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Background: In the rapidly evolving domain of healthcare technology, the integration of advanced computational models has opened up new possibilities for personalized nutrition guidance. The emergence of sophisticated language models, such as Chat Generative Pre-training Transformer (ChatGPT), offers potential in providing interactive and tailored dietary advice. However, concerns remain about the applicability and appropriateness of ChatGPT's recommendations, especially for those with distinct health conditions.

Objectives: This study aimed to evaluate the reliability of ChatGPT as a source of nutritional advice.

Methods: Three hypothetical scenarios representing various health conditions were presented alongside precise dietary requirements. ChatGPT was tasked to generate personalized dietary programs, encompassing meal timing, specific caloric portions (measured in grams and spoons), as well as alternative meal options for each scenario. Following this, ChatGPT's generated dietary programs underwent a thorough review by a multidisciplinary team of nutritionist, specialist physicians and clinical researchers. The evaluation focused on the programs' suitability, alignment with dietary standards, consideration of individual health factors, and additional guidance Safety.

Results: ChatGPT demonstrated its ability to generate various options of meal plans in accordance with basic nutrition principles. However, there are apparent issues with the recommended individual macronutrient distribution, handling health conditions, drug interactions, and setting realistic weight loss goals.

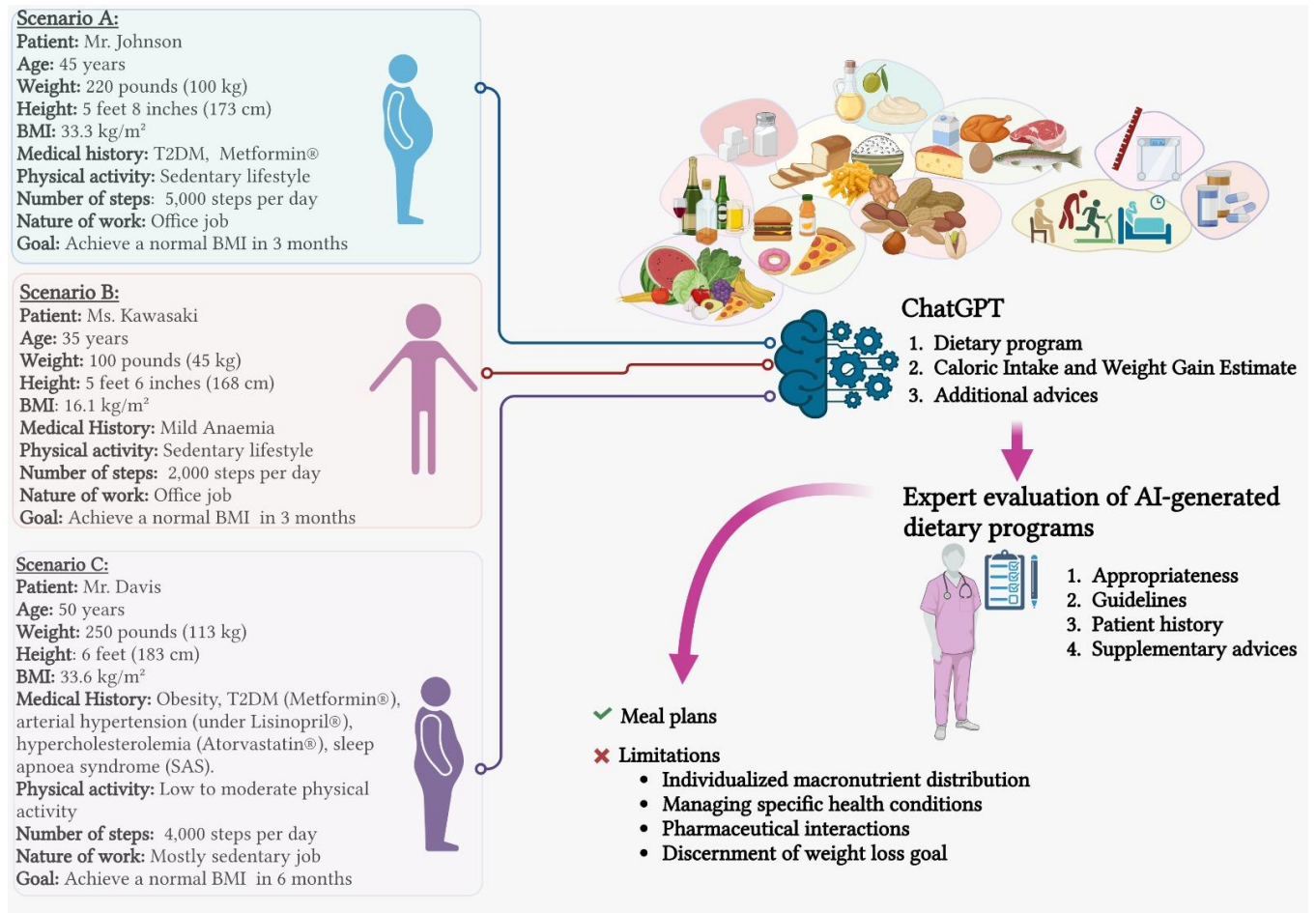
Conclusions: While ChatGPT exhibits promise as a dietary program generator, its application for intervention should be restricted to certified nutrition professionals. Until July 2023, it is not advisable for patients to engage in self-prescription using ChatGPT version 3.5, owing to its inability to provide professional knowledge and acceptable guidance, particularly for individuals with co-existing conditions. The prevailing absence of clinical reasoning highlights the importance of employing ChatGPT solely as a tool, rather than relying on it as an autonomous decision-maker. Its lack of clinical reasoning highlighted the need for human intervention and expert collaboration for precise personalized evaluations.

Keywords: Artificial Intelligence; Chatbot; Health Information Systems; Nutrition Therapy; Tailored Medicine; Virtual Health

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INTRODUCTION

Technology has revolutionized the healthcare landscape, including the field of nutrition, where advanced tools and algorithms have enhanced the provision of dietary support [1]. In the context of a complex and overburdened healthcare environment, where time is limited and large numbers of patients require dietary support, the need for efficient and accurate interventions has become critical [2]. With the increasing prevalence of non-communicable diseases linked to unhealthy lifestyles and overweight/obesity [3-5], patients are seeking for personalized dietary programs to address specific health concerns [6]. While technology has shown promise in managing routine tasks, it remains a challenge to provide personalized and precise dietary recommendations at the patient level. Each patient has unique requirements based on his/her medical history, dietary restrictions, and personal preferences [7]. Thus, the expertise and judgment of healthcare professionals in evaluating and prescribing appropriate interventions are currently indispensable.

Advanced language models (ALMs), such as Chat Generative Pre-training Transformer (ChatGPT), have recently emerged as accessible and convenient sources of healthcare information [8-13]. These models have the potential to improve productivity and alleviate the burden on healthcare staff [9]. However, it is essential to critically evaluate the effectiveness and accuracy of such information, particularly in a specialized domain such as nutrition. By assessing the performance of ChatGPT, we gain insights into how to optimize the benefits of emerging technology. This understanding is essential for determining where the expertise of healthcare professionals is most effectively utilized for the development and delivery of tailored and evidence-based dietary programs.

Based on advancements in technology and the increasing demand for personalized dietary support, the aim of this study was to evaluate the accuracy and appropriateness of ChatGPT's recommendations, which is a novel, sophisticated ALM in providing personalized nutrition guidance. Specifically, the study sought to assess the conformity of advice generated by ChatGPT in three

distinct dietary scenarios. By examining the proficiency of ChatGPT in generating personalized dietary programs, we are able to recognize its capabilities, limitations, and potential implications when integrating artificial intelligence (AI) into current nutrition practice. This research was conducted with the goal of informing healthcare professionals and contributing to the ongoing dialogue surrounding the use of AI models in nutrition interventions.

MATERIALS AND METHODS

Study Design

We employed a descriptive, quasi-qualitative, and evaluative study design to assess the efficacy of ChatGPT in generating personalized dietary programs. The study involved virtual scenarios representing three distinct health profiles and weight management goals.

Scenario Selection

Three carefully crafted virtual scenarios were created to represent diverse health profiles and weight management objectives. These scenarios encompassed a range of medical conditions, physical activity levels, and desired outcomes.

Data Collection

A multidisciplinary team of experts, including nutrition specialist physicians interacted with ChatGPT, providing comprehensive information for each scenario. This included the patient's demographic data, medical history, current health status, physical activity levels, and weight management goals.

AI Interaction and Program Generation

The team engaged in interactive sessions with ChatGPT, inputting scenario-specific details and requesting personalized dietary programs. The responses generated by ChatGPT were recorded and subsequently subjected to analysis.

Data Analysis

The meticulous process of evaluating and selecting the multidisciplinary team of experts who interacted with ChatGPT was of paramount importance, given the significant role they played in the study outcomes. This team, composed of esteemed professionals from various medical disciplines, each contributed their unique skills and expertise.

The initial script for the ChatGPT scenario was crafted by Dr. ID (in the authors' list), the main investigator with a doctorate in biological sciences and academic expertise in sports medicine and public health, alongside Professor HBS (in the authors' list), a seasoned physician and professor of physiology. This script was then refined and validated in accordance with nutritional clinical guidelines by two distinguished physicians, Drs. IS and YH (in the authors' list). Dr. IS, an esteemed endocrinologist, brings to the table a wealth of experience from both clinical and academic settings. Dr. YH complementing this expertise, specialises in Diabetes, Endocrinology, and Obesity, and serves as an Assistant Professor in nutrition. Following the script's validation, these two physicians provided an analysis of the responses provided by ChatGPT, dissecting their strengths and limitations. Their evaluations were anchored in ensuring strict adherence to evidence-based clinical guidelines for personalised dietary planning, with key considerations encompassing optimal macronutrient composition, appropriate portion sizes, dietary variety, accommodation of specific dietary restrictions, and overall nutritional adequacy. The analysis was then subjected to a thorough review by all the authors, including Dr. ID, Professor BSH, Dr. IS, Dr. YH (in the authors' list), among others, all of whom are recognised experts in academic research. To further bolster the quality of the analysis, Dr. JMG (in the authors' list), an English native speaker and academic doctor with an impressive portfolio of high-quality publications, reviewed and enhanced the readability of the responses. His crucial role ensured that the findings were communicated clearly and effectively, thereby elevating the overall quality of the study.

A qualitative analysis was conducted on the recorded AI-generated programs, expert evaluations, and assessments by medical professionals. This analysis aimed to identify the strengths, limitations, and areas for improvement of the AI-generated dietary programs.

Ethical Considerations

Given the virtual nature of the study involving non-real participants, an Institutional Review Board review was deemed unnecessary in accordance with applicable guidelines and regulations. Ethical considerations were upheld throughout the study to ensure the privacy and confidentiality of the data collected.

RESULTS

Within this section, we shall elucidate the chat scenarios conducted in collaboration with ChatGPT and review the corresponding outcomes garnered from each distinct scenario. All scenarios' individuals are virtual persons; and any connection to persons living or deceased is coincidental.

The primary objective of this study was to appraise the accuracy and appropriateness of ChatGPT as a medium for dispensing personalized nutritional guidance. The ensuing subsections will provide the findings obtained from each scenario, thereby furnishing insights into the proficiency of ChatGPT within the realm of nutritional guidance. A comprehensive analysis and interpretation of these findings are provided in the discussion section. Some texts produced by ChatGPT were transformed into tables in order to improve readability.

Scenario A

Description

Patient: Mr. Johnson

Age: 45 years

Weight: 220 pounds (100 kg)

Height: 5 feet 8 inches (173 cm)

Body mass index (BMI): 33.3 kg/m²

Medical history: Type 2 diabetes mellitus (T2DM, under medication: Metformin®)

Physical activity: Sedentary lifestyle, minimal exercise

Number of steps: Approximately 5,000 steps per day

Nature of work: Office job, primarily desk-based

Goal: Achieve a normal BMI of 25 kg/m² in 3 months

Task 1

Please provide a dietary program for this patient that includes specific timings and precise portions for each meal, measured in calories, spoons and grams. It would be beneficial if you could design a personalized program for him, ensuring he follows it daily. To prevent monotony, please include four options for each meal, allowing for variety and choice. Additionally, please calculate the caloric intake based on his basal metabolic rate (BMR) and estimate the amount of weight he is likely to lose per week, per month, and over the course of the entire diet. Also, provide in a separate section any additional advice specialised to the patient's health condition to make him reach his target the soonest possible.

ChatGPT's Response

Certainly! I will provide a personalized dietary program for Mr. Johnson to help him achieve his goal of reaching a normal BMI of 25 kg/m² in 3 months. The program will include specific timings, precise portions measured in calories, spoons, and grams, and multiple meal options to ensure variety and adherence. Additionally, I will calculate his caloric intake based on his BMR and estimate his potential weight loss per week, per month, and over the duration of the entire diet. I will also provide additional advice tailored to his health condition to support his journey towards his target. Let's proceed with the program. [Table 1](#) presents the dietary program for Mr. Johnson.

Table 1. Scenario A: Dietary program for Mr. Johnson*.

Period	Option N°	Details
Breakfast (7:30 AM)	1	1 boiled egg (78 calories) 1 slice of whole-grain bread (80 calories) 1 tablespoon of peanut butter (94 calories) 1 small apple (52 calories)
	2	1 cup of low-fat Greek yogurt (130 calories) 1 tablespoon of chia seeds (58 calories) 1/2 cup of mixed berries (40 calories) 1 teaspoon of honey (21 calories)
	3	1 small bowl of oatmeal (150 calories) 1 tablespoon of almond butter (98 calories) 1/4 cup of sliced bananas (30 calories) 1 cup of green tea
	4	Vegetable omelette with 2 eggs (220 calories) and bell peppers, spinach, and onions (150 calories) 1 slice of whole-grain toast (80 calories) 1 cup of herbal tea
Morning (10:00 AM)	Snack 1	1 small handful of mixed nuts (almonds, walnuts, and cashews) (150 calories)
	2	1 small carrot (30 calories) with 2 tablespoons of hummus (70 calories)
	3	1 medium-sized orange (60 calories)

	4	1 small container of low-fat cottage cheese (80 calories) with cucumber slices (15 calories)	
Lunch (1:00 PM)	1	Grilled chicken breast (180 grams, 220 calories)	
		1/2 cup of quinoa (90 grams, 120 calories)	
		1 cup of steamed broccoli (100 grams, 55 calories)	
		1 tablespoon of olive oil and lemon dressing (120 calories)	
	2	Baked salmon fillet (150 grams, 280 calories)	
		1/2 cup of brown rice (90 grams, 110 calories)	
		1 cup of roasted asparagus (100 grams, 30 calories)	
		1 tablespoon of balsamic glaze (50 calories)	
	3	Stir-fried tofu with mixed vegetables (200 grams, 180 calories)	
		1/2 cup of whole-wheat noodles (90 grams, 130 calories)	
		1 cup of stir-fried bok choy (100 grams, 20 calories)	
		1 tablespoon of low-sodium soy sauce (10 calories)	
	4	Lean turkey breast wrap with whole-grain tortilla (180 grams, 250 calories)	
		1/2 cup of mixed greens (50 grams, 10 calories)	
		1/4 cup of diced tomatoes (40 grams, 10 calories)	
		1 tablespoon of avocado spread (60 calories)	
Afternoon Snack (4:00 PM)	1	1 small handful of grapes (60 calories)	
	2	1 small container of Greek yogurt (100 grams, 70 calories)	
	3	1 hard-boiled egg (78 calories)	
	4	1 small bowl of vegetable soup (200 grams, 80 calories)	
Dinner (7:00 PM)	1	Grilled lean steak (200 grams, 400 calories)	
		1/2 cup of roasted sweet potatoes (100 grams, 90 calories)	
		1 cup of steamed green beans (100 grams, 30 calories)	
		1 tablespoon of chimichurri sauce (60 calories)	
		2	Baked chicken thigh (180 grams, 300 calories) with skin removed
			1/2 cup of quinoa (90 grams, 120 calories)
			1 cup of grilled zucchini (100 grams, 20 calories)
			1 tablespoon of olive oil and lemon dressing (60 calories)
		3	Grilled shrimp skewers (180 grams, 250 calories)
			1/2 cup of brown rice (90 grams, 110 calories)
			1 cup of sautéed spinach with garlic (100 grams, 30 calories)
			1 tablespoon of sriracha sauce (20 calories)
	4	Roasted tofu with mixed vegetables (200 grams, 180 calories)	
		1/2 cup of cauliflower rice (90 grams, 20 calories)	
		1 cup of roasted Brussels sprouts (100 grams, 40 calories)	
		1 tablespoon of tahini sauce (60 calories)	
Evening Snack (9:00 PM)	1	1 small handful of mixed berries (50 calories)	
	2	1 small banana (120 grams, 110 calories) with 1 tablespoon of almond butter (98 calories)	
	3	1 cup of herbal tea	
	4	1 small bowl of air-popped popcorn (30 grams, 120 calories)	
Remarks ChatGPT	from	. Please note that the calorie counts provided are approximate and can vary based on specific brands and preparation methods. . It is important to monitor portion sizes and consult with a registered dietitian or healthcare professional to customize the program according to individual needs and goals.	

*Note: The authors have transformed the response provided by ChatGPT from text to table without any other modification.

Caloric Calculation and Weight Loss Estimate

To calculate Mr. Johnson's caloric intake and estimate his weight loss, we will first determine his BMR using the Harris-Benedict equation: $BMR = 66 + (6.23 \times \text{weight in pounds}) + (12.7 \times \text{height in inches}) - (6.8 \times \text{age in years})$. Given that Mr. Johnson weighs 220 pounds and has a height of 5 feet 8 inches, his BMR is: $BMR = 66 + (6.23 \times 220) + (12.7 \times (5 \times 12 + 8)) - (6.8 \times 45) = 2,002.5$ calories per day.

To achieve weight loss, we will aim for a caloric deficit. A deficit of 500 to 1,000 calories per day is generally recommended for a safe and sustainable weight loss of 1 to 2 pounds per week. For Mr. Johnson, we will aim for a daily caloric intake of 1,500 to 1,800 calories, depending on his individual needs and preferences. This will create a moderate caloric deficit and support gradual weight loss.

Estimated Weight Loss

With a weekly caloric deficit of approximately 3,500 to 7,000 calories (1 to 2 pounds of weight loss), Mr. Johnson can expect to lose around 12 to 24 pounds (5.4 to 10.9 kg) in 3 months by following this program consistently.

Additional Advice for Mr. Johnson

Stay consistent with your dietary program and make it a habit.

Incorporate regular physical activity into your routine, such as brisk walking, jogging, or strength training, to enhance weight loss and overall fitness.

Monitor your blood glucose levels regularly and follow your prescribed medication and treatment plan for T2DM.

Stay well hydrated by drinking plenty of water throughout the day.

Seek support from a healthcare professional or a registered dietitian for further guidance and monitoring of your progress.

Remember, individual results may vary, and it's important to consult with healthcare professionals for personalized advice based on your specific health condition and needs.

Interaction 1

Mr. Johnson expressed his preference for an intermittent fasting schedule of 18 hours. Could you please provide a comprehensive dietary program tailored to his specific needs, similar to the one mentioned earlier?

ChatGPT's second response

Certainly! Here is a revised dietary program for Scenario A (Table 2), taking into account Mr. Johnson's preference for intermittent fasting of 18 hours: i) Meal Plan for Mr. Johnson (Intermittent Fasting: 18 hours); ii) Feeding Window: 6 hours (12:00 PM - 6:00 PM).

Table 2. Scenario A: Revised dietary program for Mr. Johnson*.

Period	Option N°	Details
Breakfast (12:00 PM)	1	Grilled chicken breast salad with mixed greens, cherry tomatoes, and balsamic vinaigrette dressing (400 calories, 150 grams of chicken breast, mixed greens, cherry tomatoes, 2 tablespoons of dressing)
	2	Quinoa and vegetable stir-fry with tofu (380 calories, 100 grams of quinoa, mixed vegetables, 150 grams of tofu)
	3	Avocado and tomato omelette with whole wheat toast (350 calories, 2 eggs, 50 grams of avocado, cherry tomatoes, 1 slice of whole wheat toast)
	4	Greek yogurt with berries and a sprinkle of chia seeds (280 calories, 1 cup of Greek yogurt, 100 grams of mixed berries, 1 tablespoon of chia seeds)
Lunch/Snack (3:00 PM)	1	Mixed nuts and seeds with a piece of fruit (300 calories, 30 grams of mixed nuts and seeds, 1 medium-sized fruit)
	2	Whole-wheat wrap with turkey, cheese, and veggies (350 calories, 2 slices of turkey, 1 slice of cheese, assorted vegetables in a whole-wheat wrap)
	3	Vegetable soup with a side of whole grain crackers (320 calories, 1 cup of vegetable soup, 4 whole grain crackers)
	4	Cottage cheese with cucumber slices and a drizzle of olive oil (280 calories, 1 cup of cottage cheese, cucumber slices, 1 tablespoon of olive oil)
Dinner (6:00 PM)	1	Grilled salmon with roasted asparagus and quinoa (450 calories, 150 grams of salmon, 150 grams of asparagus, 50 grams of quinoa)
	2	Baked chicken breast with steamed broccoli and brown rice (400 calories, 120 grams of chicken breast, 150 grams of broccoli, 50 grams of brown rice)
	3	Lentil curry with brown rice and mixed vegetables (380 calories, 100 grams of lentils, 50 grams of brown rice, assorted vegetables)
	4	Stir-fried tofu with bok choy and brown rice noodles (420 calories, 150 grams of tofu, 150 grams of bok choy, 50 grams of brown rice noodles)
Remarks from ChatGPT		During the fasting window (6:00 PM - 12:00 PM), Mr. Johnson should consume only water, herbal tea, or other non-caloric beverages to maintain the fast. Please note that the provided program is for illustrative purposes only and should not replace professional guidance from a registered dietitian or healthcare provider. It is advisable for Mr. Johnson to consult with a healthcare professional to assess his individual nutritional needs and to monitor his progress throughout the dietary program.

*Note: The authors have transformed the response provided by ChatGPT from text to table without any other modification.

Scenario B

Description

Patient: Ms. Kawasaki

Age: 35 years

Weight: 100 pounds (45 kg)

Height: 5 feet 6 inches (168 cm)

BMI: 16.1 kg/m²
 Medical History: Mild Anaemia, latest laboratory tests:
 Red Blood cells: 3.6106/uL, haemoglobin: 10.9 gm/dl,
 haematocrit: 33.1%
 Physical activity: Sedentary lifestyle, minimal exercise
 Number of steps: Approximately 2,000 steps per day
 Nature of work: Office job, primarily desk-based
 Goal: Achieve a normal BMI of 25 kg/m² in 3 months
 Task

Please provide a dietary program for this patient that includes specific timings and precise portions for each meal, measured in calories, spoons and grams. It would be beneficial if you could design a personalized program for him, ensuring he follows it daily. To prevent monotony, please include four options for each meal, allowing for variety and choice. Additionally, please calculate the caloric intake based on his BMR and estimate the amount of weight he is likely to gain per week, per month, and over the course of the entire diet. Also, provide in a separate section any additional advice specialised to the patient’s health condition to make her reach his target the soonest possible.

ChatGPT’s Response

Meal Plan for Ms. Kawasaki

Table 3 presents the Meal Plan for Ms. Kawasaki.

Caloric Intake and Weight Gain Estimate

Based on Ms. Kawasaki’ BMR and activity level, her estimated daily caloric intake for weight gain would be

around 2,200-2,400 calories. With this program, she can expect to gain approximately 0.5-1 pound (0.2-0.4 kg) per week, 2-4 pounds (0.9-1.8 kg) per month, and 6-12 pounds (2.7-5.4 kg) over the course of the entire 3-month diet.

Additional Advice

Given Ms. Kawasaki’ mild anaemia, it is important to incorporate iron-rich foods in her diet, such as lean meats, dark leafy greens, legumes, and fortified cereals. Including a source of vitamin C, such as citrus fruits or bell peppers, with iron-rich meals can enhance iron absorption. It is also advisable for her to consult with a healthcare professional, such as a registered dietitian or nutritionist, to monitor her progress, assess her iron levels, and make any necessary adjustments to the dietary program. It is worth noting that the provided program is a general guideline and may require further customization based on individual preferences, dietary restrictions, and specific health conditions. Regular monitoring, adherence to portion sizes, and an active lifestyle, including increased physical activity, are essential for overall health and well-being. Please note that the above program is for illustrative purposes only and should not replace professional guidance from a registered dietitian or healthcare provider.

Table 3. Scenario B: Meal Plan for Ms. Kawasaki*.

Period	Option N°	Details
Breakfast (7:30 AM)	1	Oatmeal topped with sliced almonds and a drizzle of honey (300 calories, 2 tablespoons of almonds, 40 grams of oatmeal)
	2	Scrambled eggs with spinach and cherry tomatoes (350 calories, 2 eggs, 1 cup of spinach, 50 grams of cherry tomatoes)
	3	Whole wheat toast with avocado and cottage cheese (320 calories, 1 slice of bread, 50 grams of avocado, 3 tablespoons of cottage cheese)
	4	Greek yogurt with mixed berries and a sprinkle of granola (280 calories, 1 cup of Greek yogurt, 100 grams of mixed berries, 2 tablespoons of granola)
Mid-Morning Snack (10:00 AM)	1	Banana and peanut butter (180 calories, 1 medium-sized banana, 1 tablespoon of peanut butter)
	2	Carrot sticks with hummus (150 calories, 1 medium-sized carrot, 3 tablespoons of hummus)
	3	Greek yogurt with a handful of nuts (200 calories, 1 cup of Greek yogurt, 30 grams of mixed nuts)
	4	Protein smoothie with mixed fruits (220 calories, 1 scoop of protein powder, 1 cup of mixed fruits, 200 ml of almond milk)
Lunch (1:00 PM)	1	Grilled chicken breast with quinoa and roasted vegetables (400 calories, 120 grams of chicken breast, 50 grams of quinoa, 150 grams of roasted vegetables)
	2	Lentil soup with a side salad (350 calories, 1 cup of lentil soup, mixed salad with 1 tablespoon of dressing)
	3	Whole wheat wrap with turkey, avocado, and veggies (380 calories, 2 slices of turkey, 50 grams of avocado, assorted vegetables in a whole wheat wrap)
	4	Baked salmon with sweet potato and steamed broccoli (420 calories, 120 grams of salmon, 100 grams of sweet potato, 150 grams of steamed broccoli)
Afternoon Snack (4:00 PM)	1	Apple slices with almond butter (180 calories, 1 medium-sized apple, 1 tablespoon of almond butter)
	2	Cottage cheese with pineapple chunks (150 calories, 3 tablespoons of cottage cheese, 100 grams of pineapple)

		3	Greek yogurt with honey and mixed nuts (200 calories, 1 cup of Greek yogurt, 1 tablespoon of honey, 30 grams of mixed nuts)
		4	Rice cakes with hummus and cucumber slices (160 calories, 2 rice cakes, 3 tablespoons of hummus, cucumber slices)
Dinner (7:00 PM)		1	Grilled lean steak with quinoa and roasted asparagus (450 calories, 150 grams of lean steak, 50 grams of quinoa, 150 grams of roasted asparagus)
		2	Baked chicken breast with brown rice and steamed broccoli (400 calories, 120 grams of chicken breast, 50 grams of brown rice, 150 grams of steamed broccoli)
		3	Stir-fried tofu with mixed vegetables and brown rice (380 calories, 150 grams of tofu, assorted vegetables, 50 grams of brown rice)
		4	Grilled shrimp skewers with couscous and grilled zucchini (420 calories, 150 grams of shrimp, 50 grams of couscous, 150 grams of grilled zucchini)
Evening (9:00 PM)	Snack	1	Greek yogurt with sliced almonds and a sprinkle of cinnamon (200 calories, 1 cup of Greek yogurt, 2 tablespoons of sliced almonds, a sprinkle of cinnamon)
		2	Cheese and whole wheat crackers (180 calories, 1 ounce of cheese, 4 whole wheat crackers)
		3	Protein smoothie with almond milk and a handful of spinach (220 calories, 1 scoop of protein powder, 200 ml of almond milk, a handful of spinach)
		4	Mixed berries with a dollop of whipped cream (150 calories, 1 cup of mixed berries, 2 tablespoons of whipped cream)

*Note: The authors have transformed the response provided by ChatGPT from text to table without any other modification.

Scenario C

Description

Patient: Mr. Davis

Age: 50 years

Weight: 250 pounds (113 kg)

Height: 6 feet (183 cm)

BMI: 33.6 kg/m²

Medical History: Obesity, T2DM (under medication: Metformin®), arterial hypertension (under medication: Lisinopril®), hypercholesterolemia (under medication: Atorvastatin®), sleep apnoea syndrome (SAS). Latest lab results: potassium level: 5.9 mmol/L, glycated haemoglobin 7.4%

Physical activity: Low to moderate physical activity

Number of steps: Approximately 4,000 steps per day

Nature of work: Mostly sedentary job, limited physical activity

Goal: Achieve a normal BMI of 25 kg/m² in 6 months

Task

Please provide a dietary program for this patient that includes specific timings and precise portions for each meal, measured in calories, spoons and grams. It would be beneficial if you could design a personalized program for him, ensuring he follows it daily. To prevent monotony, please include four options for each meal, allowing for variety and choice. Additionally, please calculate the caloric intake based on his BMR and estimate the amount of weight he is likely to lose per week, per month, and over the course of the entire diet. Also, provide in a separate section any additional advice specialised to the patient's health condition to make him reach his target the soonest possible.

ChatGPT's response

Dietary Program for Mr. Davis

Table 4 presents the dietary program for Mr. Davis.

Caloric Intake and Weight Loss Estimate

Based on Mr. Davis' BMR and activity level, his estimated daily caloric intake for weight loss would be around 1,800-2,000 calories. With this program, he can expect to lose approximately 1-2 pounds (0.5-1 kg) per week, 4-8 pounds (1.8-3.6 kg) per month, and 24-48 pounds (10.9-21.8 kg) over the course of the entire 6-month diet.

Additional Advice

Given Mr. Davis' medical history and health conditions, it is crucial to monitor his blood glucose levels, blood pressure, and lipid profile throughout the dietary program. Regular consultations with healthcare professionals, such as a registered dietitian or physician, are recommended to ensure the program aligns with his medication regimen and addresses any potential interactions or complications. Moreover, it is essential to encourage Mr. Davis to incorporate regular physical activity into his daily routine, as it can enhance weight loss and overall health. Moderate-intensity aerobic exercises, such as brisk walking or cycling, combined with strength training exercises, are beneficial for improving insulin sensitivity, blood pressure control, and lipid profile. It is important to note that the provided dietary program is a general guideline and may require further individualization based on Mr. Davis' preferences, dietary restrictions, and ongoing health monitoring. Collaborative efforts between healthcare professionals and the patient are vital for successful long-term weight management and overall well-being.

Please remember that the above program is for illustrative purposes only and should not replace personalized guidance from a registered dietitian or healthcare provider.

Table 4. Scenario C: Dietary program for Mr. Davis*.

Period	Option N°	Details
Breakfast (7:30 AM)	1	Vegetable omelette with egg whites, spinach, and bell peppers (350 calories, 4 egg whites, 1 cup of spinach, 50 grams of bell peppers)
	2	Greek yogurt with mixed berries and a sprinkle of flaxseeds (300 calories, 1 cup of Greek yogurt, 100 grams of mixed berries, 1 tablespoon of flaxseeds)
	3	Whole grain toast with avocado and smoked salmon (380 calories, 1 slice of whole grain toast, 50 grams of avocado, 50 grams of smoked salmon)
	4	Protein smoothie with almond milk, banana, and almond butter (350 calories, 1 cup of almond milk, 1 medium-sized banana, 1 tablespoon of almond butter)
Mid-Morning Snack (10:00 AM)	1	Carrot sticks with hummus (150 calories, 1 medium-sized carrot, 3 tablespoons of hummus)
	2	Mixed nuts and seeds (200 calories, 30 grams of mixed nuts and seeds)
	3	Cottage cheese with cucumber slices (120 calories, 3 tablespoons of cottage cheese, cucumber slices)
	4	Protein bar with low sugar content (180 calories, 1 protein bar)
Lunch (1:00 PM)	1	Grilled chicken breast with quinoa and steamed vegetables (450 calories, 150 grams of grilled chicken breast, 50 grams of quinoa, 150 grams of steamed vegetables)
	2	Baked salmon with brown rice and roasted asparagus (400 calories, 150 grams of baked salmon, 50 grams of brown rice, 150 grams of roasted asparagus)
	3	Lentil soup with a side salad (350 calories, 1 cup of lentil soup, mixed salad with 1 tablespoon of dressing)
	4	Turkey wrap with whole grain tortilla, avocado, and mixed greens (380 calories, 2 slices of turkey, 50 grams of avocado, mixed greens in a whole grain tortilla)
Afternoon Snack (4:00 PM)	1	Greek yogurt with sliced almonds and a drizzle of honey (250 calories, 1 cup of Greek yogurt, 2 tablespoons of sliced almonds, a drizzle of honey)
	2	Apple slices with peanut butter (200 calories, 1 medium-sized apple, 1 tablespoon of peanut butter)
	3	Protein shake with almond milk and a banana (220 calories, 1 scoop of protein powder, 1 cup of almond milk, 1 medium-sized banana)
	4	Rice cakes with hummus and cherry tomatoes (160 calories, 2 rice cakes, 3 tablespoons of hummus, cherry tomatoes)
Dinner (7:00 PM)	1	Grilled lean steak with sweet potato and grilled vegetables (500 calories, 150 grams of lean steak, 100 grams of sweet potato, 150 grams of grilled vegetables)
	2	Baked chicken breast with quinoa and steamed broccoli (450 calories, 150 grams of baked chicken breast, 50 grams of quinoa, 150 grams of steamed broccoli)
	3	Stir-fried tofu with brown rice and mixed vegetables (400 calories, 150 grams of tofu, 50 grams of brown rice, mixed vegetables)
	4	Shrimp stir-fry with noodles and snap peas (420 calories, 150 grams of shrimp, 50 grams of noodles, 150 grams of snap peas)
Evening Snack (9:00 PM)	1	Greek yogurt with a sprinkle of cinnamon and mixed berries (200 calories, 1 cup of Greek yogurt, a sprinkle of cinnamon, 100 grams of mixed berries)
	2	Celery sticks with almond butter (150 calories, celery sticks, 1 tablespoon of almond butter)
	3	Low-fat cheese with whole grain crackers (180 calories, 1 ounce of low-fat cheese, 4 whole grain crackers)
	4	Dark chocolate squares (150 calories, 2 squares of dark chocolate)

*Note: The authors have transformed the response provided by ChatGPT from text to table without any other modification.

DISCUSSION

Nutrition stands as a cornerstone in the promotion of optimal health and well-being, and the provision of personalized dietary programs has emerged as a promising approach to maximize individual outcomes. In this study, our objective was to assess the efficacy, accuracy, and safety of employing an ALM (i.e., ChatGPT), in generating customized dietary programs tailored to individuals with diverse health profiles and objectives. The findings unveiled the development of individualized meal plans featuring specific meal timings, precise

portion sizes quantified in calories, and attentiveness to personal preferences and dietary restrictions. Through an in-depth analysis and interpretation of these results, this discussion section aims to scrutinize the inherent strengths and limitations embedded within the ChatGPT's generated dietary programs. Moreover, we will delve into the practical implications of integrating AI into the realm of nutrition practice. Then we highlighted the imperative role of professional guidance in effectively and safely translating AI-generated programs into successful dietary interventions.

Scenario A

For the first scenario, we created Mr. Johnson, who represents a common profile among individuals seeking the guidance of a nutritionist: no comorbidities with a BMI ranging from 30 to 35, categorizing him as obesity level 1. According to data from the National Health and Nutrition Examination Survey for 2017–2018, approximately 30.7% of adults are overweight, 42.4% have obesity, and 9.2% have severe obesity[8]. This demographic makes Mr. Johnson a suitable candidate for our first patient representation.

The dietary program developed by ChatGPT to assist Mr. Johnson exhibited a well-structured approach. It offered a diverse range of meal options and accurately estimated caloric intake based on Mr. Johnson's BMR. However, one notable limitation of the program was its failure to specify precise portion sizes in grams. This imprecision hinders the ability to accurately gauge caloric intake and maintain consistent portion control, both of which are crucial aspects of an effective dietary program. Furthermore, it is important to recognize the impact of individual variation. The weight loss calculations provided by ChatGPT are based on general guidelines and assumptions, without accounting for factors such as metabolism, body composition, and overall health. These factors can significantly influence the rate at which weight is lost, highlighting the need for a nuanced approach considering individual differences. Lastly, the program generated by ChatGPT primarily focused on meal options and caloric intake, overlooking the incorporation of behavioural strategies that promote sustainable behaviour change. Addressing aspects such as emotional eating, managing cravings, and fostering long-term adherence to the program would greatly enhance Mr. Johnson's chances of success in achieving his weight loss goals.

To further explore the capabilities of ChatGPT in accommodating individual preferences, we specifically requested a dietary program for Mr. Johnson aligning with his preference for intermittent fasting. The generated program exhibited commendable aspects, offering a diverse range of nutrient-rich food options encompassing lean proteins, whole grains, fruits, vegetables, and healthy fats, while adhering to the prescribed fasting window. It is noteworthy that ChatGPT's ability to consider and incorporate specific

dietary preferences, such as intermittent fasting, demonstrates its versatility in generating tailored programs. This highlights the potential of AI models to provide personalized dietary guidance aligning with individual choices and lifestyles (eg; plant based/vegetarians). However, it is essential to acknowledge that, while ChatGPT can provide valuable general dietary guidance, it falls short in addressing the nuanced and individualized needs of patients with specific health conditions and comorbidities.

Discussion of proposal for scenario A

ChatGPT provided a comprehensive and diverse nutritional program with a variety of meals and choices. However, there are several areas requiring improvement, given the lack of personalization. Initially, it was essential to discuss the objective of achieving a BMI of 25 kg/m² in 3 months, which for Mr. Johnson translates to losing 25 kg in 3 months. This rate of weight loss is considered rapid and would potentially be harmful to his health. We expected ChatGPT to address this concern explicitly in the provided program. Ideally, ChatGPT should have referenced international guidelines, which recommend a weight loss of 10% of total body weight, over a period of 3 to 6 months [14]. Unfortunately, ChatGPT did not mention this, even though we specifically asked for a program aiming to lose over 20% of total weight in less than 3 months. Moreover, before suggesting any diet plan, it was important to estimate Mr. Johnson's daily calorie intake, with a recommended reduction of one third to achieve a balanced diet. It was also crucial to consider Mr. Johnson's food preferences to ensure his enjoyment of meals and enhance adherence to the diet. As a truly robust model for providing personalized nutritional advice, it would have been beneficial for ChatGPT to generate interaction around these factors. Financial resources and ingredient availability were other crucial factors to consider when creating an applicable and personalized program. Similar to the previously mentioned limitations, it would have been advantageous for ChatGPT to address these constraints. The proposed diet consisted of three balanced meals with optional snacks. Late evening snacks were not recommended as they hinder the body's ability to experience hunger, which is necessary for weight loss [15]. Regarding water intake, it was only mentioned during the beginning of the

intermittent period, despite its importance in guaranteeing program success and preventing water retention. For Mr. Johnson, a daily intake of at least 3 litres of water (30 ml/kg/Day) is desirable [16]. Another concern is the consideration of the glycaemic index (GI) in the diet prescription, as well as continuous reminders for blood glucose monitoring. Lastly, we noticed some inadequacies in the prescribed diet. For the evening snack in option 2 (Table 1), ChatGPT mentioned a small banana (120 grams, 110 calories) with 1 tablespoon of almond butter (98 calories), which is not suitable and may be harmful for a patient with T2DM. Similarly, in option 2 for breakfast (Table 1), the inclusion of a tablespoon of honey is not recommended due to its high GI.

Scenario B

In this scenario, we created Ms. Kawasaki to be part of a substantial proportion of the population that is underweight and aiming to gain weight. The dietary program provided by ChatGPT reveals certain limitations and areas warranting further consideration. While it attempts to address Ms. Kawasaki's goal of achieving a normal BMI of 25 kg/m² in 3 months, there are aspects that could be improved from a clinical nutrition perspective. Firstly, it is important to acknowledge ChatGPT incorporated the patient's health condition of anemia into the dietary program, focusing on foods rich in iron. In the additional advice section, ChatGPT provided suggestions regarding iron intake, which is commendable. However, the program has certain limitations. It fails to take into account Ms. Kawasaki's individualized nutrient needs, which can vary based on factors such as age, sex, activity level, and specific health conditions. The lack of customization in terms of macronutrient distribution, micronutrient adequacy, and overall dietary balance may hinder the program's effectiveness in supporting optimal health. Moreover, in the section of additional advice, there was an expectation that ChatGPT would address lifestyle changes and the importance of incorporating physical activity, especially for weight gain in the form of muscle mass. However, ChatGPT did not provide any information in that regard. It is crucial to emphasize that in cases of underweight individuals, achieving weight gain solely through dietary calorie surplus may not yield desired results without the incorporation of an

appropriate and personalized physical exercise program [17]. Additionally, it is worth noting there was an expectation for ChatGPT to address the challenge of achieving a BMI of 25 kg/m² within a 3-month timeframe, particularly when starting from a low initial BMI of 16.1 kg/m². The program provided by ChatGPT did not acknowledge this challenge nor provide realistic expectations regarding the feasibility of such a rapid weight gain. This is an important consideration, as individuals with resistance to weight gain may require a longer-term approach and additional strategies to support their goals. A more comprehensive and nuanced understanding of the patient's unique circumstances and challenges is essential for developing a realistic and effective dietary program.

Discussion of proposal for scenario B

First, it is crucial to determine whether Ms. Kawasaki's thinness is due to recent weight loss or constitutive thinness. Furthermore, gathering information about the patient's family and personal history is essential. Additionally, it is important to identify the type of anemia by specifying the mean corpuscular volume and mean hemoglobin content. This will facilitate further assessment, including serum iron, ferritin levels, and assays for vitamin B12 and folic acid. These precautions should have been taken into account or, at minimum, provided as a warning by ChatGPT before initiating the nutritional program, and appropriate treatment should be initiated as a first-line therapy. Furthermore, some limitations in the prescribed program need to be addressed. For instance, ChatGPT mentioned a portion size of 120 grams for grilled salmon or chicken during lunch (Table 3), but it would be more suitable to increase it to 150 grams. Similarly, for dinner, the recommended portion sizes of 150 grams and 120 grams should be adjusted accordingly.

Scenario C

The program provided by ChatGPT for Mr. Davis's dietary plan exhibits both strengths and limitations. One of the strengths lies in the program's ability to offer a variety of meal options that encompass a well-balanced distribution of macronutrients. This includes the inclusion of nutrient-dense foods like lean proteins, whole grains, fruits, and vegetables. Such diversity in meal choices highlights ChatGPT's potential to generate

a comprehensive meal plan aligning with fundamental nutrition principles. Additionally, the program provided multiple alternatives for each meal, thereby promoting variety and catering to individual preferences. However, it is essential to recognize the program's limitations. First, individuals with conditions such as obesity, T2DM, arterial hypertension, hypertriglyceridemia, and SAS require more precise recommendations regarding carbohydrate and fat intake, sodium restriction, and blood glucose monitoring. Unfortunately, the program lacks detailed guidance in these areas, which could significantly affect the optimization of Mr. Davis's health outcomes. Moreover, the program does not account for potential interactions between Mr. Davis's medications and specific foods or nutrients, a factor that is of paramount importance in the creation of a truly personalized dietary plan. Medications such as Metformin, Lisinopril, and Atorvastatin, which Mr. Davis is currently taking, can interact with certain foods or nutrients in ways that may affect their efficacy or potentially lead to adverse effects. For instance, Metformin, a common medication for T2DM, can affect vitamin B12 absorption, potentially leading to a deficiency if not properly managed. Lisinopril, a medication for hypertension, may interact with foods high in potassium, leading to hyperkalemia, a condition characterized by dangerously high levels of potassium in the blood. Atorvastatin, a cholesterol-lowering medication, can interact with grapefruit and grapefruit juice, which can lead to an increased risk of side effects such as muscle pain and liver damage. These potential interactions underscore the need for a more sophisticated dietary planning tool that can integrate data on medication use and provide specific guidance on food and nutrient interactions. Such a tool would need to be capable of alerting users to potential interactions and suggesting modifications to the diet plan to mitigate these risks. This could include recommending alternative foods, suggesting appropriate portion sizes, or providing guidance on the timing of meals relative to medication administration.

In the absence of such capabilities, the role of healthcare professionals becomes even more critical. Dietitians and other healthcare providers have the expertise to evaluate potential interactions, adjust dietary plans accordingly, and provide ongoing monitoring to ensure safety and efficacy. This highlights the importance of a

collaborative approach that combines AI technology with human expertise in the management of complex health conditions. As of July 2023, the program is not capable of providing specific guidance in this regard, underscoring the importance of professional expertise in evaluating potential interactions and customizing diet plans accordingly.

Discussion of proposal for scenario C

Mr. Davis, who is diabetic, hypertensive, and at high cardiovascular risk, would greatly benefit from weight loss. This would lead to improvements in his glycaemic control, blood pressure levels, dyslipidaemia, and even SAS, while reducing further risk of cardiovascular complications. Therefore, it is crucial to provide him with a well-balanced diet tailored to his specific needs, preferences, and comorbidities. The recommended diet should consist of foods with a medium to low GI, while reducing sodium and high-glycaemic foods intake. It is also important to address other cardiovascular risk factors, such as smoking and alcohol consumption, alongside the dietary changes. Emphasizing the inclusion of fruits and vegetables, which are rich in vitamins, fiber, antioxidants, and cardioprotective polyphenols, is essential. By using location data, seasonal fruits like strawberries and pomegranates could even be offered as part of the diet plan. It is important to emphasize a daily water intake of approximately 3,500 ml for Mr. Davis. This strategy not only aids in weight loss, but also reduces the risk of hyperosmolarity in this patient. Furthermore, ensuring good quality and restful sleep is crucial for weight loss and improved glycaemic and blood pressure control. It is advisable to consult a specialist regarding the possibility of fitting a device for SAS.

ChatGPT Overall Evaluation

ChatGPT exhibits promising potential as a tool for generating personalized dietary programs. However, caution is necessary when applying it in patient care. While ChatGPT offers valuable guidance in dietary planning, it should not be regarded as a substitute for the expertise and clinical judgment of registered dietitians or healthcare professionals. Collaborative efforts between AI systems like ChatGPT and healthcare experts are pivotal to ensure accurate, individualized, and safe dietary interventions. It is worth noting patients should

not solely rely on ChatGPT for dietary advice, particularly those with existing health conditions or comorbidities. The supervision and interpretation of clinical nutritionists are indispensable in ensuring that the provided advice aligns with evidence-based guidelines and meets each patient's unique needs. The expertise of nutrition specialists facilitates a comprehensive contextual understanding, enabling customization, aspects that may not be fully addressed solely by AI models.

This study aimed to assess ChatGPT's efficacy in generating personalized dietary programs for hypothetical patients in various health scenarios. The findings revealed that ChatGPT could generate programs. The findings revealed that while ChatGPT could generate nutritional programs, its advice often lacks full adherence to evidence-based guidelines and not adequately consider specific health considerations. The generated programs displayed customization, offering a plethora of diverse meal options and precise portions to accommodate individual preferences and dietary restrictions. These findings have practical implications as they could streamline the process of creating personalized dietary plans, enhance the efficiency of healthcare professionals, ultimately improving patient care. Additionally, the absence of real-time interaction and outcome monitoring hampers the assessment of the generated programs impact on real patients' health outcomes and adherence. Limitations

This study acknowledges several limitations warranting careful consideration when interpreting the findings and extrapolating them to real-world contexts. First, the virtual scenarios employed in this study, while diverse in their representation of health profiles and weight management goals, may not fully capture the intricate complexity and individual nuances encountered in actual patient scenarios. Therefore, caution should be exercised when generalizing the findings to real-world populations. The second limitation lies in the subjective evaluations conducted by the participating experts. Despite efforts to ensure objectivity, inherent variability in the assessments and interpretations of the AI-generated programs may introduce a level of subjectivity and potential bias into the evaluation process. Third, the absence of real-time interaction between the experts and the AI model is a notable limitation. The evaluation relied on static outputs without the dynamic exchange and

clarification that real-time interaction would allow. Incorporating real-time interaction could provide valuable insights into the AI model's ability to address specific inquiries and adapt the generated programs based on expert feedback. Additionally, it is pertinent to recognize ChatGPT's limitations can be mitigated through extensive interactions and the provision of comprehensive patient data. ChatGPT operates based on the information provided and may not calculate certain parameters unless explicitly requested. Therefore, based on the authors' experience [9, 11, 18-20], we advocate for nutrition specialists to engage in multiple iterative rounds of interaction with ChatGPT, furnishing it with detailed patient data and articulating desired outcomes. This meticulous process should augment the accuracy and effectiveness of the generated dietary programs. Moreover, the lack of real-life implementation and outcome monitoring hinders our ability to ascertain the actual impact of these AI-generated programs on the health outcomes and adherence of real patients. Fourth, it is important to note that this study evaluated a specific AI model, ChatGPT, and its performance may not necessarily reflect the capabilities and limitations of other advanced large language models. Different models may possess varying strengths and weaknesses, which may influence their suitability for generating personalized dietary programs. In addition, with the continuous advancement of AI technology, it is conceivable that newer, and forthcoming iterations may enhance the overall user experience [21]. Lastly, it might be better to inform ChatGPT about the cultural and societal backgrounds of each patient, which can significantly influence their nutrition. Culture and society play crucial roles in shaping people's beliefs, values, traditions, and behaviours, including their food choices and eating patterns [22]. Moreover, religious beliefs and ethical considerations can strongly influence dietary choices, and individuals following religious practices such as Islam, Judaism, or Hinduism may adhere to specific dietary restrictions or preferences. These limitations underscore the need for further research to address the gaps identified in this study. Future investigations should strive to incorporate a more diverse and representative sample of real patients, involve real-time interaction with AI models, monitor long-term outcomes, and evaluate the performance of different AI models in generating tailored dietary

programs. By addressing these limitations, we can gain a more comprehensive understanding of the true potential and limitations of AI in the field of nutrition and its impact on patient care and outcomes.

CONCLUSIONS AND CAUTIONS

This study explored the utilization of ALMs, specifically ChatGPT, to generate individualized dietary programs for fictional patients across diverse health scenarios. The outcomes underscore the potential of AI models in producing personalized nutritional guidance, thereby streamlining processes, improving healthcare practitioners' efficiency, and ultimately enhancing patient care within the field of nutrition. The findings illustrate that ChatGPT exhibits the capacity to generate dietary programs that adhere to evidence-based guidelines and address specific health considerations. The AI-generated programs highlight customization and diversity, offering multiple meal options and precise portions to accommodate individual preferences and dietary restrictions. Moreover, the study underscores the indispensable role of human expertise in conjunction with AI models. The critical evaluation and refinement of AI-generated programs by nutrition experts and medical professionals underscore the significance of interdisciplinary collaboration when integrating AI technologies into healthcare practices. It is crucial to acknowledge individuals or patients seeking dietary programs should not yet employ ChatGPT independently, as it presents inherent risks. However, we propose ChatGPT as a potential tool to reinforce productivity and the quality of tailored dietary programs, exclusively when monitored by nutritional specialists. While the findings gleaned from this study offer invaluable insights, further research is indispensable to corroborate the efficiency, effectiveness, and safety of ChatGPT in real-life scenarios. Future investigations should concentrate on evaluating patient outcomes, long-term adherence rates, and the broader impact of AI-generated dietary programs on improving overall health outcomes.

Cautionary Notes and Implications

We would like to emphasize that our analysis did not consider the management of physical activity or stress, despite these being vital factors that can significantly influence the success or failure of any diet program.

Indeed, it is important to note that our study was primarily focused on evaluating the reliability and effectiveness of ChatGPT as a source for tailored nutrition advice. Our aim was not to assess a holistic health program or a wellness program, but rather to concentrate on a program with a sole focus on nutrition. Nonetheless, we acknowledge the interconnectedness of these factors and their collective impact on overall health and wellbeing and most importantly weight loss.

ChatGPT serves as a tool in providing initial guidance for dietary plans. However, the nuanced nature of nutritional recommendations and their impacts on overall health necessitate the involvement of registered dietitians and healthcare professionals. These experts possess the ability to tailor the AI-generated programs to the unique requirements and goals of each patient, considering factors such as medical history, nutritional needs, lifestyle factors, and specific dietary preferences. The complex nature of interactions between diet, medications, and health conditions further underscores the need for personalized assessment and ongoing monitoring, which require human intervention and clinical judgment. Therefore, the output from ChatGPT should be regarded as a starting point for further discussion and interaction with a clinical nutritionist or registered dietitian. The collaboration between AI technology and human expertise is essential to optimize the effectiveness and safety of dietary interventions, ensuring that they align with both the patient's preferences and their health objectives. The identified limitations highlight the importance of integrating AI with human expertise when interpreting and tailoring dietary plans, especially for individuals with complex health profiles.

Future research should focus on exploring the real-life efficiency and safety of ChatGPT, and its potential for integration into clinical practice. This will help to further enhance the synergy between AI and human expertise in the field of nutrition and dietetics.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

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COMPETING INTERESTS

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTHORS' CONTRIBUTIONS

I.D and H. B.S: conception and design. I. D, H. B.S, J.M.G, I.S, Y.H and K.C: analysis and interpretation of the data I.D, H.B.S, H.G, J.M.G, A.E.O, I.S, Y.H, M.T, M.B.A, N.G, R.A.H, J.A.W, S.S.1, O.M.A, L.J.M.D.S, R.F.A, H.I.C, S.S.2, N.Z.A, N.C, H.D, N.L.B, and K.C: drafting of the paper. I.D, H.B.S, H.G, J.M.G, A.E.O, I.S, Y.H, M.T, M.B.A, N.G, R.A.H, J.A.W, S.S.1, O.M.A, L.J.M.D.S, R.F.A, H.I.C, S.S.2, N.Z.A, N.C, H.D, N.L.B, and K.C: revising it critically for intellectual content. All authors provided their final approval to the version that will be published.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available upon request from the corresponding author.

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DECLARATION

We would like to emphasize that the interpretation of the output in this study is subjective to a certain degree, as it relies on the authors' experience with advanced language models. Despite our efforts to maintain objectivity, it is important to recognize that different reviewers may have different interpretations of the findings.

The majority of the authors possess access to ChatGPT version 4.0. Nevertheless, a deliberate decision was made to utilize version 3.5, which is freely available, in order to avoid any potential conflicts of interest.

When we requested ChatGPT to generate four distinct meal options, we had the opportunity to specify cultural or regional food preferences, or even dietary choices such as veganism or vegetarianism, among other types of diets. However, to maintain the integrity of this article and eliminate any potential conflicts of interest, we refrained from doing so. It is worth noting that any user of ChatGPT has the capability to create their own personalized and customized diet based on their individual food preferences, availability of ingredients, and cultural traditions.

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