



# An exercise of our imagination

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“AI is technology’s most important **priority**,  
and healthcare is its most **urgent**  
**application.**”

—Satya Nadella  
2021



**HARVARD T.H. CHAN**  
SCHOOL OF PUBLIC HEALTH



What is metformin?

Metformin is a prescription medication used to treat type 2 diabetes and sometimes prediabetes. It works by decreasing the amount of glucose produced by the liver and improving insulin sensitivity in muscle and fat cells.

Can anyone with type 2 diabetes take it?

Most people with type 2 diabetes can take metformin, but it may not be suitable for some individuals. For example, people with kidney disease, liver disease, or certain other medical conditions may not be able to take metformin. It is important to talk to a healthcare professional who can determine if metformin is appropriate based on an individual's medical history and current health status.

Are there alternatives?

Yes, there are many alternative medications for treating type 2 diabetes if metformin is not suitable or effective. Other medications include sulfonylureas (e.g., glipizide, glyburide), thiazolidinediones (e.g., pioglitazone, rosiglitazone), DPP-4 inhibitors (e.g., sitagliptin, linagliptin), GLP-1 receptor agonists (e.g., liraglutide, exenatide), and SGLT2 inhibitors (e.g., dapagliflozin, canagliflozin). Insulin injections may also be prescribed if oral medications are not effective. The choice of medication depends on the individual's medical history, current health status, and other factors.

Yeesh! That seems complicated! I don't know what to do.

Managing type 2 diabetes can seem overwhelming, but there are healthcare professionals who can help. It's important to work closely with a doctor, nurse, or other healthcare professional who can guide you through the process of choosing the right treatment plan for your individual needs. They can explain the different medication options, help you understand how to monitor your blood sugar levels, and provide support and guidance for making lifestyle changes to help manage your diabetes.

A 12-year-old girl is brought to the emergency department by her mother because of a 1-week history of worsening swelling in her legs. The patient also noticed blood in her urine yesterday. The bleeding has not recurred. She had an upper respiratory tract infection and sore throat 1 week ago that caused her to miss several days of school. Medical history is otherwise unremarkable and she takes no routine medications. Menarche has not yet occurred. BMI is 20 kg/m<sup>2</sup>. Vital signs are temperature 37.0°C (98.6°F), pulse 78/min, respirations 12/min, and blood pressure 136/84 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 100%. Physical examination discloses erythema of the posterior pharynx, mild cervical lymphadenopathy, and 3+ pitting edema to both knees.

Results of urinalysis are shown:

Protein	150 mg/dL
Blood	Positive
Leukocyte esterase	Positive
Nitrite	Negative
WBCs	5–10/hpf
RBCs	10–25/hpf
Casts	1–2/lpf

Results of which of the following laboratory studies are most likely to be abnormal in this patient?

- (A) Bleeding time
- (B) Erythrocyte count
- (C) Serum concentration of C3
- (D) Serum IgA concentration
- (E) Serum rheumatoid factor assay

I would choose (C) Serum concentration of C3 as the most likely abnormal laboratory finding in this patient.

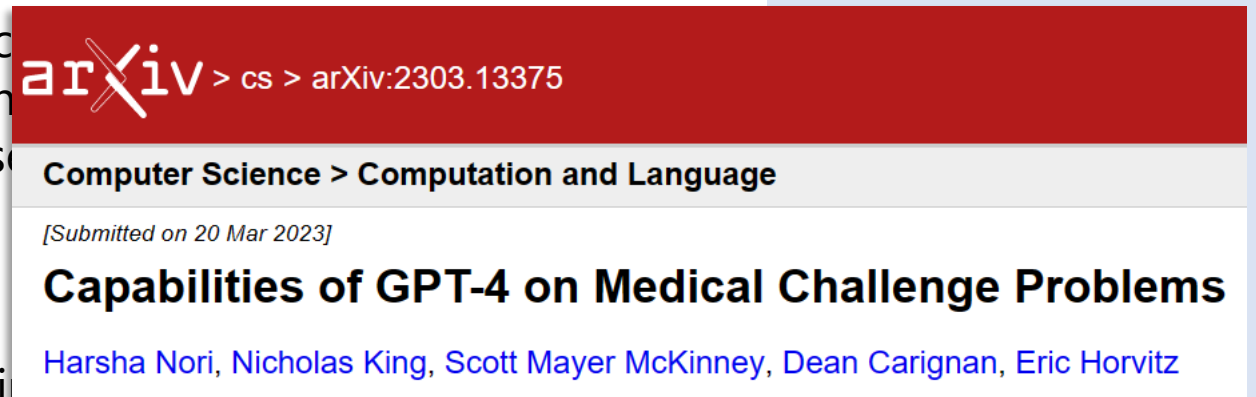
I would choose (C) Serum concentration of C3 as the most likely abnormal laboratory finding in this patient.

This patient presents with a history of recent upper respiratory tract infection, hematuria, proteinuria, and edema. These findings are suggestive of post-streptococcal glomerulonephritis (PSGN), an immune-mediated kidney disease that can develop after a streptococcal infection, such as a sore throat.

In PSGN, immune complexes containing streptococcal antigens deposit in the glomeruli, leading to inflammation and damage. This activates the complement system, which can lead to decreased renal function.

The other options are less likely in this case:

- (A) Bleeding time: There is no indication of a bleeding disorder in this patient.
- (B) Erythrocyte count: Although hematuria is present, a significant change in erythrocyte count is not expected.
- (D) Serum IgA concentration: An elevated level is characteristic of IgA nephropathy, which does not match this patient's presentation.
- (E) Serum rheumatoid factor assay: This is a marker for rheumatoid arthritis, which doesn't match this patient's presentation.



The screenshot shows the top portion of an arXiv preprint page. The header is red with the arXiv logo and the text 'arXiv > cs > arXiv:2303.13375'. Below this is a grey bar with the text 'Computer Science > Computation and Language'. Underneath is a white bar with the text '[Submitted on 20 Mar 2023]'. The main title is 'Capabilities of GPT-4 on Medical Challenge Problems' in bold black font. Below the title is the author list: 'Harsha Nori, Nicholas King, Scott Mayer McKinney, Dean Carignan, Eric Horvitz' in blue font.

*No specialized training!*

What do you think the girl described in this problem might be thinking and feeling?

As an AI language model, I can't directly assess a person's thoughts and feelings, but I can make an educated guess based on the information provided.

The 12-year-old girl in this scenario might be feeling worried or scared due to the recent changes in her health, such as the swelling in her legs and the blood in her urine. She might be anxious about the severity of her condition and the potential long-term consequences. The discomfort from her symptoms, including the sore throat, cervical lymphadenopathy, and edema, may also cause her some physical distress.

She might also be concerned about missing school and falling behind in her studies. Additionally, she could be feeling embarrassed about discussing her symptoms, particularly those related to menstruation and urinary issues, with healthcare professionals.

It's essential for the healthcare team to address her concerns and provide reassurance, as well as explain the diagnosis and treatment plan in an age-appropriate manner. This will help alleviate her anxiety and ensure she feels comfortable asking questions and discussing her symptoms.



The girl's name is Meg. If you were Meg's doctor, what would you say in order to provide comfort and support?

If I were Meg's doctor, I would take a compassionate and empathetic approach to address her concerns and provide comfort and support. Here's an example of what I might say:

"Hi Meg, I understand that you might be feeling worried or scared about the symptoms you've been experiencing lately. I want to reassure you that we're here to help you get better. Based on your symptoms and the tests we've done, it looks like you have a condition called post-streptococcal glomerulonephritis, which can happen after an infection like the sore throat you had recently. The good news is that most people with this condition recover fully, and we're going to closely monitor your progress and provide the appropriate treatment to help you feel better.

If you have any questions or concerns at any time, please don't hesitate to ask me or any of the other healthcare professionals involved in your care. We're here to support you and make sure you understand what's happening with your body. And don't worry about missing school - your health is the top priority right now, and we can work with your school to ensure you catch up on your studies when you're feeling better.

Remember, it's okay to feel scared or worried, but know that we're here to help and support you every step of the way. If you need anything or have any questions, just let us know."

I'm training to be a doctor. Please play-act the role of Meg, and I will be her doctor. Let's have a conversation as though she has come to me in my office. I'll start:

Hi, Meg. Your mother tells me that you've been having some swelling in your legs. Can you tell me how you are feeling?

Hi, Doctor. Yes, I've noticed that my legs have been swelling up, especially around my knees. It's been getting worse over the past week, and it feels a bit uncomfortable. I'm also worried because I saw some blood in my urine yesterday. I had a sore throat and a cold last week, but I didn't think it would cause these problems. I'm really scared and don't know what's happening to me.

Ok, I see. Well, let's see if we can get to the bottom of this. Let me first look over your vital signs that the nurse took. Hmm, that all looks fine. So then let's take a look at your knees. Can you sit up here?

Sure, Doctor. Here, let me sit up on the examination table. I hope you can figure out what's causing the swelling and the other issues I've been having. It's been really distressing for me. ...

# Microsoft's AI Principles



Fairness



Reliability  
& Safety



Privacy &  
Security



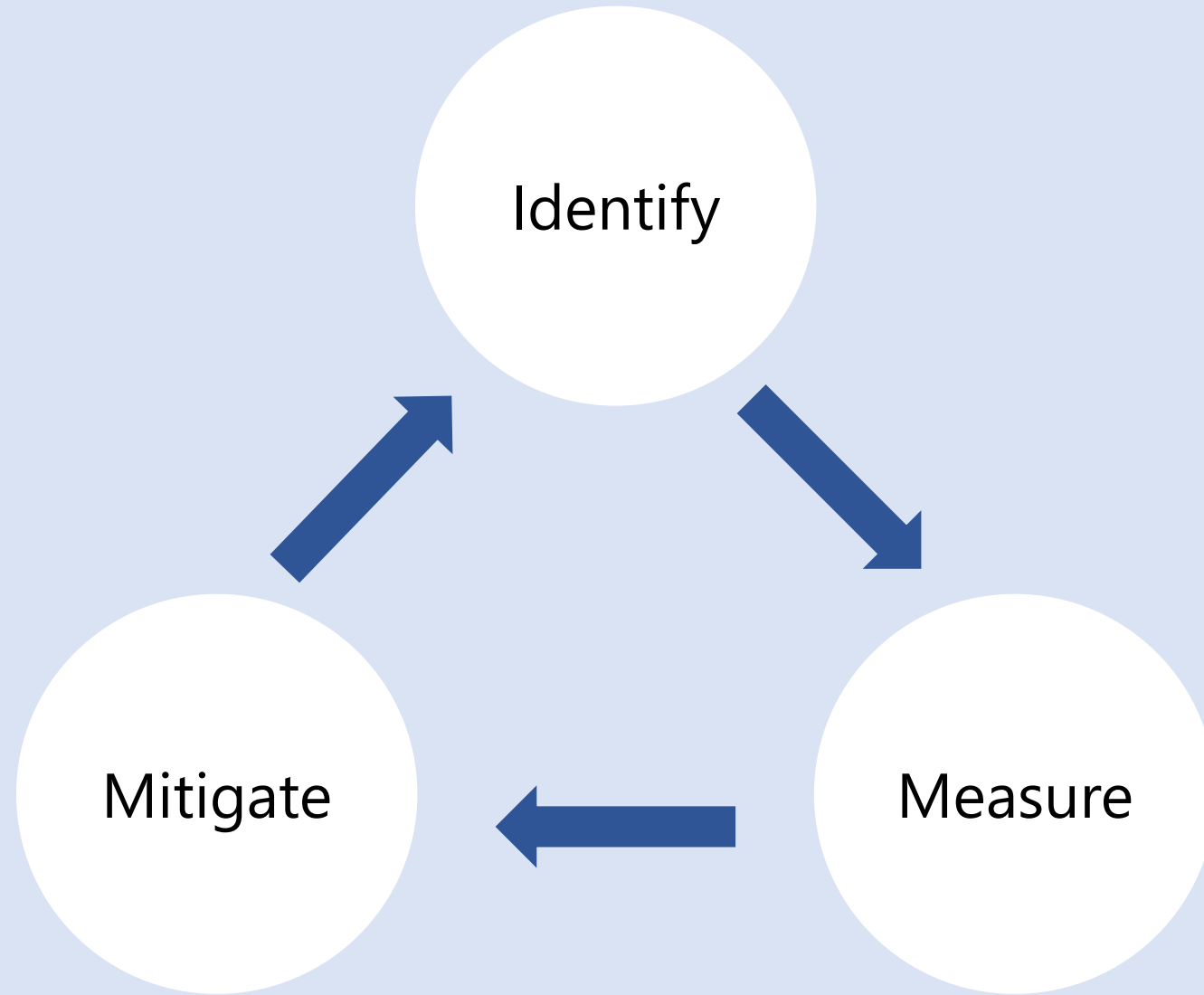
Inclusiveness



Transparency



Accountability



## COMPLETE BLOOD COUNT

<b>TEST</b>	<b>RESULT</b>	<b>REFERENCE RANGE</b>
Haemoglobin	15.5	male : 14 - 16 g% Female : 12 - 14 g%
RBC Count	4.6	14 - 16g%
PCV	37.8	35 - 45 %
<b><u>RBC INDICES</u></b>		
MCV	82.17	80 - 99 fl
MCH	<b>33.70</b>	28 - 32 pg
MCHC	<b>41.01</b>	30 - 34 %
RDW	10.2	9 - 17 fl
<b><u>TOTAL WBC COUNT</u></b>		
Total WBC Count	5500	4000 - 11000 / cu.mm
Neutrophils	60	40 - 75 %
Lymphocytes	30	20 - 45 %
Eosinophils	5	00 - 06 %
Monocytes	5	00 - 10 %
Basophils	0	00 - 01 %
<b><u>PLATELETS</u></b>		
Platelet Count	155500	150000 - 450000 / cu.mm
Platelets on Smear	Adequate On Smear	
<b><u>PERIPHERAL BLOOD SMEAR</u></b>		
RBC Morphology	Hypochromia (+), Microcytosis (+),Anisocytosis (+)	
WBCs on PS	Normal	

I received this report from the medical lab on my recent physical exam. Can you explain in simple terms if there is anything I need to be concerned about?

- ✓ Searching for: **lab report interpretation**
- ✓ Searching for: **lab report abnormal values**
- ✓ Generating answers for you...

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Hi, this is Bing. I'm glad you're taking care of your health. 😊

A lab report is a document that summarizes the results of an experiment and its interpretations<sup>1</sup>. It usually includes a title page, an introduction, a method section, a result section, a discussion section and a reference list<sup>2</sup>.

To understand your lab results, you need to compare them with the reference values that indicate what is normal or abnormal for your age, sex and health condition<sup>3</sup><sup>4</sup>. The reference values may vary depending on the laboratory that performed the test<sup>5</sup>.

Based on your lab report, I noticed some values that are outside the reference range:

- Your hemoglobin level is 15.5 g%, which is slightly higher than the normal range for males (14-16 g%)<sup>6</sup>.
- Your MCH level is 33.70 pg, which is higher than the normal range (28-32 pg)<sup>6</sup>.
- Your MCHC level is 41.01 %, which is higher than the normal range (30-34 %)<sup>6</sup>.
- Your RBC morphology shows hypochromia (+), microcytosis (+) and anisocytosis (+), which means your red blood cells have less color, smaller size and irregular shape than normal<sup>6</sup>.

These values suggest that you may have some form of anemia or iron overload disorder<sup>7</sup>. However, this is not a definitive diagnosis and you should consult your doctor for further evaluation and treatment.

I hope this helps you understand your lab report better. Please let me know if you have any questions or concerns. 🙏

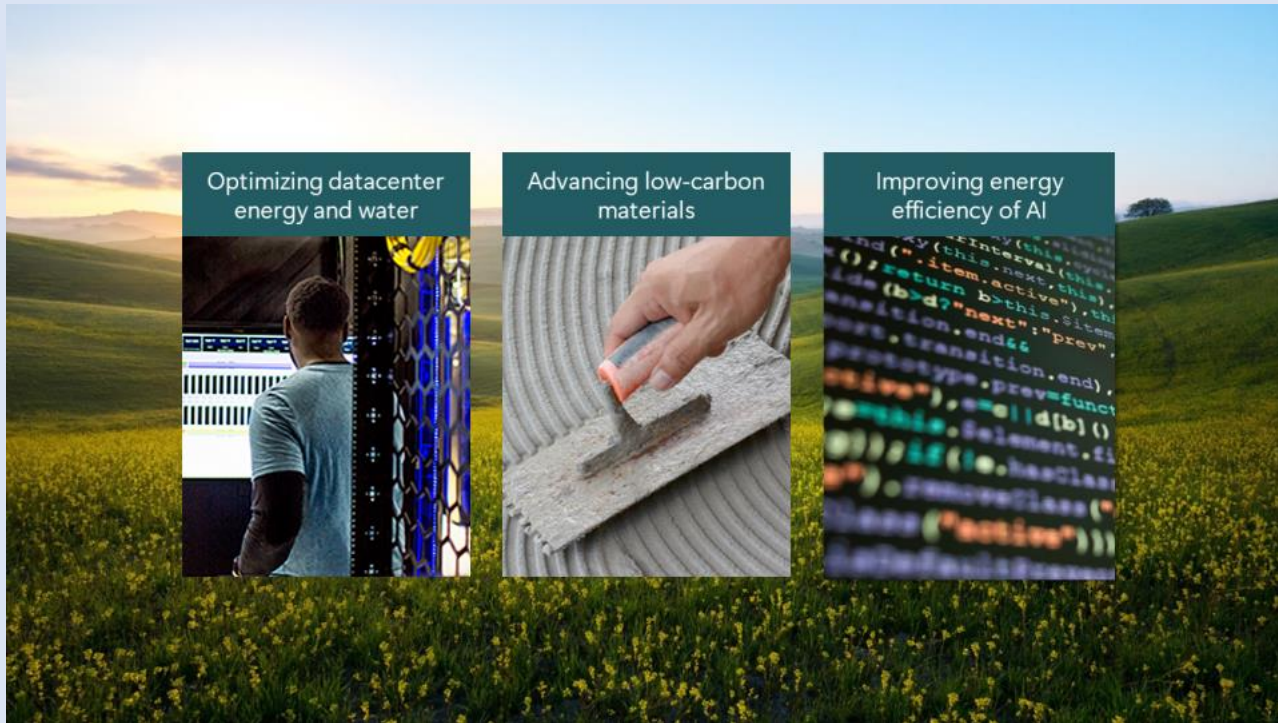


**Any sufficiently advanced technology is  
indistinguishable from magic**

**- Arthur C. Clarke (3<sup>rd</sup> law)**



# Sustainable by design: Advancing the sustainability of AI



- Unprecedented pace of adoption
- Groundbreaking advances: platform shift where new technologies are shaping economies
- Recognize the resource intensity of these applications and the need to address the environmental impact from every angle

# Innovation by design: Advancing the sustainability of AI

- AI is revolutionizing the discovery of new materials
- Microsoft and the Pacific Northwest National Laboratory (PNNL) used AI and high-performance computing to discover a new solid electrolyte material, potentially reducing lithium use in batteries by up to 70%
- Time saving- weeks- not years: 32 million potential inorganic materials to 18 promising candidates that could be used in battery development in just 80 hours.

