



Virtual bedside teaching with 'AI Virtual Patients' in HKU 香港大學研發「AI虛擬病人」進行虛擬臨床教學



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Conventional clinical bedside teaching 傳統臨床教學

- Inpatient wards / clinics
在住院病房進行
- Gather clinical history from a genuine patient
收集患者的病史
- Presentation to the clinical teacher
與臨床老師討論個案



Pros and cons of conventional bedside teaching

優點和缺點

- Pros

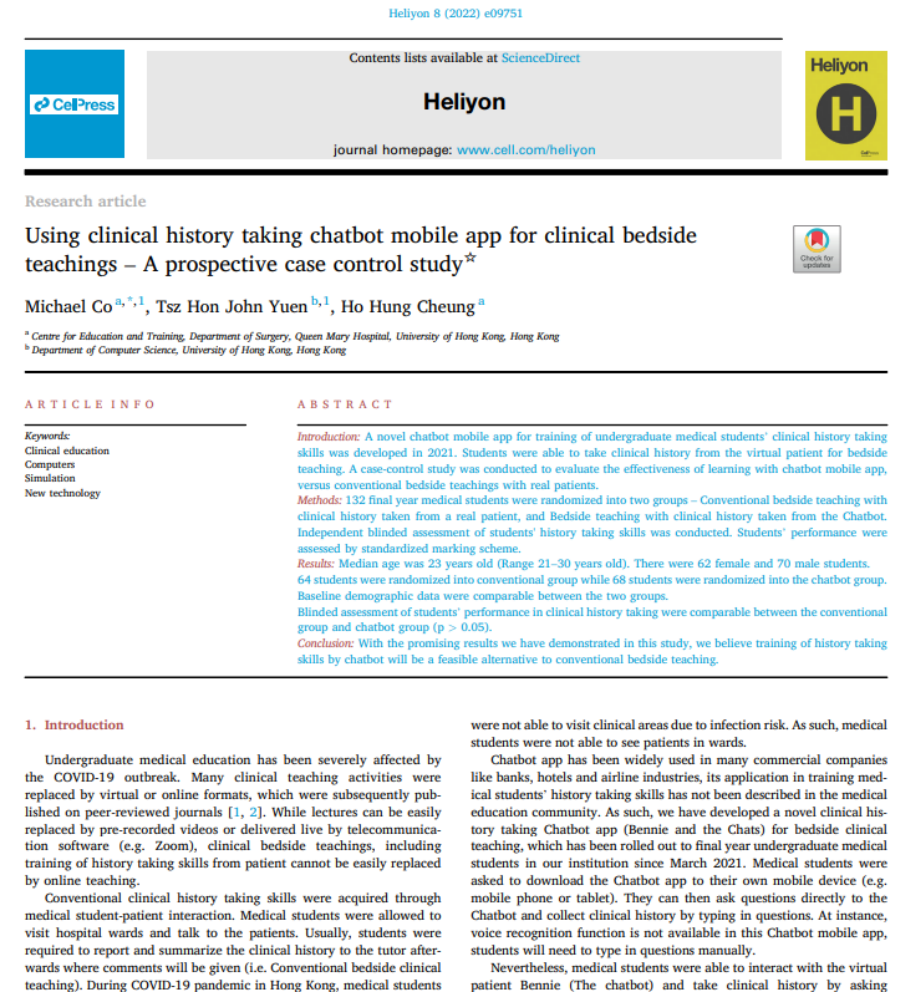
- Seeing real patient 與真實患者案例溝通
- Learn how to interact 學會與真實的病人互動
- Bedside manner 學習臨床禮儀

- Cons

- Desired teaching cases are not always available
理想的教學案例並不總是存在
- Teaching cases are not standardised 教學案例不統一

Virtual bedside teaching 虛擬臨床教學

- Initiated during COVID-19 pandemic
在新型冠狀病毒大流行期間引入
- A prototype AI chatbot was developed in 2020
原型聊天機器人於 2020 年開發
- Pilot run in 2021 and published results
2021年進行測試運行，成果發表在學術期刊上



Self-developed prototype 2021

自主研發 原型聊天機器 2021

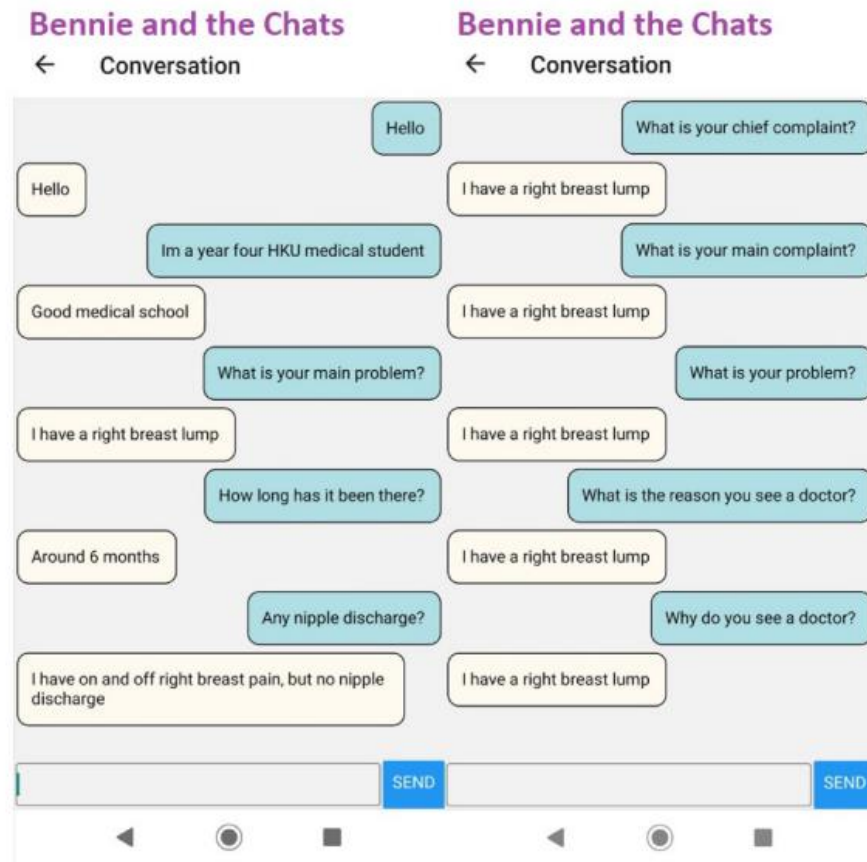


Figure 1. Two separate screen captures of conversation between medical student and Chatbot Bennie, illustrating the student-chatbot interaction (Right) and chatbot's response to synonym (Left).

- Not equipped with generative AI
不具備生成式人工智能
- Answers are all pre-installed
答案都是預先設定的

Responses are monotonous
答案 / 回覆單調

‘AI Virtual Patients’ Diagnosis Application

「AI 虛擬病人」問診應用程式

- Developed in 2023
- Launched in August 2023
- 2023 開發，同年 8 月推出



Generative AI
生成式人工智能

Features of 'AI Virtual Patients' Diagnosis Application

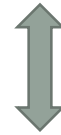
「AI虛擬病人」問診應用程式特點

- Teachers can design their own virtual patients
 - Patient's personality
 - Patient's case history
 - Patient's personal preference
- 臨床老師可以設計自己的虛擬患者
 - 患者個性
 - 患者病史
 - 患者個人偏好





Generative AI
生成式人工智能



App interface 「AI虛擬病人」問診應用程式介面

Login: Bennie and the Chats



BENNIE AND THE CHATS

HISTORY CLERKING LIKE NEVER BEFORE

UID (Username)
bennie

PIN (Password)
.....

Login

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Division Selection

- Surgery
- Medicine
- Obstetrics & Gynecology
- Paediatric Ward
- Orthopedic Ward
- Clinical Oncology Ward
- Psychiatry Ward
- Custody Ward
- Intensive care unit
- Private Ward

Case Selection

- 1 Bennie Tsoi, 65/Female
- 2 Bennie Lam, 40/Female
- 3 Bennie Chan, 68/Female
- 4 Bennie Zhang, 28/Female
- 5 Bennie Kim, 28/Female
- 6 Bennie Lee, 43/Female

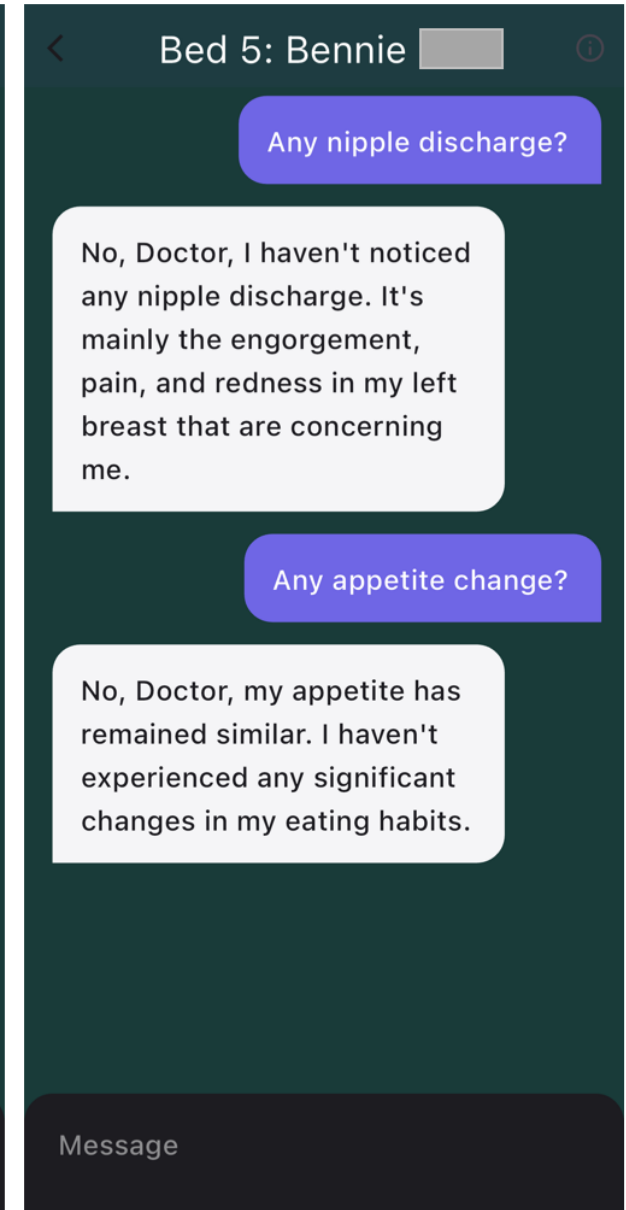
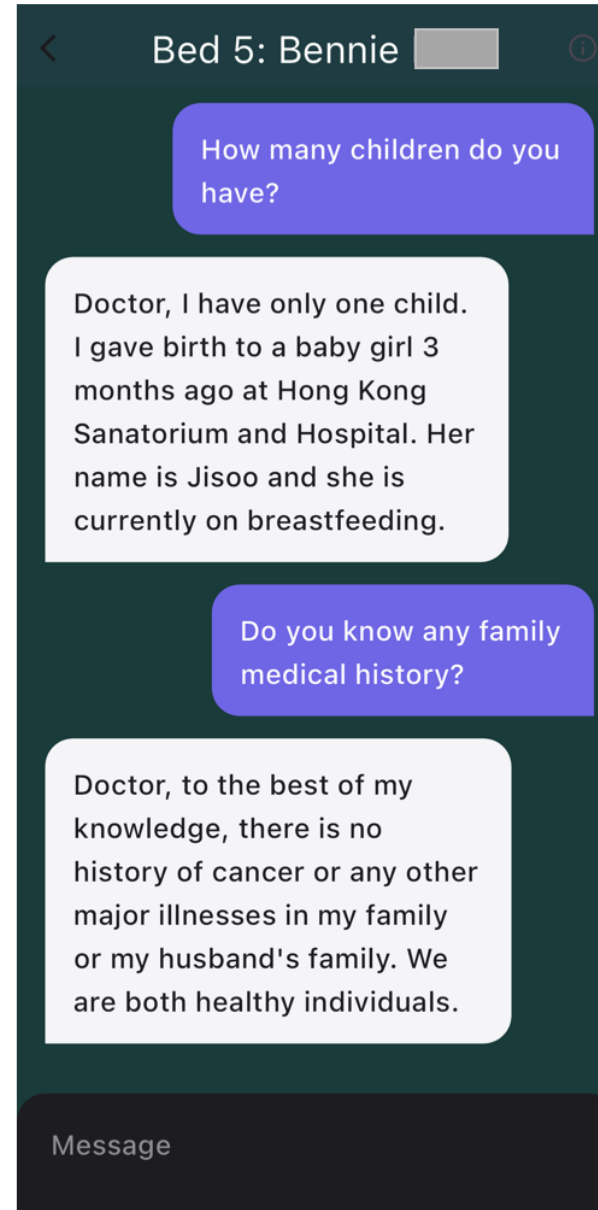
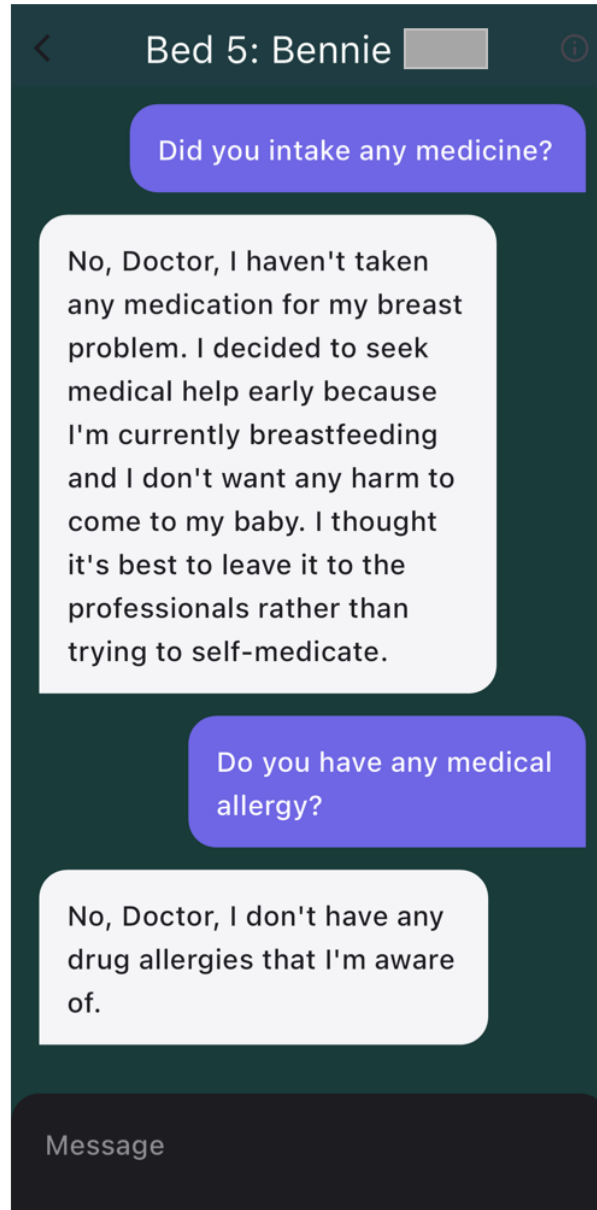
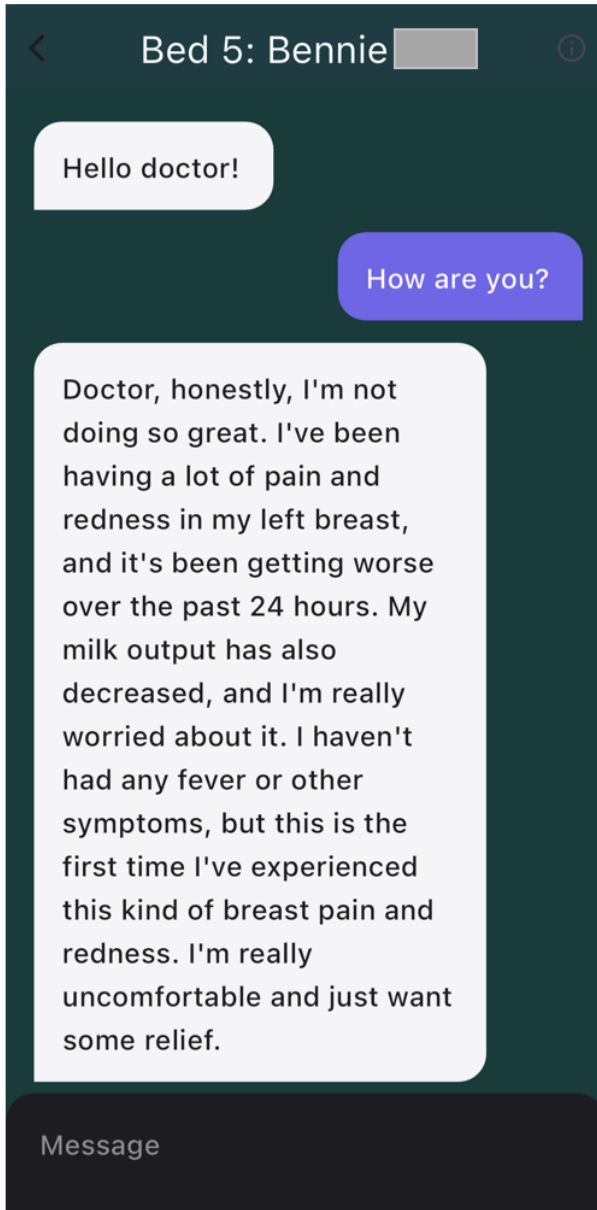
Bed 1: Bennie

19:55

Hello doctor!

How are you?

I'm not doing well, Doc. I've been having some really bothersome symptoms lately. The abdominal pain, frequent bowel movements, and blood in my stool have got me pretty worried. It's been going on for a while now, and I'm just not feeling like myself anymore. So, to answer your question, I'm definitely not doing great.



Distinct personality for each virtual patient

不同的患者個性

Bed 1: Bennie

Hello doctor!

What is your problem?

Oh, thank you for asking, Doctor. I'm not feeling very well lately. I've been experiencing cramping abdominal pain, frequent bowel movements, and some blood in my stool. It's been going on for a while and it's starting to worry me. I've also noticed a decrease in my appetite and I've lost some weight recently. I'm not sure what's causing all of this, but I thought it would be best to come and get it checked out.

Do you have any medical allergy?

Actually, I don't really have any known allergies to medicines or any food. I've never had any bad reactions or side effects to any medication before.

Polite 有禮

Bed 1: Bennie

Hello doctor!

What is your problem?

I'm not doing well, mate. I've been having this constant abdominal pain, cramping like a bloody torture. And on top of that, I've been constantly running to the loo, taking a dump like it's my full-time job. And guess what? There's blood in my stool too. It's freaking me out, to be honest. I can't even enjoy a decent meal anymore. I've lost weight, and I'm feeling like crap every day. It's really starting to get to me.

Do you have any medical allergy?

No, I'm not allergic to any medications as far as I'm aware of.

Rude 粗魯

Bed 1: Bennie

What is your problem?

Oh, doctor, I'm glad you asked. I'm not feeling too great, to be honest. I've been having cramping abdominal pain, frequent bowel movements, and sometimes I even pass blood in my stool. The pain comes and goes, but it's been bothering me quite a bit. I've also lost some weight, about 3kg over the past 6 months. It's been really frustrating because I used to love going out with friends for meals, but now my appetite is poor. I've also been feeling quite down lately, and I've become less sociable. So yeah, not the best of times, doc.

Do you have any medical allergy?

No, I don't have any known allergies to medications or any other medical substances. At least, none that I'm aware of. I've never had a severe reaction to any medications in the past.

Talkative 健談

Bed 1: Bennie

Hello doctor!

What is your problem?

Well, doc, to be honest, I'm not doing great. I've been having some pretty unpleasant symptoms lately. I've been experiencing cramping abdominal pain, and I've been having to go to the bathroom way more than usual. Like, 3 to 4 times a day, and it's not pleasant. And on top of that, there's been some blood in my stool. It's been going on for a while now, and it's starting to really affect me. I've also lost some weight recently, which is concerning. So yeah, I'm definitely not feeling like myself.

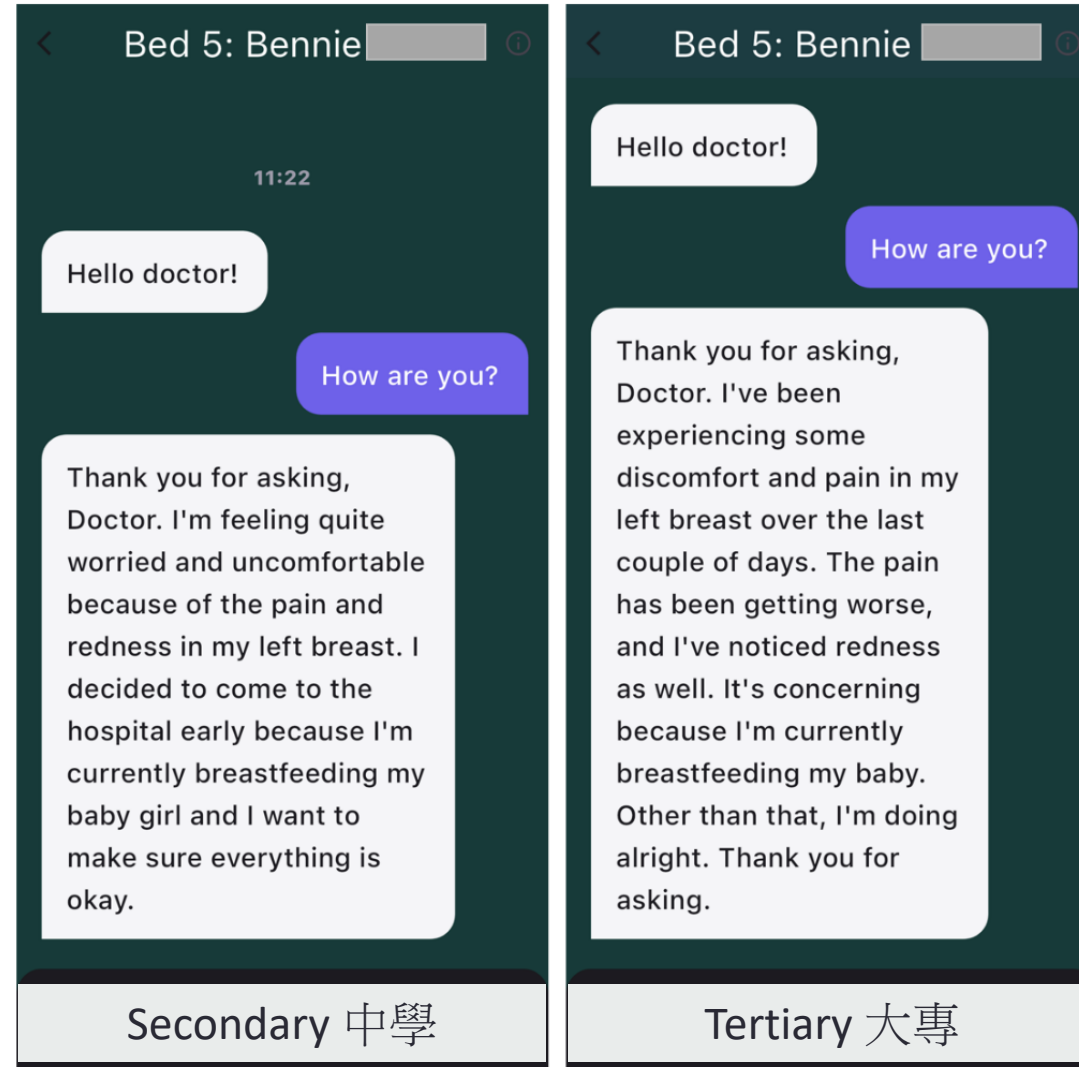
Do you have any medical allergy?

No, I don't have any known medical allergies.

Grumpy 暴躁

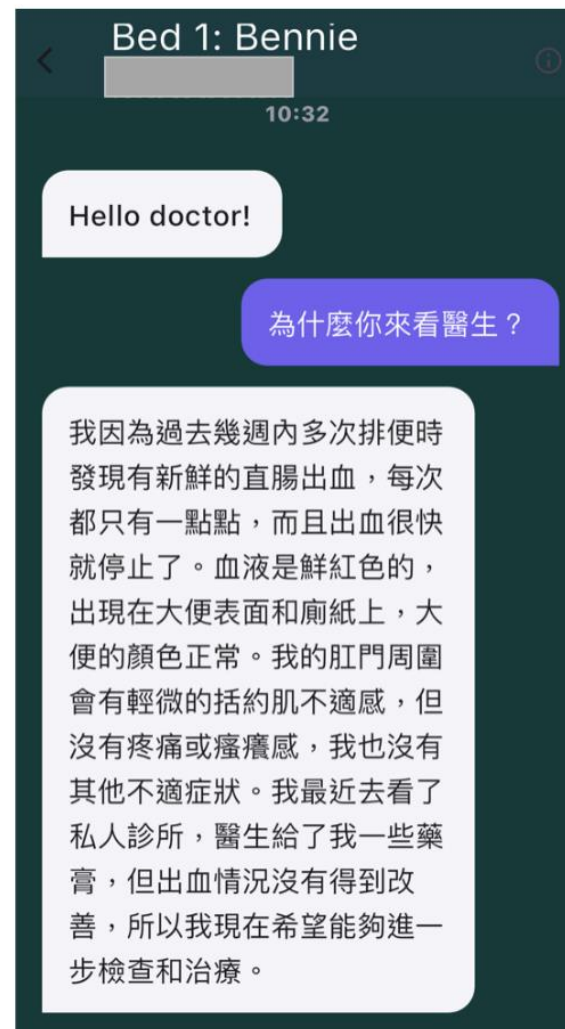
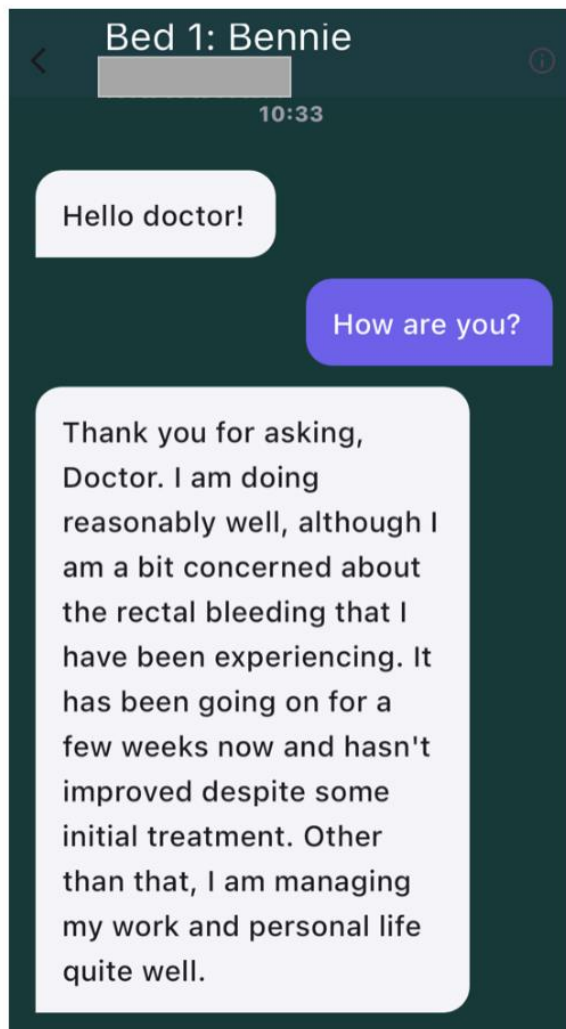
Different education levels

不同的教育水平



Multilingual support

支援多國語言

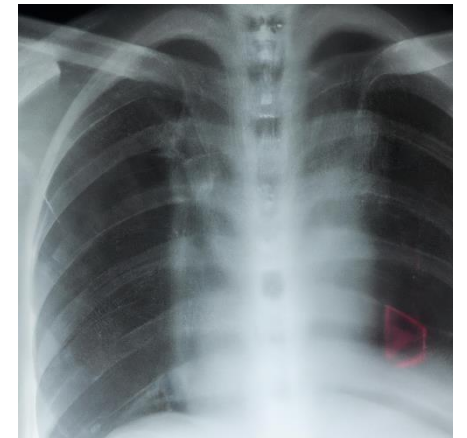


Future development 未來發展

- AI-generated pictures / videos for patient interaction
AI生成的圖片 / 影片用於與患者互動



- AI-generated medical images
AI 產生的醫學影像



Demonstration of virtual case clerking

虛擬臨床病史採集示範

'AI Virtual Patients' is available on desktop / mobile app
「AI虛擬病人」可在手機應用程式或電腦桌面上使用

Powered by



**HKU
Med**

LKS Faculty of Medicine
The University of Hong Kong
香港大學李嘉誠醫學院

BME SYSTEMS

Redefining Modern Medical Education

Virtual bedside teaching

- Clerking of virtual patient within or outside the campus / hospital
可以在醫院內 / 外「看」到虛擬患者
- Case discussion with teachers
 - Clinical photos
 - Radiology images
 - Pathology images
 - Discuss on management plans與臨床老師進行病例討論



Benefits of Virtual Bedside Teaching

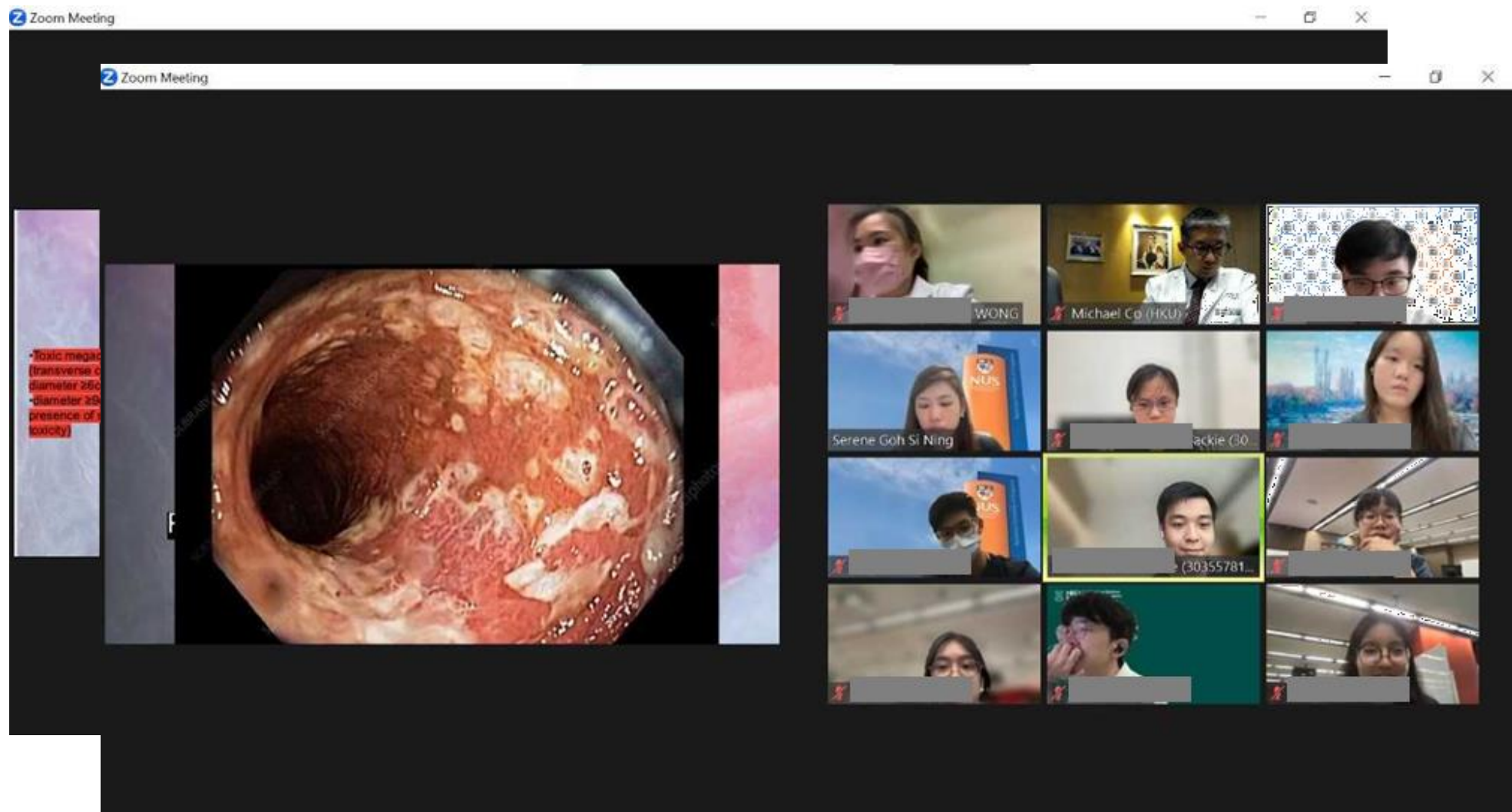
- Tailored case scenarios 量身訂造複雜及罕見的臨床病例
 - Complexity
 - Rarity
- Teaching without geographical restrictions 教學不受地域限制

Created opportunity for international collaboration in medical education
促成國際教學合作

- Joint Virtual bedside teaching 聯合虛擬臨床教學
- The University of Hong Kong & National University of Singapore
- Benefits
 - Exposure to diseases that are not prevalent in our own locality
 - Learn from peers from other institutions

Joint HKU-NUS virtual bedside

香港大學 - 新加坡國立大學聯合虛擬臨床教學



Joint HKU-NUS virtual bedside teaching

香港大學 - 新加坡國立大學聯合虛擬臨床教學

- World's first cross-territory virtual bedside teaching was made possible by the 'AI virtual patients'

全球首個跨地域虛擬臨床教學

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- HKU and NUS teachers designed virtual patients of their own region.
香港大學及新加坡國立大學的臨床老師以不同的本地病例設計虛擬病人

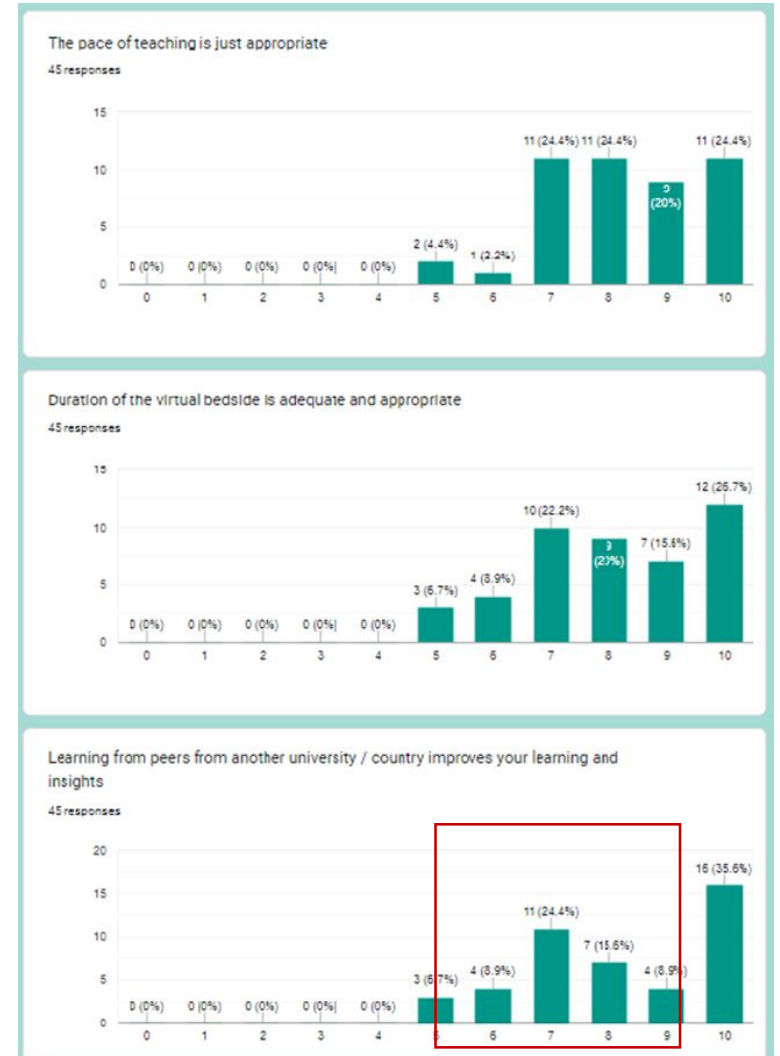
- Cross-over teaching and group discussion
兩地教學交流和小組討論

Joint HKU-NUS virtual bedside teaching

香港大學 - 新加坡國立大學聯合虛擬臨床教學

- 70 students from both universities participated
兩所大學共 70 名學生參與
- Most students agreed that joint virtual bedside teaching enhanced learning experience
 - Majority of them expressed that they treasure the opportunity to learn from their international peers

大部分學生表示珍惜向國際同儕學習的機會



Sharing by Dr Serene Goh

National University of Singapore



The Way Forward 展望將來

- Regular teaching events
納入常規教學
- Addition of new collaborators
- University of Edinburgh in the UK
has decided to join the next joint
virtual bedside teaching

英國愛丁堡大學已表示將參與下個由香港大學和新加坡國立大學共同舉辦的虛擬臨床教學

- HKUMed has also established
EdTech team to coordinate tech-
related teachings

港大醫學院已成立教育科技團隊協調相關嶄新科技教育工作





Medical Education

Past, present, & future



HKU
Med