



# ChatGPT and Future Artificial Intelligence Chatbots: What may be the Influence on Credentialed Nutrition and Dietetics Practitioners?



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**C**HATGPT IS A CONVERSATIONAL service using artificial intelligence (AI), also known as an AI chatbot. It is accessible with a simple web interface and generates natural-language utterances in reply to human prompts (ie, sentence(s) asking a question or raising an issue). Since its launch on November 30, 2022, it has hit the media headlines and the scientific community.<sup>1,2</sup> This is the first time the public engaged with an AI chatbot with such enthusiasm. ChatGPT has attracted 100 million users just 2 months after launching.<sup>3</sup> It is being implemented in Microsoft applications (eg, Office and Bing).<sup>4</sup> According to Meta's chief AI scientist, Yann LeCun, the influence of ChatGPT is rather about society's perception and access than technical breakthroughs.<sup>5</sup> Thus, other AI chatbots using similar technologies, such as Bard by Google, are being launched.<sup>6</sup>

AI chatbots, such as ChatGPT, can be used in a variety of settings and multiple languages. Optimistic credentialed nutrition and dietetics practitioners will see an opportunity to use AI chatbots for assistance in their daily work whereas pessimistic ones will consider them as tools that could harm our profession and partly replace us. This includes registered dietitian nutritionists (RDNs) and nutrition dietetics technicians (NDTs). This article guides those working in public health, clinical settings, and academia, among other settings, to perceive the possible

opportunities and risks of using ChatGPT in their practice.

## WHAT IS ChatGPT?

The AI company OpenAI developed ChatGPT, which is a conversational interface based on GPT-3.5 (GPT-4 as of March 14, 2023, only for paid users). GPT-3.5 is a large language model (LLM) that can handle a chat with a maximal length of about 3,000 words.<sup>7</sup>

ChatGPT is a statistical model whose aim is to predict the next word based on previous words following contents and styles expected by humans (natural language).<sup>8</sup> The consecutive pairs of words are obtained thanks to probabilities using a neural network with billions of parameters. In other words, given the words *type 2*, an LLM may predict the next word to be *diabetes*, having learned how often those words appeared together from the billions of texts it has seen during training and from human feedback it has been given during fine-tuning.<sup>9</sup> Therefore, like a parrot, ChatGPT does not consider the meaning of words but it reacts to words.

To predict words, ChatGPT has been trained on a vast amount of text data from websites all around the Internet (training data). ChatGPT, GPT-3.5, and GPT-4 are not open-access models: no data, no code, and no design was released. Therefore, it is not fully transparent which datasets ChatGPT has digested; it probably includes news articles, forum posts, social media conversations, and English-language Wikipedia.<sup>10</sup> At present, the last training of the model occurred in September

2021.<sup>7</sup> ChatGPT is thus not aware of all information happening afterward, such as the recent controversy about the American Academy of Pediatrics guidelines for the evaluation and treatment of obesity.<sup>11</sup>

ChatGPT can generate texts on a wide variety of topics. Usually, the tone is well adapted to the one from the prompt (eg, lay vs expert). In addition, safeguard measures defined by OpenAI have been put in place so that as few answers as possible can be given to medical, illegal, and morally wrong questions.<sup>8,12</sup> ChatGPT can also generate tables and computer code. More recently, digital images can be generated using ChatGPT from Bing (Microsoft's search engine) thanks to a text-to-image model (DALL-E), also developed by OpenAI.<sup>13</sup>

You can access ChatGPT via the link <https://chat.openai.com/chat>, sign up, start a new chat, and test the AI chatbot. It is in its testing phase and will improve over time. There is currently a free<sup>8</sup> and a paid (\$20/month)<sup>14</sup> option of ChatGPT. Removing the free option is not excluded in the future.

## WHEN RDNs AND NDTRs CHALLENGE ChatGPT

ChatGPT can inform users how to eat healthfully, prescribe diets, plan recipes, or provide a shopping list, considering for instance users' description of foods they have in their pantry or fridge. To test ChatGPT abilities, we asked to define the ideal diet for a person with type 2 diabetes (Figure 1).

The answer was clear and relatively in line with the information provided

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on the Internet by the American Diabetes Association.<sup>15,16</sup> In addition, there is a warning about the importance of consulting a “healthcare provider” or a “registered dietitian”. In a follow-up prompt, we asked ChatGPT to define a 1-day menu for this type of diet (without repeating type 2 diabetes (Figure 2).

Overall, the menus were in accordance with the Diabetes Plate Method.<sup>16</sup> Main meals contained nonstarchy vegetables, lean protein foods, and carbohydrate foods, although the suggested amount of carbohydrate foods (ie, sweet potatoes, chickpeas, and quinoa) was small and seems to be inspired by ketogenic diets. When asked, ChatGPT could also provide a step-by-step recipe for the lunch menu with the appropriate cooking time for the chicken in the salad. However, it is important to note that ChatGPT answers to the same prompt (open in a new chat each time) vary over time due to the nondeterministic nature of the underlying model and the regular optimizations of ChatGPT.<sup>7</sup> Therefore,

it is difficult to know which information a patient/client would receive, especially if they provide other requirements related to sex, age, food preferences, available budget, and cultural background, for instance.

We repeated the test with the ideal diet for people undergoing hemodialysis. The answer was also relatively detailed and accurate (ie, lowering the intake of potassium and phosphorus, limiting fluids, increasing the intake of high-quality protein, monitoring carbohydrates, and consulting a “renal dietitian”). Yet, when we asked for 1-week menus, the menus included foods not optimal for hemodialysis patients/clients (eg, spinach and avocado), without warnings. Menus were also repetitive and similar to those for type 2 diabetes patients/clients, featuring for instance the same foods (eg, grilled chicken and salmon). Including inappropriate foods while asked to provide dietary plans was also noted by other researchers interested in food allergies (eg, including almond milk within a nut-free dietary plan).<sup>17</sup>

Finally, we provided ChatGPT a case study of a patient/client with type 1 diabetes we usually used for students in nutrition and dietetics and asked ChatGPT to generate nutritional diagnoses according to the Nutrition Care Process Terminology.<sup>18</sup> It generated 6 problems relatively in line with the nutrition-related situation of the patient/client but also included inaccurate statements (eg, lack of understanding of food labels, whereas we wrote in the case study that this was not assessed). Nutritional diagnoses tended to be repetitive and generic (lack of uniqueness). Furthermore, those diagnoses were not stated according to the Nutrition Care Process Terminology and not generated in the form of Problem, Etiology, and Signs/Symptoms statement. Etiology was often defined but signs and symptoms were never stated. Similar observations were found in another case study of a patient/client with type 2 diabetes we tested.

## A USEFUL TOOL FOR GETTING INFORMATION?

ChatGPT makes online information about nutrition and dietetics more accessible. Indeed, before ChatGPT, the public and patients/clients had to type keywords in search engines (eg, Google and Bing) to identify Internet sources, open one or several webpages to find the relevant information, and synthesize information by themselves. By contrast, ChatGPT provides direct and definite answers to users’ prompts, without the need to open webpages and sort out information. Still, the user’s ability to define an issue, ask related questions, refine prompts, and evaluate the accuracy of the answer is crucial for AI chatbot users.

Applications combining ChatGPT and grocery shopping, such as Instacart,<sup>19</sup> may also enable communities and patients/clients to ask about recipes and order foods according to their personal needs (eg, age, sex, and dietary requirements of household members). This could be seen as an inexpensive way to access tailored nutrition and dietetics advice, of course, potentially influenced by grocery shops.

Because ChatGPT can summarize texts in lay terms, it could also help simplify complex subjects around diseases, nutrition, and dietetics and

### Our prompt:

Define the ideal diet for a person with type 2 diabetes.

### ChatGPT answer:

The ideal diet for a person with type 2 diabetes should aim to regulate blood sugar levels and promote overall health. Here are some general guidelines to consider:

1. Carbohydrate intake: Carbohydrates can raise blood sugar levels, so it's important to monitor and control their intake. Complex carbohydrates, such as whole grains, vegetables, and fruits, are generally better choices than simple carbohydrates, such as white bread and sugary foods. Fiber-rich foods can also help regulate blood sugar levels.
2. Protein intake: Proteins are important for building and repairing tissues and maintaining muscle mass. Good sources of protein include lean meats, fish, beans, nuts, and low-fat dairy products.
3. Fat intake: While fat intake should be moderated, healthy fats, such as those found in nuts, seeds, and fish, can have beneficial effects on blood sugar and cholesterol levels.
4. Portion control: Eating smaller, more frequent meals throughout the day can help regulate blood sugar levels. It's also important to monitor portion sizes and avoid overeating.
5. Avoid processed and sugary foods: Processed and sugary foods can cause spikes in blood sugar levels and should be avoided as much as possible.
6. Consult with a registered dietitian: A registered dietitian can provide personalized recommendations and help design a meal plan that meets individual needs and preferences.
7. Regular monitoring: It's important for people with diabetes to monitor their blood sugar levels regularly to ensure that they are staying within their target range.

Remember, dietary changes alone may not be enough to control blood sugar levels, and medication or insulin may be necessary. It's important to work closely with a healthcare provider to develop an individualized plan for managing type 2 diabetes.

**Figure 1.** ChatGPT answer about the ideal diet for patients/clients with type 2 diabetes (Version February 13, 2023).

**Our prompt:**

Define a 1-day menu for this type of diet.

**ChatGPT answer:**

Sure! Here is an example of a one-day menu that follows the dietary guidelines for people with type 2 diabetes:

**Breakfast**

- 1 small sweet potato, sliced and roasted
- 2 scrambled eggs
- 1/2 small avocado, sliced
- 1 small orange
- 1 cup unsweetened almond milk

**Mid-Morning Snack**

- 1 small apple
- 1 ounce of mixed nuts (almonds, walnuts, and cashews)

**Lunch**

- 2 cups mixed greens
- 1/2 cup cherry tomatoes
- 1/2 cup sliced cucumber
- 3 ounces grilled chicken breast
- 1/4 cup chickpeas
- 2 tablespoons balsamic vinaigrette dressing

**Afternoon Snack**

- 1 small pear
- 1 string cheese

**Dinner**

- 3 ounces grilled salmon
- 1/2 cup cooked quinoa
- 1/2 cup steamed broccoli
- 1/4 cup roasted red pepper
- 1 tablespoon olive oil and lemon juice dressing

**Dessert**

- 1 small serving of mixed berries with 1/4 cup unsweetened Greek yogurt

Remember that this is just an example, and it's important to customize your meal plan to your individual needs and preferences. You may want to consult with a registered dietitian to help you design a meal plan that meets your nutritional requirements while also helping you manage your blood sugar levels.

**Figure 2.** ChatGPT answer about the recommended 1-day menu for a person with type 2 diabetes (Version February 13, 2023).

has the potential to enhance education by providing interactive learning experiences. Furthermore, crucial warnings to users about working with health care providers may increase the number of people aware of our profession and consulting us.

Whereas ChatGPT provides quick nutrition and dietetics answers to communities and patients/clients, it will not remove the numerous well-known social, cultural, economic,

emotional, and psychological barriers hindering healthy eating daily; for example, price of healthy foods, lack of time to cook, and lack of social support.<sup>20</sup> Among the added values of RDNs and NDTRs is the ability to assess and consider these barriers influencing the act of eating to build tailored nutrition counseling for each patient/client.

For RDNs and NDTRs, ChatGPT may lead to missed opportunities for in-

person contact and care by patients/clients thinking that AI chatbot advice is good enough. It could also encourage users to consult unqualified nutrition and dietetics practitioners if users are not aware of the difference between credentialed and uncredentialed nutrition and dietetics practitioners.

People should know that ChatGPT does not reference the sources of information that it draws on to generate answers. Therefore, it is impossible to know if the sources are evidence-based or otherwise in nature. When asked to provide peer-reviewed citations, ChatGPT provides references (probably frequently mentioned in the webpages included in the training data) but references do not always exist. For instance, when asked for a peer-reviewed citation about the consumption of ultra-processed food in Switzerland, ChatGPT made up this reference: *Fardet A, et al. (2021). Ultra-Processed Food Consumption and Dietary Quality in a Swiss Population-Based Sample: Evidence from the Swiss National Nutrition Survey. Nutrients, 13(2), 610.* The first author is well-known in the field but has never published an article with this title in that journal.

ChatGPT could be seen as a useful tool to get a quick second opinion, available 24/7, on nutrition and dietetics issues, which may be useful for clinical decision making.<sup>9</sup> However, RDNs and NDTRs must be aware of the limitations of ChatGPT and relying only on it to provide advice or affirm statements must not be done at the moment. This was even said by the OpenAI CEO himself.<sup>21</sup> The limitations of ChatGPT are numerous. First, ChatGPT may “lie”; that is, generate plausible-sounding but inaccurate answers,<sup>8</sup> as seen above about the menus planned for patients/clients undergoing hemodialysis and the case study of the patient/client with type 1 diabetes. Noteworthy, ChatGPT can sometimes spot its errors when asked in a follow-up prompt to check the correctness of its answer.<sup>22</sup> Second, ChatGPT makes up or distorts facts, such as the made-up reference, known as the hallucination problem in AI. Third, ChatGPT does not hierarchize sources based on evidence. Indeed, for nutrition topics with numerous nonevidence-based viewpoints expressed on the Internet,

widespread falsehoods, and nonscientific opinions might be spread by ChatGPT. For example, when asked “Are low carb diets good for weight loss?” three times, ChatGPT was rather conservative twice and in favor of it once (with warnings at the end). Fourth, ChatGPT has difficulties with establishing causal relations, for instance in clinical reasoning.<sup>23</sup> Of note, LLMs are improving and these four challenges are active research areas and solutions might arise in the future.

## A USEFUL TOOL FOR WRITING INFORMATION?

ChatGPT can quickly draft texts without spelling mistakes, which need to be proofread and very often amended. This could be useful to generate a draft of clinical notes; for example, summaries of the Nutrition Care Process steps in electronic health records or discharge letters.<sup>9,23-25</sup> This could in turn save RDNs and NDTRs time and increase their efficiency.

ChatGPT could also help communicate with communities and patients/clients. It could formulate answers in e-mail exchanges. Of note, if patients/clients and colleagues also use ChatGPT themselves, they might send more e-mail messages! RDNs and NDTRs should be aware that ChatGPT may produce prejudiced and offensive texts despite being trained not to.<sup>12</sup> ChatGPT might also be useful to provide tailored, relatively simple, and summarized explanations around nutrition and dietetics to communities and patients/clients. Furthermore, it could generate texts for flyers, posters, or tweets to promote healthy nutrition.

Both RDNs and NDTRs should know that ChatGPT tends to provide verbose answers,<sup>8</sup> which may not be adapted to communities and patients/clients with limited literacy. Therefore, it is important to clarify the need for concision and specify the expected number of sentences or lines in the prompts. In addition, requesting the use of bullet points or manually simplifying and synthesizing texts can be helpful. Finally, for privacy and data protection issues, people must not enter identifiable patient/client data into ChatGPT prompts because the latter can be reviewed and used by OpenAI.<sup>26</sup>

## A USEFUL TOOL IN ACADEMIA?

Contents and styles of texts generated by ChatGPT are often so human-like that it can be difficult for academics to determine whether texts were generated by AI or written by students<sup>27</sup> or researchers.<sup>1,28</sup> For instance, ChatGPT has passed a test in medicine, including multiple-choice answers in Korea.<sup>2</sup> However, ChatGPT score was the worst (60.8% of correct answers) in comparison to the 76 “real” medical students.<sup>2</sup> ChatGPT can also fool experts in their research topics. In a study, ChatGPT was asked to generate 50 abstracts based on the titles and journals of 10 abstracts recently published in five high-impact factor medical journals. The findings suggest that blinded human reviewers correctly identified only 68% of the generated abstracts as not human written and incorrectly reported 14% of original abstracts as being generated by ChatGPT.<sup>28</sup>

Academics training students in nutrition and dietetics should quickly adapt the way they assess students’ knowledge and competencies. For instance, combining oral examination with essays is essential to test if what has been written in the essay is also well mastered by students orally (when ChatGPT cannot assist the student). Reinforcing applied learning (eg, organizing workshops more often, giving more importance to grades obtained in practical examinations and internships) is another option. In scientific essays, expert knowledge of assessors is also key to evaluating the quality of the content and the reference list. Academics must also inform students about plagiarism and academic dishonesty and that using ChatGPT to do homework may impair their ability to pass academic exams, practice effectively during internships, and obtain successful credentials. Educating students about information literacy, scientific integrity, and the value of gaining knowledge and skills from in-depth reading, critical thinking, and scientific writing (eg, defining questions, and structuring thoughts) is of utmost importance. Finally, international academic rules to regulate the use of AI in scientific writing are also essential.<sup>29</sup> In this sense, plagiarism software that identifies AI-generated texts is needed to

help academics rapidly spot texts generated by AI. Tools, such as GPTZero<sup>30</sup> or Turnitin,<sup>31</sup> might be able to detect texts generated by ChatGPT. Nevertheless, they should not be solely relied upon because they can produce both false positives (ie, incorrectly blaming people for using ChatGPT) and false negatives (ie, failing to detect people who have used ChatGPT).

ChatGPT can also assist those working in academia in generating test questions, quizzes, and clinical vignettes, but also brainstorming pedagogic objectives while developing or revising courses and programs. ChatGPT raises strong expectations in helping with writing scientific manuscripts or grant proposals (eg, summarizing information, brainstorming hypotheses, suggesting experiments, and drafting abstracts), despite the multiple downsides (eg, persuasive inaccuracies, unknown sources, hidden biases, and reasoning errors).<sup>23,29,32</sup> Therefore, supervision from a domain expert for proper guidance and verification is always required. In addition, by design (parroting), ChatGPT is unlikely to create original ideas or new knowledge without mentioning that the most recent scientific articles in the field are currently unknown because they are not used in the training data.

## WHAT IS THE MAIN USABILITY OF ChatGPT IN NUTRITION AND DIETETICS PRACTICE?

Because many people can experiment with ChatGPT for a large set of tasks and AI chatbots evolve quickly, it is hard to predict future use. AI chatbots could be used within the patient/client relationship to augment clinical judgment and outputs, but also as substitutes for health care providers or for direct-to-consumer health advice-giving, which raises different legal and ethical questions.<sup>33</sup> At present, we believe that RDNs and NDTRs should be aware of this technology and its potential opportunities and risks of using it in practice (see the [Table](#)) and be able to educate patients/clients about the latter.<sup>33</sup>

Regarding potential opportunities, ChatGPT, and other coming AI chatbots, can be useful AI assistants for forming a quick second opinion (if used advisedly), summarizing information, and brainstorming. ChatGPT



**Table.** Potential opportunities and risks of using ChatGPT in nutrition and dietetics practice

Potential opportunities	Potential risks
<p><b>For RDNs and NDTRs<sup>a,b</sup>:</b></p> <ul style="list-style-type: none"> <li>• Obtaining a quick, 24/7 second opinion (if used advisedly)</li> <li>• Brainstorming ideas (eg, research hypotheses, test questions, pedagogic objectives)</li> <li>• Summarizing texts quickly</li> <li>• Drafting texts with adaptable tone and no spelling mistakes (eg, e-mail, clinical notes, health promoting material, paper/grant abstracts)</li> <li>• Increasing in-person time thanks to a reduced administrative workload</li> <li>• Getting public recognition and being referred to more patients/clients, when ChatGPT warns about consulting a RDNs and NDTRs</li> </ul> <p><b>For communities and patients/clients:</b></p> <ul style="list-style-type: none"> <li>• Getting direct and interactive answers to questions about healthy eating, nutrition, dietetics, and diseases for free (for now)</li> <li>• Gaining awareness of RDNs and NDTRs as resources for nutrition and dietetics issues, when ChatGPT warns about consulting a RDNs and NDTRs</li> <li>• Easing the planification of menus, which could be tailored according to personal needs (if specified in the prompts)</li> </ul>	<p><b>For everyone:</b></p> <ul style="list-style-type: none"> <li>• Being unable to get relevant information if unable to correctly define issues, ask related questions, refine prompts, and evaluate the accuracy of answers</li> <li>• Relying on made-up, unsourced, and outdated information</li> <li>• Relying on incomplete or inaccurate summaries despite sounding plausible</li> <li>• Spreading marketed, biased, or dubious information</li> <li>• Drafting verbose, generic, repetitive, inaccurate, offensive, biased, or unoriginal texts, especially if not proof-read and edited</li> <li>• Not respecting privacy and data protection (in submitted prompts)</li> <li>• Depending on this technology, which may lead to a decrease in critical thinking and clinical judgment</li> </ul> <p><b>For RDNs and NDTRs:</b></p> <ul style="list-style-type: none"> <li>• Missing opportunities for in-person contact and care because patients/clients rely only on artificial intelligence-generated advice</li> <li>• Facilitating academic dishonesty</li> </ul> <p><b>For communities and patients/clients:</b></p> <ul style="list-style-type: none"> <li>• Referring to uncertified nutrition professionals if unaware of the difference between them and RDNs and NDTRs, when ChatGPT warns about consulting a RDNs and NDTRs</li> </ul>

<sup>a</sup>RDN = registered dietitian nutritionist<sup>b</sup>NDTR = nutrition and dietetics technicians, registered

is also useful to draft texts, which may in turn reduce administrative workload and increase in-person time spent with communities and patients/clients. For communities and patients/clients, ChatGPT may provide an opportunity to gain awareness about nutrition and dietetics, which may, in turn, strengthen our profession.

At the same time, we should keep in mind that ChatGPT does not always provide accurate and unbiased information, especially if combined with commercial applications (eg, ChatGPT integration in Bing, with advertisements guiding the generated answers). Information may sound believable while being completely fabricated. Furthermore, texts generated by ChatGPT can contain errors, are often verbose, tend to be circular, and lack originality. Using AI chatbots might

also increase the dependence on technology, potentially leading to decreased critical thinking and clinical judgment. Finally, some students and researchers in nutrition and dietetics may use it dishonestly to fool readers in essays, tests, and research articles.

## CONCLUSIONS

ChatGPT, but also other future AI chatbots, are not search engines that search for relevant documents nor encyclopedias that compile knowledge. They react to the user's prompts in a human-like way. AI chatbots can assist RDNs and NDTRs, but cannot be used as a replacement for their expertise, judgment, and soft skills. We should be aware of this technology and promote our profession and our competencies over ChatGPT to the general public,

communities, and patients/clients. In parallel, we should reinforce our profession to provide high-quality, accurate, and tailored nutrition counseling and care and show empathy, attentiveness, and ability to motivate communities and patients/clients. This can be achieved notably with high-performance training programs and continuing education.

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## DECLARATION OF AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors used ChatGPT solely for demonstration purposes, utilizing it to showcase and scrutinize its outputs. ChatGPT was not utilized to assist in the manuscript writing process.

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