



## A Patient's Visit to the Clinic: Using Structured AI to Create a Socratic Tutor to Promote Critical Thinking about COVID-19 and Congestive Heart Failure

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### Abstract

Through the use of AI embedded in a research platform, the paper shows how a novice can use AI to 'learn' the questions and answers that might be relevant to ask a patient who has either COVID-19 or CHF (Congestive Heart Failure). The strategy to learn uses AI as a Socratic Tutor, with the user identifying the diseases, the age, and gender of the presumed patient. The user types in a request to identify relevant questions to ask the patient, the reason why the question is being asked of the patient, and then likely thoughts that the patient might be thinking before answering the question. The approach enables the user to quickly explore many types of diseases, types of patients, all with the goal of learning about what might be encountered in the patient-doctor interaction. The approach is presented as a work-in-progress, to demonstrate the contribution of AI to medical education.

### Introduction

As part of their education and training, medical students are taught appropriate questions to ask when talking to a patient. Knowing how to talk to a patient, how to listen, how to recommend, constitute three different aspects of the softer side of medicine, in previous years called the doctor's bedside manner (Kanofsky, 2020). Much of the knowledge has been codified (Silverman, 2012), but it is still a truism to say that

the best teacher is experience. It is with experience that the novice doctor becomes a professional, 'hearing more' by understanding what patients are trying to say.

The recent advance in AI, artificial intelligence, opens up the possibility that there may be a faster way to understand the patient. To some, this faster way might be an esoteric system of measuring physiological responses and interpreting them (Wu et al., 2023), but that esoteric system of giving meaning to the cacophony of physiological responses is far in the future. Rather, it might well be that AI can 'teach' a student how to listen, or perhaps simulate what a patient might be thinking. It is this latter way of understanding the patient which constitutes the topic of this paper (Afzal et al., 2020; Baidoo-Anu & Ansah, 2023; Chan & Zary, 2019).

The objective of this paper is to introduce and demonstrate a recently developed approach, using a combination of design thinking from technology called Mind Genomics (Moskowitz, 2012; Zemel et al., 2019), along with AI to provide some of the output to queries called for by this Mind Genomics technology (Le, 2019; Liao et al., 2020), and finally with sub-text, providing what might happen in terms of doctor-patient interaction, and what the patient might be thinking (Narayanan et al., 2023).

The importance of knowing the patient cannot be overestimated. The question is not the importance, but rather whether the 'new' world of AI can be adapted to a rapid, scalable, cost-effective system to teach and to train. Or are we for the next while to remain with training and experience.

The approach shown in this paper originated decades ago, when users began to realize that the subjective world cannot be well understood by isolating a topic and studying it, such as one does with questionnaires (Rowley, 2014). An example of this one-at-a-time topic comes from questionnaires about the medical experience, such as the Press Ganey score (Wilson et al., 2016). The method is deceptively easy but fails to take into account the complexity of the situation.

During the early 1990s, author HRM and colleagues began to experiment with more 'ecologically relevant' test stimuli in the effort to understand how people make decisions. The work involved creating small descriptive phrases, mixing them together to create vignettes, presenting these vignettes to people, obtaining ratings, and then later using statistical methods to deconstruct the ratings into the contribution of the elements. The process seems clunky and overly complicated compared to the simple method of presenting single general ideas, instructing the respondent to rate the idea, and then averaging the ratings. The reality captured by the vignettes turned out to be more instructive, however (Moskowitz & Silcher, 2006). The user could modify these ideas, also known as messages or elements. The ideas could be polished, shaped, expanded or contracted, changed in meaning, changed in their very nature and tonality. As a consequence, it soon became obvious that users could understand and study more complex situations, and better understand the minds of people.

## Methods

The simulation approach used a Mind Genomics platform, Socrates as a Service (<https://socratesasaservice.com/u/dashboard>). The idea was to create a scenario instructing AI (Idea Coach) to simulate a visit of a patient to a doctor. The AI was told that the person to be simulated was a medical professional. The objective was to deal with asking questions to the patient. The AI was to suggest a question that the medical professional might ask, provide a reason for asking the question, and then come up with four thoughts that the patient might have upon being asked the question. The AI was given the background as shown below:

*"I am interested to learn how to ask questions in a clinic. My patients often come in with complaints that are not clearly expressed. I want to learn what questions to ask my patients about their condition, without alarming them. For each question that I ask, I want to understand WHY I am asking it. I also want to get four thoughts that are going through the mind of my patient, when my patient hears me ask the question. This will give me the question, the reason why I ask the question,*

*and four things that my patient might be thinking before answering the question."*

In addition to the standard or 'boilerplate' background, the AI was also provided with a short description of the patient.

It should be noted that the information that will be provided in this paper comes from only two of 20 different iterations, where the nature of the patient varies (e.g., age, gender, illness). The actual material which emerges from the effort is embedded in the so-called 'Idea Book' for the project. Each iteration with a new definition of the patient requires about 30 seconds, allowing the user to create a reference book for any indication. The Idea Book is emailed to the user about 20-30 minutes after the first part of the Mind Genomics study has been completed, where questions and answers are selected.

Table 1 shows the results for two individuals, all other prompts to the AI being the same. The first individual is a 50-year-old male suffering from COVID-19. The individual is specified as being American. The second individual is the same 50-year-old male, this time suffering from CHF, congestive heart failure.

The important thing to learn from the top Table 1 is the introduction to critical thinking offered by creating an ordinary dialectic in Idea Coach. The effort does not require anything in the way of deep understanding. Rather, the AI prompt is set up in the form of a simple request that one might ask of a personalized tutor. The Idea Coach AI is able to transform the 'almost chatty request' into the proper format.

### Four things are relevant here:

1. As just noted, the request is easy to create. One need not become an expert in so-called prompt-engineering. Natural language suffices, as long as the description of what is desired is crisp, concise, and the language used is meaningful.
2. The user is able to configure the language to achieve the correct tonality. One example is the request that 'I want to learn what questions to ask my patients about their condition, without alarming them.' This language sets the tone of what emerges.
3. The user can ask the Idea Coach AI to provide what ideas may be coursing through the mind of the patient.
4. The user can specify the amount of information provided, such as the request to provide 'four things that the patient might be thinking before answering the question.' The results in Table 1 will show that occasionally fewer than four things are provided.
5. Once the request is made, the user simply presses the Idea Coach button, to generate the necessary information. The answers are returned in approximately 10-30 seconds, sufficient to allow time for the user to review, and either do the task again, edit the squib and then do the task, or move on and end the process.

**I am interested in learning how to ask questions in a clinic. My patients often come in with complaints that are not clearly expressed. I want to learn what questions to ask my patients about their condition, without alarming them. For each question that I ask, I want to understand WHY I am asking it. I also want to get four thoughts that are going through the mind of my patient when my patient hears me ask the question. This will give me the question, the reason why I ask the question, and four things that my patient might be thinking before answering the question.**

**My Patient is a 50-Year-Old Male Suffering from COVID-19**

**My Patient is American Born**

<b>Questions</b>	<b>Reason for the question</b>	<b>Patient's thoughts (often 3 of 4)</b>
“How would you describe your current symptoms?” (To assess the severity and nature of their complaints)	Understanding the symptoms presents an overall picture of the patient's condition.	Am I experiencing symptoms that others with COVID-19 have reported? What could be causing these symptoms? Will it get worse?
“Have you experienced any difficulty breathing?” (To assess respiratory distress)	Shortness of breath is a common symptom of COVID-19 and can indicate the severity of the infection.	Could this difficulty breathing be a sign of something serious? How long will this last? Can I manage it at home?
“Have you had a fever? If so, what was the highest temperature you reached?” (To assess if fever is present and its severity)	Fever is commonly associated with COVID-19 and can indicate the body's response to the infection.	Is my fever within normal limits? Should I be concerned about a high temperature? How can I bring the fever down?
“Have you experienced any loss of taste or smell?” (To assess possible COVID-19 symptoms)	Loss of taste or smell is a distinct symptom of COVID-19 and aids in diagnosing the condition.	Is it common for people with COVID-19 to lose taste or smell? Will it come back eventually? Can I still enjoy food?
“Are you experiencing any chest pain or pressure?” (To assess potential heart or lung involvement)	Chest pain can indicate complications from COVID-19, such as pneumonia or heart problems.	Could this chest pain be life-threatening? Is it just part of having COVID-19? Will it go away on its own?
“Have you noticed any rash or skin changes?” (To assess if COVID-19 is causing dermatological symptoms)	Skin manifestations have been observed in some COVID-19 cases and may provide valuable diagnostic information.	Is it common for COVID-19 patients to have skin issues? How long will it last? Can I treat it at home?
“How long have you had these symptoms?” (To understand the duration of illness)	Duration of symptoms helps determine the stage of the infection and possible complications.	Is the duration of my symptoms normal? How long until I start feeling better? Is my recovery progressing as expected?
“Have you had any known exposure to individuals diagnosed with COVID-19?” (To assess potential transmission sources)	Contact tracing is crucial in preventing further spread of the virus and identifying potential risk factors.	Did I contract the virus from someone I know? How can I protect my loved ones? Will I be isolated?
“Any recent international travel or exposure to high-risk areas?” (To assess travel-related exposure)	Travel history may help identify potential sources of infection and determine the need for further testing or monitoring.	Could I have picked up the virus during my recent travels? Should I have avoided certain places? Will I need to quarantine?
“Are you currently taking any medications?” (To evaluate possible drug interactions)	Determining the patient's current medication regimen is essential to prevent any adverse effects or interactions with COVID-19 treatments.	Can I continue taking my regular medications? Will they interfere with my COVID-19 treatment? Should I stop any medications?
“Do you have any pre-existing medical conditions?” (To assess potential risks or complications)	Some pre-existing conditions can increase the patient's vulnerability to severe outcomes or complications from COVID-19.	Will my existing health condition worsen due to COVID-19? Am I at higher risk of severe illness? How can I protect myself?

"Have you been in contact with any immunocompromised individuals?" (To assess potential risk to vulnerable populations)	Identifying contact with immunocompromised individuals is crucial to prevent transmission to those at higher risk.	Could I have unintentionally spread the virus to someone vulnerable? How can I ensure their safety? Will I be responsible for their illness?
"Have you experienced any mental health changes or increased stress during this time?" (To address mental well-being)	COVID-19 can have psychological impacts, and assessing mental health helps provide comprehensive care	Is it common to experience worsened mental health during COVID-19? How can I cope with the stress? Will it impact my recovery?
"Are you practicing recommended hygiene measures and following public health guidelines?" (To promote safe behavior)	Encouraging adherence to preventive measures is crucial in preventing further transmission and protecting the patient and others	Am I doing enough to protect myself and others? What other precautions should I take? How can I avoid contracting it again?
"Do you have any questions or concerns about your current condition or COVID-19 in general?" (To address patient education)	Providing an opportunity for the patient to voice their concerns or seek clarification helps with informed decision-making	Are there any important aspects of my condition that I'm missing? How can I better understand COVID-19? Will I ever fully recover?
<b>My Patient is a 50-Year-Old Male Suffering from Congestive Heart Failure</b>		
<b>My Patient is American Born</b>		
<b>Question</b>	<b>Reason for the question</b>	<b>Patient's thoughts (often 4 of 4)</b>
"How would you describe the symptoms you're experiencing?"	To understand the nature and severity of the patient's complaints.	Am I describing it accurately? Will the doctor understand what I mean? How serious is it? How will it affect my daily life?
"When did you first notice these symptoms?"	To determine the onset and duration of the condition.	Do I remember the exact date? Is it related to something specific? Should I have seen a doctor earlier? Will it be a long-term issue?
"Do your symptoms have any triggers or worsen in certain situations?"	To identify any environmental factors that contribute to the symptoms	What could be causing this? Should I avoid certain things? Will the doctor recommend any lifestyle changes? Is it a serious problem?
"Have you noticed any improvements or changes in your symptoms recently?"	To assess the progress of the condition and the effectiveness of any ongoing treatments.	Is it getting better on its own? Is my current treatment working? Will the doctor need to adjust my medication? Is my condition worsening?
"Are you taking any medications, supplements, or herbal remedies?"	To determine if any medications might be interacting with their condition or worsening the symptoms.	Should I mention even over-the-counter medications? Will the doctor recommend alternative treatments? Will my medications be changed?
"Have you had any recent illnesses, surgeries, or hospitalizations?"	To assess the patient's medical history and potential factors that may have contributed to the present condition	Is my recent illness related? Should I mention minor illnesses? Is it important to disclose past surgeries? Will it affect my treatment options?
"Do you have any known allergies?"	To ensure that potential allergens are considered during the diagnosis and treatment process.	Should I mention all types of allergies? Can it be related to my symptoms? Should I inform the doctor about past reactions? Will it affect the prescribed medications?
"Has anyone in your family experienced similar health conditions?"	To assess the familial risk factors and potential hereditary component contributing to the condition	Should I mention extended family? Will it affect my diagnosis? Should I inform about relatives' chronic conditions? Is it just a coincidence?
"How would you rate your overall stress levels?"	To understand if stress plays a role in exacerbating the	Does stress affect my condition? Should I mention work-related stress?



	symptoms or overall health.	Will the doctor recommend stress management techniques? Is my condition purely stress-related?
"Do you experience any difficulty with breathing or shortness of breath?"	To assess the impact of the condition on respiratory function and potential complications.	Will I require additional tests? Is it a serious symptom? Will I need an inhaler? Is it related to my heart condition?
"Have you noticed any swelling in your ankles, legs, or abdomen?"	To evaluate the presence of fluid retention, a common symptom of congestive heart failure.	Is it normal to have swelling? Will it go away on its own? Will the doctor prescribe diuretics? Can it lead to other complications?
"How would you describe your energy levels and fatigue?"	To understand the impact of the condition on daily activities and overall quality of life.	Is fatigue a normal symptom? Will it improve with treatment? Will I need to modify my lifestyle? Can it indicate something more severe?
"Have you experienced any chest pain, discomfort, or tightness?"	To assess the presence of angina, a common symptom in congestive heart failure.	Is it a heart attack? Will it pass on its own? Should I mention it if it's only occasional? Will I need a cardiac catheterization?
"Are you currently engaging in any physical exercise or activities?"	To determine the patient's activity level and discuss any necessary modifications to their routine	Is exercise recommended? Can I still be physically active? Will it worsen my condition? Will the doctor provide exercise guidelines?
"Are you experiencing any difficulties sleeping, such as waking up frequently or shortness of breath while lying down?"	To evaluate the presence of sleep disturbances related to congestive heart failure.	Should I mention it if it's occasional? Is it just a normal part of aging? Will the doctor prescribe sleep aids? Can it lead to other complications?

Table 1: Results from the study.

AI to Broaden Horizons and to Teach Rapidly and with Targeted Instruction

Beyond the creation of questions lies the possibility of uncovering patterns in the material offered. After the user has completed the acquisition of questions, viz., iterations with or without changing the squib provided to the AI, the AI program moves to the second phase. As noted above, the user can request iteration after iteration, changing the squib at will. The AI program treats each iteration as a totally separate set of information to be analyzed. The AI program ‘summarizes’ each iteration with the following AI-based summaries:

1. Themes – which identify the recurrent issues across all of the material generated in the iteration.

2. Perspectives – which identify what is provided, and a critique of both the good and the bad aspects of the provided material.

3. What is missing from the information provided by that iteration?

4. Alternative viewpoints – different interpretations emerging from the same question or answer.

5. Interested audience – who would be interested in the material.

6. Opposing audience – reasons to doubt the validity of the material or its applicability to the situation.

7. Innovation – ‘new’ ideas, or at least hints about new ideas. The innovations are based only on the AI and are simply points for discussion.

Themes - 50-Year-Old Male with COVID-19

1. Symptoms assessment and severity evaluation:
- a. Assessing the symptoms and severity of the patient's condition.

b. Evaluating respiratory distress and difficulty breathing.

c. Identifying the presence and severity of fever.

d. Checking for loss of taste or smell as a possible COVID-19 symptom.

e. Assessing chest pain or pressure and potential heart or lung involvement.

f. Looking for any rash or skin changes as potential dermatological symptoms.

g. Understanding the duration of the symptoms to determine the stage of the infection.

2. Exposure assessment:

- a. Identifying potential sources of exposure to individuals diagnosed with COVID-19.
- b. Assessing recent international travel or exposure to high-risk areas.
- c. Assessing contact with immunocompromised individuals for potential transmission risks.

3. Medical and health assessment:

- a. Evaluating current medication usage and possible drug interactions.
- b. Identifying pre-existing medical conditions and potential risks or complications.
- c. Addressing mental health changes or increased stress during this time.

4. Education and prevention:

- a. Promoting adherence to recommended hygiene measures and public health guidelines.
- b. Providing an opportunity for the patient to ask questions or express concerns about their condition or COVID-19 in general.

**Themes - 50-Year-Old Male Suffering from Congestive Heart Failure**

1. Understanding symptom characteristics:

- a. Nature and severity of symptoms
- b. Onset and duration of symptoms
- c. Triggers or situations that worsen symptoms
- d. Improvements or changes in symptoms

2. Assessing medical history and current condition:

- a. Medications, supplements, and herbal remedies
- b. Recent illnesses, surgeries, or hospitalizations
- c. Known allergies
- d. Familial risk factors and hereditary components

3. Evaluating overall health and well-being:

- a. Impact of stress on health
- b. Difficulty with breathing or shortness of breath
- c. Presence of swelling in ankles, legs, or abdomen
- d. Energy levels and fatigue
- e. Chest pain, discomfort, or tightness

4. Assessing lifestyle factors:

- a. Current engagement in physical exercise or activities
- b. Difficulties sleeping, such as frequent waking or shortness of breath while lying down

### Perspectives - 50-Year-Old Male with COVID-19

1. Symptoms assessment and severity evaluation:
  - a. Plus: Provides a comprehensive evaluation of the patient's condition and helps determine appropriate treatment.
  - b. Minus: Relies heavily on subjective reporting and may be influenced by individual interpretation of symptoms.
  - c. Interesting: Assessing loss of taste or smell as a potential symptom is unique to COVID-19 and can help differentiate it from other respiratory illnesses.
2. Exposure assessment:
  - a. Plus: Identifies potential sources of exposure and helps prevent further transmission of the virus.
  - b. Minus: Relies on the patient's ability to recall and accurately report their recent activities and interactions.
  - c. Interesting: Assessing travel history can provide important information about potential exposure to COVID-19 from high-risk areas.
3. Medical and health assessment:
  - a. Plus: Helps identify any pre-existing conditions that may increase the patient's risk of severe illness.
  - b. Minus: May require detailed medical history, which can be time-consuming and may not be readily available.
  - c. Interesting: Addressing mental health changes and increased stress highlights the holistic approach to patient care during the pandemic.
4. Education and prevention:
  - a. Plus: Empowers patients with knowledge and guidance on how to protect themselves and others from COVID-19.
  - b. Minus: Depends on patient compliance and understanding of recommended guidelines.
  - c. Interesting: Providing a platform for questions and concerns allows for personalized education and reassurance.

### Perspectives - 50-Year-Old Male Suffering from Congestive Heart Failure

1. Understanding symptom characteristics:
  - a. Plus factors:
    - i. Helps in identifying the nature and severity of symptoms, leading to appropriate treatment.
    - ii. Allows for tracking the progression and changes in symptoms over time.
  - b. Minus factors:
    - i. Relies on accurate and detailed reporting from patients, which can be subjective and prone to errors.
    - ii. Doesn't provide a definitive diagnosis on its own, further medical evaluations may be required.
  - c. Interesting factors:
    - i. Triggers or situations that worsen symptoms can reveal specific environmental or lifestyle factors to address.

2. Assessing medical history and current condition:

- a. Plus factors:
  - i. Provides important information on previous treatments and outcomes for better decision-making.
  - ii. Enables identification of potential risks and vulnerabilities based on familial or hereditary factors.
- b. Minus factors:
  - i. Relies on accurate recall and reporting of medical history, which can be challenging for some patients.
  - ii. Limited by the availability and accessibility of medical records from different healthcare providers or institutions.
- c. Interesting factors:
  - i. Allergies can reveal possible interactions or contraindications for certain medications or treatments.

3. Evaluating overall health and well-being:

- a. Plus factors:
  - i. Considers the broader impact of lifestyle and emotional well-being on overall health.
  - ii. Helps in assessing the effectiveness of stress management techniques on symptom management.
- b. Minus factors:
  - i. Difficulties in quantifying or measuring subjective experiences like energy levels or stress impact.
  - ii. Doesn't provide a complete picture of physical health and may require other assessments or tests.
- c. Interesting factors:
  - i. Swelling in different body parts could indicate underlying issues related to circulation or organ function.

4. Assessing lifestyle factors:

- a. Plus factors:
  - i. Allows for identification of potential lifestyle changes that could positively impact symptoms.
  - ii. Provides insights into patients' physical activity levels and exercise habits.
- b. Minus factors:
  - i. Relies on accurate self-reporting, which may be influenced by social desirability bias.
  - ii. Doesn't account for other potential lifestyle factors (e.g., nutrition, smoking) that could impact symptoms.
- c. Interesting factors:
  - i. Difficulties sleeping while lying down could suggest potential sleep disorders or respiratory issues.



### What is Missing - 50-Year-Old Male with COVID-19

1. Are you vaccinated against COVID-19? (To determine the patient's vaccination status and potential immunity)
  - a. Reason: Vaccination status can influence the severity of symptoms and risk of complications.
  - b. Patient's thoughts: Should I get vaccinated if I haven't already? Will being vaccinated affect my symptoms or recovery? Can I still transmit the virus if I'm fully vaccinated?
2. Have you been tested for COVID-19? If so, what were the results? (To confirm the presence of the virus)
  - a. Reason: Knowing the test results helps in confirming the diagnosis and provides valuable information for treatment and contact tracing.
  - b. Patient's thoughts: Did I test positive for COVID-19? Are my symptoms definitely related to the virus? How accurate are the test results?
3. Are you currently in isolation or quarantine? (To determine if the patient is following recommended isolation guidelines)
  - a. Reason: Isolation and quarantine are crucial in preventing further spread of the virus and protecting others.
  - b. Patient's thoughts: Am I properly following the guidelines for isolation? How long should I stay in isolation? Will I be able to leave quarantine soon?
4. Have you received any specific medical advice or treatment for your symptoms? (To evaluate the patient's current care plan)
  - a. Reason: Understanding the patient's current treatment and advice received helps in providing appropriate medical advice and continuity of care.
  - b. Patient's thoughts: Is there anything else I should be doing to manage my symptoms? Will my current treatment plan be effective? Should I seek further medical attention?
5. Are you able to perform daily activities and take care of yourself? (To assess functional ability and potential need for support)
  - a. Reason: Impaired ability to carry out daily activities may indicate the need for additional care or assistance.
  - b. Patient's thoughts: Can I continue with my daily routine while experiencing symptoms? Will I need assistance with basic tasks? How can I best take care of myself during this time?

### What is Missing - 50-Year-Old Male Suffering from Congestive Heart Failure

1. What is the patient's medical history?
2. Are there any known risk factors for the condition?
3. Are there any specific dietary or lifestyle factors that may be contributing to the symptoms?
4. Are there any specific activities or movements that exacerbate the symptoms?
5. Are there any associated symptoms, such as dizziness, nausea, or fever?
6. Are there any chronic conditions or comorbidities that may be affecting the symptoms?

7. Has there been any recent weight loss or gain?
8. Are there any personal or family history of heart disease?
9. Are there any symptoms that are not currently being experienced but have been in the past?
10. Are there any specific complications or limitations caused by the symptoms?
11. Are there any specific concerns or questions the patient has about their condition or its management?
12. Are there any changes in appetite or digestion related to the symptoms?
13. Is there any history of mental health concerns or emotional stress that may be impacting the symptoms?
14. Are there any specific societal or cultural factors that could impact the patient's experience and understanding of the condition?
15. Are there any alternative or complementary therapies the patient has tried or is interested in exploring?

#### **Alternative Viewpoints - 50-Year-Old Male with COVID-19**

1. How would you describe your current symptoms? (To assess the severity and nature of their complaints)
  - a. Alternative viewpoint: Symptoms can vary greatly from person to person, so focusing on the symptoms might not provide a clear picture of the overall condition. Instead, it may be more important to ask about the impact of the symptoms on the patient's daily life and functioning.
2. Have you experienced any difficulty breathing? (To assess respiratory distress)
  - a. Alternative viewpoint: Difficulty breathing can be caused by various factors, not just COVID-19. It may be important to consider other potential causes, such as allergies or asthma, before attributing it solely to COVID-19.
3. Have you had a fever? If so, what was the highest temperature you reached? (To assess if fever is present and its severity)
  - a. Alternative viewpoint: Fever is a common symptom of many illnesses, not just COVID-19. It may be important to ask about other accompanying symptoms and conduct further diagnostic tests to confirm the presence of COVID-19.
4. Have you experienced any loss of taste or smell? (To assess possible COVID-19 symptoms)
  - a. Alternative viewpoint: Loss of taste or smell can occur due to various factors, such as nasal congestion or sinus infections. It may be important to consider other potential causes before attributing it solely to COVID-19.
5. Are you experiencing any chest pain or pressure? (To assess potential heart or lung involvement)
  - a. Alternative viewpoint: Chest pain or pressure can be caused by various factors, including anxiety or musculoskeletal issues. It may be important to consider other potential causes before attributing it solely to COVID-19.

6. Have you noticed any rash or skin changes? (To assess if COVID-19 is causing dermatological symptoms)
  - a. Alternative viewpoint: Skin changes can occur due to various factors, including allergies or other infections. It may be important to consider other potential causes before attributing it solely to COVID-19.
7. How long have you had these symptoms? (To understand the duration of illness)
  - a. Alternative viewpoint: The duration of symptoms can vary greatly from person to person. It may be important to consider other factors, such as the patient's overall health and immune response, when assessing the stage of the infection.
8. Have you had any known exposure to individuals diagnosed with COVID-19? (To assess potential transmission sources)
  - a. Alternative viewpoint: The patient may not always be aware of their exposure to individuals with COVID-19. Contact tracing efforts should be conducted to identify potential sources of transmission accurately.
9. Any recent international travel or exposure to high-risk areas? (To assess travel-related exposure)
  - a. Alternative viewpoint: COVID-19 can be present in any location, not just high-risk areas or countries with known outbreaks. It may be important to consider community transmission and local infection rates.
10. Do you have any pre-existing medical conditions? (To assess potential risks or complications)
  - a. Alternative viewpoint: While pre-existing medical conditions can increase the risk of severe illness from COVID-19, it is also essential to consider other factors such as age, overall health, and immune response.
11. Have you been in contact with any immunocompromised individuals? (To assess potential risk to vulnerable populations)
  - a. Alternative viewpoint: It is not solely the responsibility of COVID-19 patients to protect immunocompromised individuals. Everyone should follow public health guidelines to prevent transmission and protect vulnerable populations.
12. Have you experienced any mental health changes or increased stress during this time? (To address mental well-being)
  - a. Alternative viewpoint: Mental health changes and increased stress during the pandemic can occur regardless of whether one has contracted COVID-19. It is important to address mental well-being for everyone, not just COVID-19 patients.

#### **Alternative Viewpoints - 50-Year-Old Male Suffering from Congestive Heart Failure**

1. "How would you describe the symptoms you're experiencing?"
  - a. Alternative viewpoint: "Can you show me where exactly you're feeling the symptoms?"
    - i. This alternative question focuses more on the physical examination rather than the patient's description, which can sometimes be subjective and open to interpretation.
2. "When did you first notice these symptoms?"

- a. Alternative viewpoint: "Have you noticed any patterns or trends in your symptoms?"
    - i. This alternative question focuses on any potential triggers or recurring patterns that the patient may have observed, providing additional information to better understand the condition.
3. "Do your symptoms have any triggers or worsen in certain situations?"
  - a. Alternative viewpoint: "Can you provide any specific examples of when your symptoms worsen?"
    - i. This alternative question seeks specific instances or circumstances when the symptoms worsen, rather than general triggers, to have a clearer understanding of the potential causes.
4. "Have you noticed any improvements or changes in your symptoms recently?"
  - a. Alternative viewpoint: "How have your symptoms progressed over time?"
    - i. This alternative question asks for a broader overview of symptom progression rather than specific improvements, potentially capturing any nuances that the patient may have missed.
5. "Are you taking any medications, supplements, or herbal remedies?"
  - a. Alternative viewpoint: "Are you following any specific treatment plans?"
    - i. This alternative question takes a broader approach, inquiring about any treatment plans the patient may be following, including non-medication approaches like lifestyle changes or therapy.
6. "Have you had any recent illnesses, surgeries, or hospitalizations?"
  - a. Alternative viewpoint: "Do you have any relevant medical history that may be related to your current condition?"
    - i. This alternative question broadens the scope to include any medical history that may have relevance to the present condition, not just recent illnesses, surgeries, or hospitalizations.
7. "Do you have any known allergies?"
  - a. Alternative viewpoint: "Do you have any other medical conditions or sensitivities?"
    - i. This alternative question expands beyond just allergies to encompass any other medical conditions or sensitivities that may be important to consider in the diagnosis and treatment.
8. "Has anyone in your family experienced similar health conditions?"
  - a. Alternative viewpoint: "Are there any family members with a history of chronic illnesses or conditions?"
    - i. This alternative question takes a broader approach, asking about any chronic illnesses or conditions in the family, not just similar health conditions.
9. "How would you rate your overall stress levels?"
  - a. Alternative viewpoint: "Are there any specific stressors in your life that may be affecting your health?"
    - i. This alternative question focuses on identifying specific stressors that may be contributing to the patient's symptoms, rather than a general rating of overall stress levels.

**10.** "Do you experience any difficulty with breathing or shortness of breath?"

- a. Alternative viewpoint: "Have you noticed any changes in your breathing patterns or any unusual sensations in your chest?"
  - i. This alternative question prompts the patient to provide more detailed information about their breathing difficulties, rather than just a general question about experiencing breathing difficulties.

**11.** "Have you noticed any swelling in your ankles, legs, or abdomen?"

- a. Alternative viewpoint: "Have you experienced any changes in your body shape or have your clothes been fitting differently?"
  - i. This alternative question focuses on changes in body shape or clothing fit as potential indicators of fluid retention, without specifically mentioning swelling in specific areas.

**12.** "How would you describe your energy levels and fatigue?"

- a. Alternative viewpoint: "Have you noticed any changes in your ability to engage in daily activities or feeling more tired than usual?"
  - i. This alternative question prompts the patient to assess changes in their daily functioning and fatigue rather than asking for a subjective rating of energy levels.

**13.** "Have you experienced any chest pain, discomfort, or tightness?"

- a. Alternative viewpoint: "Have you had any unusual sensations or feelings in your chest?"
  - i. This alternative question expands beyond just pain, discomfort, or tightness in the chest to encompass any unusual sensations or feelings that the patient may be experiencing.

**14.** "Are you currently engaging in any physical exercise or activities?"

- a. Alternative viewpoint: "What is your current level of physical activity?"
  - i. This alternative question focuses on the patient's current level of physical activity



### **Interested Audiences - 50-Year-Old Male with COVID-19**

1. Healthcare professionals:
  - a. Healthcare professionals, such as doctors and nurses, would be highly interested in these topic questions as they aim to assess the severity and nature of a patient's symptoms. It helps them diagnose and treat patients effectively.
2. Individuals with suspected or confirmed COVID-19:
  - a. People who are experiencing symptoms or have tested positive for COVID-19 would be interested in these questions as they address their concerns and can guide them in seeking appropriate medical care.
3. Family members and caregivers:
  - a. Family members and caregivers of individuals with suspected or confirmed COVID-19 would find these questions valuable as they can help them understand the symptoms, potential complications, and necessary measures to protect their loved ones.
4. Public health officials and policymakers:
  - a. Public health officials and policymakers would be interested in these questions as they provide insights into the symptoms experienced by COVID-19 patients, potential risk factors, and measures to prevent transmission. This information can guide public health strategies and policies.
5. Researchers and scientists studying COVID-19:
  - a. Researchers and scientists studying COVID-19 would find these questions relevant as they provide valuable information about the symptomatic presentation, potential complications, and risk factors associated with the disease. This information can inform further research and guide the development of effective treatments and preventive strategies.

### **Interested Audiences - 50-Year-Old Male Suffering from Congestive Heart Failure**

1. Patients:
  - a. Patients who are experiencing symptoms and seeking medical help would be most interested in these topic questions. They want to better understand their symptoms, their severity, and potential causes. These questions help them communicate their concerns and understand how their symptoms might affect their daily life.
2. Doctors/Healthcare professionals:
  - a. Doctors and healthcare professionals would also be interested in these topic questions. These questions allow them to gather important information to assess the patient's condition, determine a diagnosis, and develop an appropriate treatment plan. They help healthcare professionals understand the nature and progression of the symptoms, as well as any potential triggers or factors that may be exacerbating the condition.
3. Researchers:
  - a. Researchers studying specific conditions or related fields may also be interested in these

topic questions. They can use the information collected from these questions to analyze patterns, identify common symptoms, and evaluate the effectiveness of treatments. This data can contribute to advancing medical knowledge, improving diagnostic methods, and developing new treatment options.

**4. Medical students:**

- a. Medical students may find these topic questions useful in their studies and training. They can learn how to effectively gather information from patients, understand the importance of specific questions, and develop their diagnostic and communication skills.

**5. Caregivers/Family members:**

- a. Caregivers and family members of patients may also be interested in these topic questions. They can help the patient prepare for their medical appointment, understand the importance of certain symptoms or concerns, and provide support in discussing and managing the condition. These questions can help caregivers and family members actively participate in the patient's healthcare journey.

**6. Health insurance providers:**

- a. Health insurance providers may also have an interest in these topic questions, as they can help them assess the validity and necessity of medical claims related to the specific condition. Additionally, the information gathered from these questions can assist in the evaluation and management of healthcare costs.

**Opposing Audiences - 50-Year-Old Male with COVID-19**

There may be several audiences that could potentially oppose the topic of discussing COVID-19 symptoms and related questions. These could include:

**1. Individuals who deny the existence or severity of COVID-19:**

- a. Some people may deny the reality of the pandemic or downplay its significance. They may oppose discussing symptoms and related questions because they believe COVID-19 is a hoax or not a serious health concern.

**2. Anti-vaccination groups:**

- a. Certain groups or individuals may oppose discussing COVID-19 symptoms and related questions because they are skeptical of vaccines or government recommendations. They may reject information on COVID-19 symptoms, testing, and vaccinations because of their beliefs.

**3. Conspiracy theorists:**

- a. Conspiracy theorists often reject mainstream information and may oppose discussions about COVID-19 symptoms. They may believe in and spread misinformation or alternative explanations for the origins and nature of the virus.

**4. Individuals who have experienced negative impacts from lockdowns or restrictions:**

- a. Some people who have faced economic hardships, mental health challenges, or other

negative consequences due to COVID-19 restrictions may have opposing views. They may question the necessity of discussing symptoms or adhere to public health guidelines.

5. Individuals who prioritize personal freedom over collective well-being:

- a. There may be individuals who oppose discussing COVID-19 symptoms or following public health guidelines because they prioritize their personal freedoms and believe that mandatory measures infringe upon their rights.

It is important to address these opposing viewpoints with accurate information, empathy, and open dialogue to promote understanding and encourage adherence to public health guidelines.

**Opposing Audiences - 50-Year-Old Male Suffering from Congestive Heart Failure**

Audiences that might oppose the topic would include:

1. Patients who are hesitant to discuss their symptoms:

- a. Some patients may be reluctant to fully disclose their symptoms due to fear, embarrassment, or skepticism. They may hesitate to describe their symptoms accurately, which can hinder the doctor's ability to diagnose and treat their condition effectively.

2. Patients who downplay the severity of their symptoms:

- a. Some patients may underestimate or downplay the severity of their symptoms, which can lead to a delayed diagnosis or inadequate treatment. They may fear being perceived as weak or exaggerating their symptoms, leading them to provide incomplete information.

3. Patients who are resistant to lifestyle changes or treatments:

- a. Patients who are resistant to making necessary lifestyle changes, such as adjusting their diet or exercise routine, may oppose discussing their symptoms fully. They may worry that the doctor will recommend treatments or changes that they are unwilling or unable to follow, leading to potential conflict or non-compliance.

4. Patients with a history of non-adherence to medical advice:

- a. Patients who have previously been non-compliant with medical advice or treatment plans may resist disclosing their symptoms fully. They may believe that the doctor's recommendations will not be effective or that they can manage their condition on their own.

5. Patients with a history of distrust in the medical system:

- a. Patients who have previously had negative experiences or hold deep-rooted mistrust in the medical system may oppose discussing their symptoms openly. They may be skeptical of the doctor's intentions or concerned about potential misdiagnosis or mistreatment.

It is important for healthcare providers to create a safe and non-judgmental environment where patients feel comfortable and encouraged to share their symptoms openly, ensuring accurate diagnosis and appropriate treatment.

### **Innovations - 50-Year-Old Male with COVID-19**

1. Telehealth platforms for remote symptom assessment and evaluation.
2. COVID-19 symptom tracking apps for self-assessment and monitoring.
3. Wearable devices that can monitor respiratory distress and difficulty breathing.
4. Fever monitoring devices that can provide real-time temperature readings.
5. COVID-19 testing kits for at-home self-assessment.
6. Virtual reality platforms for assessing chest pain or pressure and potential heart or lung involvement.
7. Mobile apps for dermatological symptom assessment and self-diagnosis.
8. AI-powered chatbots or interactive tools for understanding the duration of symptoms and determining the stage of infection.
9. Contact tracing apps or wearable devices to identify potential sources of exposure.
10. Online platforms for providing mental health support and resources during the pandemic.
11. Innovative hygiene products such as touchless hand sanitizers or self-cleaning surfaces.
12. AI-powered voice or chat assistants that can provide educational information and answer questions about COVID-19 and recommended guidelines.

### **Innovations - 50-Year-Old Male Suffering from Congestive Heart Failure**

1. Telemedicine platforms or apps that allow patients to easily communicate with healthcare providers, especially for assessing symptom characteristics and evaluating overall health remotely.
2. Wearable health monitoring devices that can track and collect data on symptoms, physical activity, and overall well-being, providing objective information for healthcare professionals.
3. Personalized medicine approaches that take into account an individual's medical history, current condition, and lifestyle factors to create targeted treatments and interventions.
4. Integrative medicine programs that combine traditional medical treatments with complementary therapies, such as acupuncture or mindfulness meditation, to address overall health and wellbeing.
5. Health insurance policies that cover a wide range of preventive services, including regular checkups and screenings, to promote early detection and proactive management of health conditions.
6. Employer wellness programs that provide resources and support for employees to improve their overall health and wellbeing, such as access to fitness facilities or wellness coaching.
7. Public health campaigns and initiatives that focus on educating the public about the importance of understanding symptom characteristics, assessing medical history, and making lifestyle changes for better health outcomes.

## Discussion and Conclusions

Researchers and consumers of research have accustomed themselves to a world of facts and, perhaps, hypotheses about how the world works. Advances in science come from new facts, new pieces of information about how the world works. The Popperian view of science is that the hypotheses emerging from these facts can be subject to falsification (Nola, 1987). From this hypothetico-deductive system, we begin to think that the job of the researcher is to use science to establish 'what's really happening.' And, in the words of S.S. Stevens of Harvard University, 'theories abound in the absence of facts' (Stevens, 1939). In other words, the focus is on fact, individual facts bound together by the sinews of hypotheses.

This paper demonstrates that the introduction of AI into the world of attitudinal research may accelerate the search for facts by prompting the user with questions. Rather than allowing the researcher to learn to think in a trial-and-error fashion, the approach presented here forces the user, especially the novice, to formulate the situation, such as the problem, as well as a variety of relevant side issues, such as how the problem is expressed, what is the underlying thought, how will people of a certain type respond to the problem. The approach guides the researcher in a different direction, thinking about the meaning of different outcomes to the question before the research effort begins. That outcome itself is interesting. Even more interesting, perhaps, is the summarization by AI of the questions presented by AI.

When all is said and done, the outcome of the effort is a rapid, Socratic tutor, AI-based, with this tutor ready to work tirelessly, accepting query after query, doing its job, and then providing a summary. What this paper presents is one effort, an effort lasting approximately 1-2 minutes of the user's time. For that investment, the payback is enormous. What is even more promising is the easily demonstrated extension of the effort so that the enterprising user can parametrically explore the topic, varying perhaps the WHO (who is the person) and the WHAT (the reason driving the individual to visit the doctor or the clinic). In a matter of one simple hour, the enterprising, and even without more programming, the enterprising user can explore age, gender, and disease state, with perhaps 30-40 options. It is this type of generative power that makes the AI effort an easy jump into the future.

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