Examination (USMLE). We tested ChatGPT (Feb 13, 2023 release) using a typical clinical toxicology case of acute organophosphate poisoning. ChatGPT fared well in answering all of our queries regarding it.

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KEYWORDS

ChatGPT; clinical toxicology; organophosphates; artificial intelligence; AI; medical education

Since its public launch on November 30, 2022, ChatGPT, which ironically has not been specifically trained in medicine, has been taking the medical world by storm [1-3]. Developed by the San Francisco-based OpenAI Inc/LP, ChatGPT is a very large language model that uses deep learning artificial intelligence (AI) techniques to generate human-like responses to natural language queries. It is based on the Generative Pre-trained Transformer 3 (GPT-3 x) architecture, which has been trained on gigantic amounts of data. ChatGPT is currently being integrated into the Microsoft Bing search engine, which will soon make it readily accessible to hundreds of millions of online users worldwide, including patients, medical and nursing students, and clinicians [4].

We tested ChatGPT (Feb 13, 2023, release; standalone, available via OpenAI [5]) using a typical clinical toxicology vignette (a case of acute organophosphate poisoning) retrieved from an online presentation [6]. The case, as we modified it for and typed it in ChatGPT, as well as ChatGPT's answer (which followed only a couple of seconds after inputting the case), are

shown in [Figure 1](#). The figure also shows a regenerated ChatGPT response after we pressed the "Regenerate response" button at the bottom of the first ChatGPT answer.

The clinical case example we used is a very straightforward one, unlikely to be missed by any practitioner in the field, and ChatGPT fared well in answering all of our queries regarding it. Both the first ChatGPT response and the regenerated one were fine and offered good explanations of the underlying reasoning. However, the pressing problem in real life is not one of finding the correct diagnosis but of taking appropriate history and being able to elicit and ascertain the correct signs. In real life, junior clinicians may arrive at the wrong diagnosis because they missed or confused the signs. As ChatGPT becomes further developed and specifically adapted for medicine, it could one day be useful in less common clinical cases (ie, cases that experts sometimes miss). Rather than AI replacing humans (clinicians), we see it as "clinicians using AI" replacing "clinicians who do not use AI" in the coming years.

Figure 1. Diagnosing a case of acute organophosphate poisoning in ChatGPT.

< Left: Clinical case and queries

A 28-year-old male truck driver was found unconscious at the car park 30 minutes ago. He was last seen normal 3 hours ago, when he was assigned to deliver chlorpyrifos. His heart rate at the moment is 110/min, his blood pressure: 150/90 mmHg, respiratory rate: 22/min, and body temperature is 36.8 °C. He has solvent-like odour on the chest and trunk. His O₂ Sat is 88% RA. He is showing diaphoresis, pupils: 1 mm, and copious foaming saliva. Cardiovascular system examination: Normal S1, S2 sounds, no murmurs. Respiratory system examination: generalised coarse crepitation and rhonchi. His abdomen is flat, soft, with increased BS. Nervous system examination: comatose, not responsive to painful stimuli, flaccid tone, muscle fasciculation in extremities, with reflexes: 1+ all extremities. What is his likely diagnosis and prognosis? What further test(s) if any should be done? How do you treat him?

v Below: First ChatGPT answer (left) and regenerated response (right)

Based on the information provided, it is likely that the truck driver has been exposed to chlorpyrifos, which is a toxic pesticide. The solvent-like odour on his chest and trunk, as well as the symptoms of diaphoresis, copious foaming saliva, and muscle fasciculations suggest acute pesticide poisoning.

The low oxygen saturation of 88% indicates hypoxia and respiratory distress, which can lead to severe brain damage or death if not promptly treated. The coarse crepitation and rhonchi in his lungs suggest the presence of fluid and inflammation, which can cause acute respiratory distress syndrome (ARDS). The increased bowel sounds in his abdomen indicate parasympathetic overactivity and increased gastrointestinal motility, which is a common feature of organophosphate poisoning.

The prognosis for this patient is guarded and depends on the extent of the damage caused by the pesticide exposure. If the patient receives prompt and appropriate medical care, including supportive measures and antidotal therapy, the chances of survival and recovery are higher.

Further diagnostic tests that should be done include a complete blood count, liver function tests, serum electrolytes, arterial blood gas analysis, and chest X-ray. These tests can help to assess the severity of the poisoning, identify any complications, and monitor the patient's response to treatment.

The treatment for acute pesticide poisoning includes decontamination, supportive care, and antidotal therapy. Decontamination involves removing the patient's contaminated clothing, washing the skin with soap and water, and flushing the eyes with saline solution. Supportive care includes providing oxygen therapy, mechanical ventilation, intravenous fluids, and medications to manage symptoms such as seizures, agitation, and nausea. Antidotal therapy involves administering specific antidotes to counteract the toxic effects of the pesticide. The specific antidote for chlorpyrifos poisoning is atropine and pralidoxime.

In summary, the truck driver's likely diagnosis is acute chlorpyrifos poisoning, and his prognosis is guarded. The priority is to provide prompt and appropriate medical care, including decontamination, supportive care, and antidotal therapy. Further diagnostic tests are necessary to assess the extent of the damage and monitor the patient's response to treatment.

Based on the presented symptoms, the truck driver is likely suffering from acute organophosphate (OP) poisoning due to exposure to chlorpyrifos, an OP pesticide. The solvent-like odour suggests he may have been inhaling the chemical, and his copious foaming saliva and low oxygen saturation levels indicate respiratory distress. The increased heart rate and blood pressure can be attributed to the toxicity of chlorpyrifos. The presence of coarse crepitation and rhonchi indicates that there is a fluid accumulation in the lungs, which could be due to pulmonary edema, a common complication of OP poisoning.

The prognosis of the patient depends on the severity of the poisoning and the time elapsed since the exposure. The fact that the driver was found unconscious suggests a significant exposure, and his poor neurological status, including unresponsiveness, flaccidity, and fasciculations, indicate a severe poisoning. He needs to be treated urgently to prevent further deterioration and organ damage.

The following tests should be carried out to confirm the diagnosis and assess the extent of the damage: serum acetylcholinesterase activity, arterial blood gas analysis, chest x-ray, electrocardiogram, and blood tests to check electrolytes and liver function.

The treatment of acute OP poisoning includes decontamination of the patient, supportive care, and antidotal therapy. The patient's clothes should be removed, and the skin and hair thoroughly washed with soap and water. The airway should be secured, and oxygen administered. Antidotal therapy with atropine and pralidoxime should be initiated as soon as possible to counteract the effects of the OP pesticide. Atropine should be given to reduce muscarinic symptoms, while pralidoxime reactivates the inhibited acetylcholinesterase. The patient's blood pressure, heart rate, and respiratory rate should be closely monitored.

In conclusion, the patient likely has acute organophosphate poisoning, which is a medical emergency that requires prompt treatment. The prognosis depends on the severity of the poisoning and the timely administration of antidotal therapy. The tests mentioned above should be performed to confirm the diagnosis, assess the extent of the damage, and guide the treatment.

ChatGPT Feb.13 Version. Free Research Preview. Our goal is to make AI systems more natural and safe to interact with. Your feedback will help us improve.

Conflicts of Interest

None declared.

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Abbreviations

AI: artificial intelligence

GPT-3 x: Generative Pre-trained Transformer 3

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