

Virtual bedside teaching with 'Al 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

Heliyon 8 (2022) e09751



Contents lists available at ScienceDirect

Heliyon

journal homepage: www.cell.com/heliyon



Research article

Using clinical history taking chatbot mobile app for clinical bedside teachings – A prospective case control study[★]



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ARTICLE INFO

Keywords: Clinical education Computers Simulation New technology

ABSTRACT

Introduction: A novel chatbot mobile app for training of undergraduate medical students' clinical history taking skills was developed in 2021. Students were able to take clinical history from the virtual patient for bedside teaching. A case-control study was conducted to evaluate the effectiveness of learning with chatbot mobile app, versus conventional bedside teachings with real patients.

Methods: 132 final year medical students were randomized into two groups – Conventional bedside teaching with clinical history taken from a real patient, and Bedside teaching with clinical history taken from the Chatbot. Independent blinded assessment of students' history taking skills was conducted. Students' performance were assessed by standardized marking scheme.

Results: Median age was 23 years old (Range 21–30 years old). There were 62 female and 70 male students. 64 students were randomized into conventional group while 68 students were randomized into the chatbot group. Baseline demographic data were comparable between the two groups.

Blinded assessment of students' performance in clinical history taking were comparable between the conventional group and chatbot group (p > 0.05).

Conclusion: With the promising results we have demonstrated in this study, we believe training of history takin skills by chatbot will be a feasible alternative to conventional bedside teaching.

1. Introduction

Undergraduate medical education has been severely affected by the COVID-19 outbreak. Many clinical teaching activities were replaced by virtual or online formats, which were subsequently published on peer-reviewed journals [1, 2]. While lectures can be easily replaced by pre-recorded videos or delivered live by telecommunication software (e.g. Zoom), clinical bedside teachings, including training of history taking skills from patient cannot be easily replaced by online teaching.

Conventional clinical history taking skills were acquired through medical student-patient interaction. Medical students were allowed to visit hospital wards and talk to the patients. Usually, students were required to report and summarize the clinical history to the tutor afterwards where comments will be given (i.e. Conventional bedside clinical teaching). During COVID-19 pandemic in Hong Kong, medical students were not able to visit clinical areas due to infection risk. As such, medical students were not able to see patients in wards.

Chatbot app has been widely used in many commercial companies like banks, hotels and airline industries, its application in training medical students' history taking skills has not been described in the medical education community. As such, we have developed a novel clinical history taking Chatbot app (Bennie and the Chats) for bedside clinical history taking Chatbot app (Bennie and the Chats) for bedside clinical students in our institution since March 2021. Medical students were asked to download the Chatbot app to their own mobile device (e.g., mobile phone or tablet). They can then ask questions directly to the Chatbot and collect clinical history by typing in questions. At instance, voice recognition function is not available in this Chatbot mobile app, students will need to type in questions manually.

Nevertheless, medical students were able to interact with the virtual patient Bennie (The chatbot) and take clinical history by asking

Self-developed prototype 2021 自主研發 原型聊天機器 2021

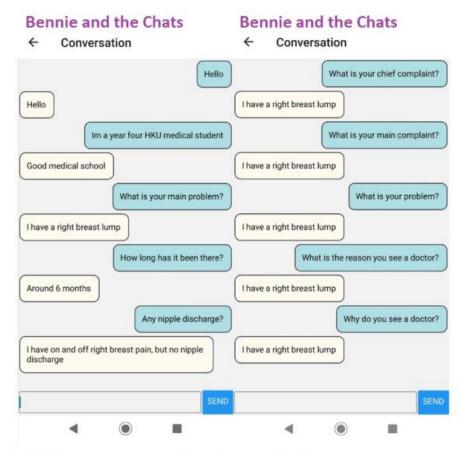


Figure 1. Two separate screen captures of conversation between medical student and Chatbot Bennie, illustrating the student-chatbot interaction (Right) and chatbot's response to synonym (Left).

- Not equipped with generative Al 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

'Al 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 Al 生成式人工智能

Features of 'Al 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













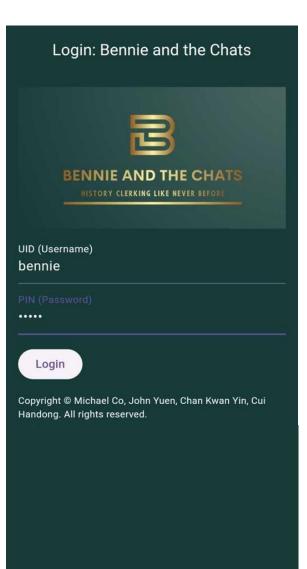


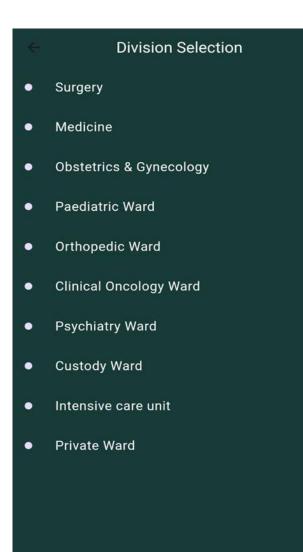
Generative Al 生成式人工智能

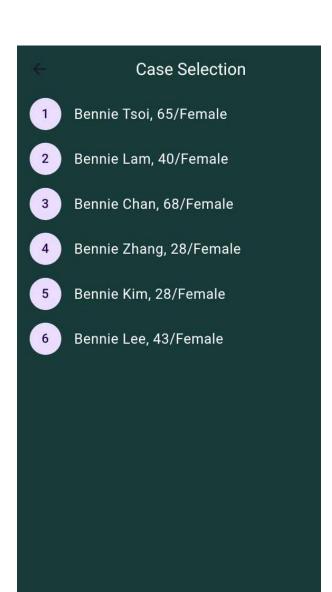


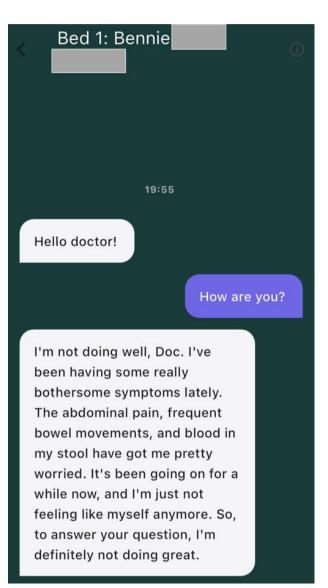


App interface 「AI虛擬病人」問診應用程式介面









Bed 5: Bennie

Hello doctor!

How are you?

Doctor, honestly, I'm not doing so great. I've been having a lot of pain and redness in my left breast, and it's been getting worse over the past 24 hours. My milk output has also decreased, and I'm really worried about it. I haven't had any fever or other symptoms, but this is the first time I've experienced this kind of breast pain and redness. I'm really uncomfortable and just want some relief.

Message

Bed 5: Bennie

Did you intake any medicine?

No, Doctor, I haven't taken any medication for my breast problem. I decided to seek medical help early because I'm currently breastfeeding and I don't want any harm to come to my baby. I thought it's best to leave it to the professionals rather than trying to self-medicate.

Do you have any medical allergy?

No, Doctor, I don't have any drug allergies that I'm aware of.

Message

Bed 5: Bennie

How many children do you have?

Doctor, I have only one child. I gave birth to a baby girl 3 months ago at Hong Kong Sanatorium and Hospital. Her name is Jisoo and she is currently on breastfeeding.

Do you know any family medical history?

Doctor, to the best of my knowledge, there is no history of cancer or any other major illnesses in my family or my husband's family. We are both healthy individuals.

Message

Bed 5: Bennie

Any nipple discharge?

No, Doctor, I haven't noticed any nipple discharge. It's mainly the engorgement, pain, and redness in my left breast that are concerning me.

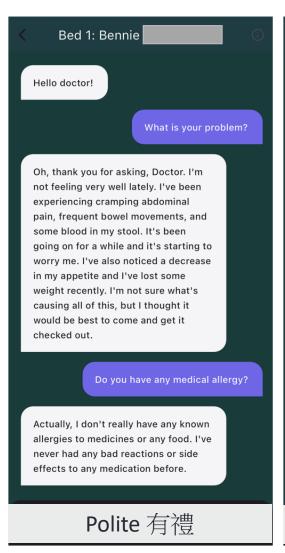
Any appetite change?

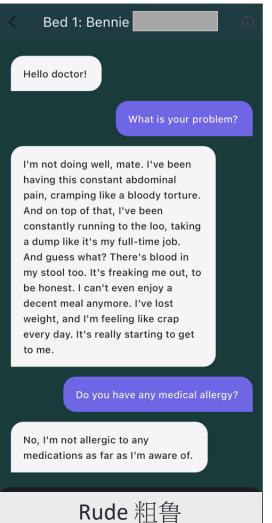
No, Doctor, my appetite has remained similar. I haven't experienced any significant changes in my eating habits.

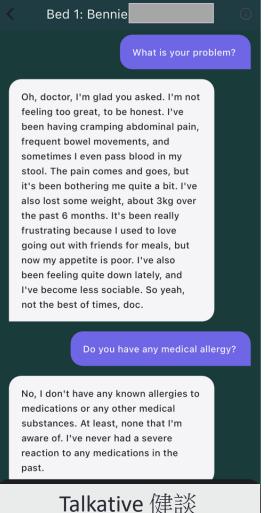
Message

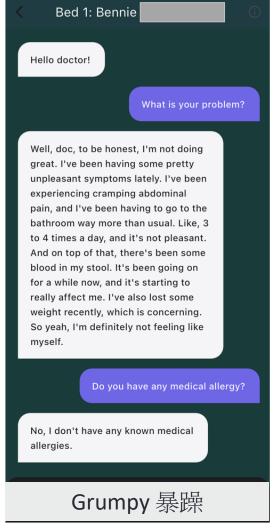
Distinct personality for each virtual patient

不同的患者個性

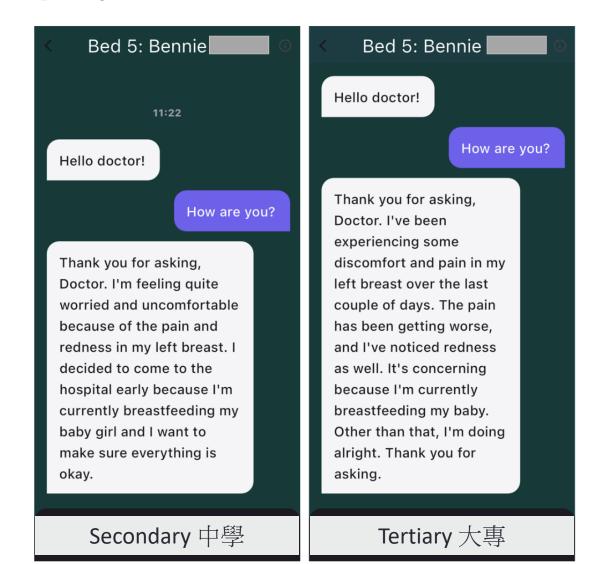




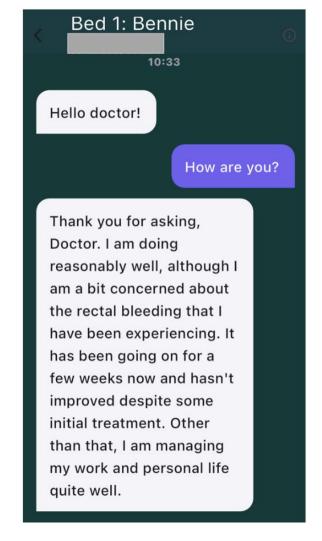




Different education levels 不同的教育水平



Multilingual support 支援多國語言





Future development 未來發展

 Al-generated pictures / videos for patient interaction

AI生成的圖片 / 影片用於與患者互動

• Al-generated medical images Al 產生的醫學影像











Demonstration of virtual case clerking 虛擬臨床病史採集示範

'Al 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





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

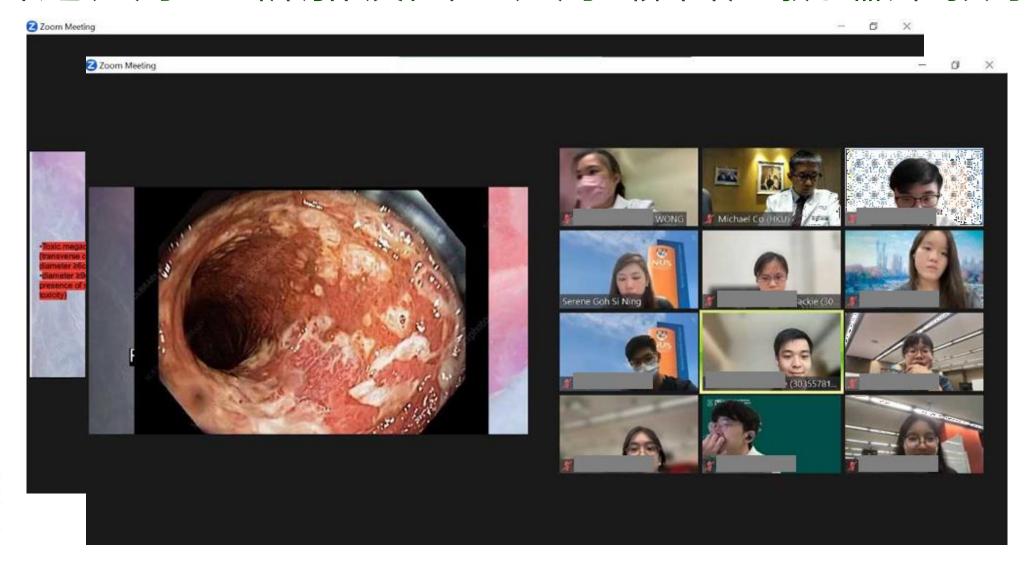
- Tailored case scenarios 量身訂造複雜及罕見的臨床病例
 - Complexity
 - Rarity
- Teaching without geographical restrictions 教學不受地域限制

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 'Al virtual patients'

全球首個跨地域虛擬臨床教學

- 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 techrelated 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



