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Nursing research in simulation education

模拟教学中的护理研究

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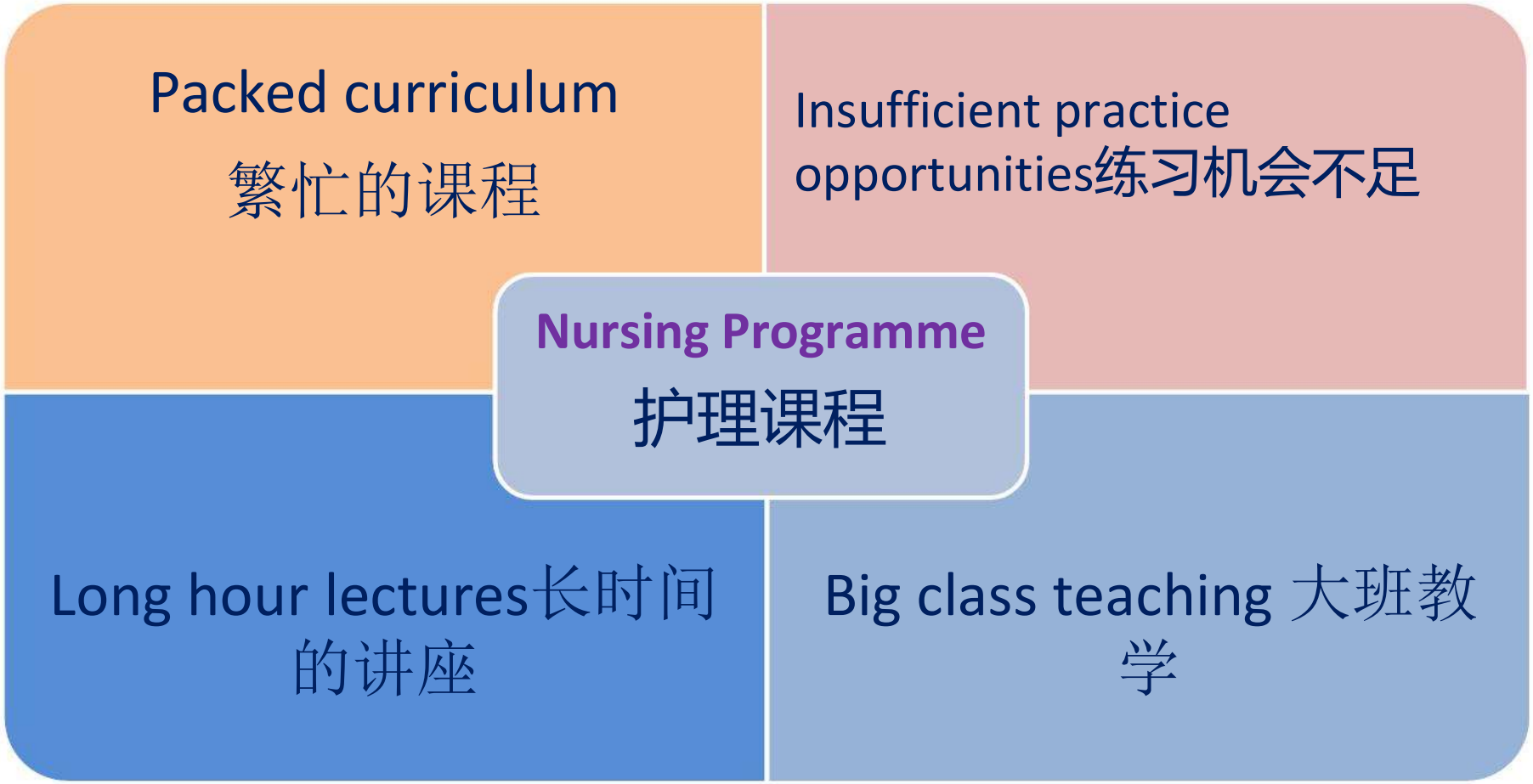
PART ONE

Simulation education in Hong Kong 香港的模拟教学

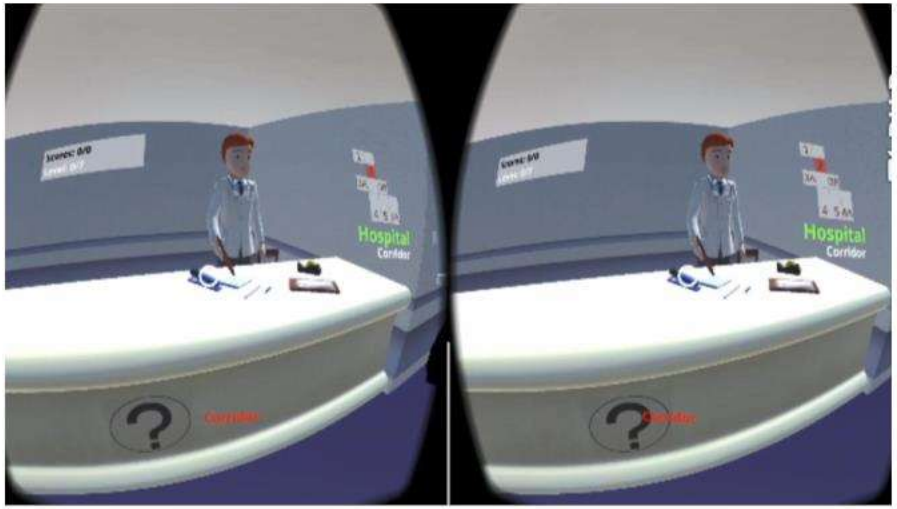
- Undergraduate nursing education in tertiary institutions
  高等院校的护理本科教育
- Health care professional training 医护专业培训
- Multi-disciplinary simulation and skills centres have been established in the local public health care sector 在地方公共保健部门设立了多学科模拟和技能中心
- A series of advanced team-based training and specialty emergency management courses have been launched, including: 开展了一系列以团队为基础的先进培训和专业急救管理课程:
  - advanced surgical trauma course 外科创伤高级课程
  - obstetrics emergency workshop 产科急诊研习班
  - airway management simulation training 气道管理模拟培训
  - acute wound care workshop 急性创伤护理研习班

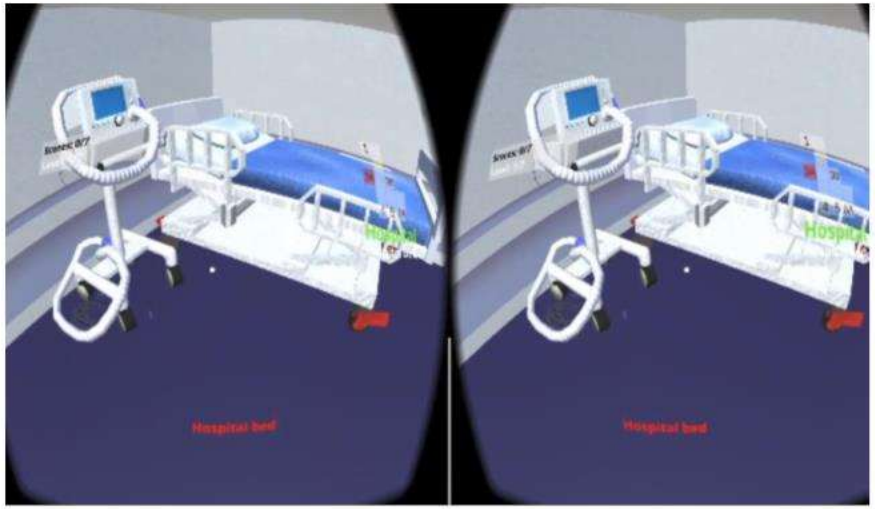
Background 背景



Example 1: Virtual reality application for teaching safety 虚拟教学: 安全

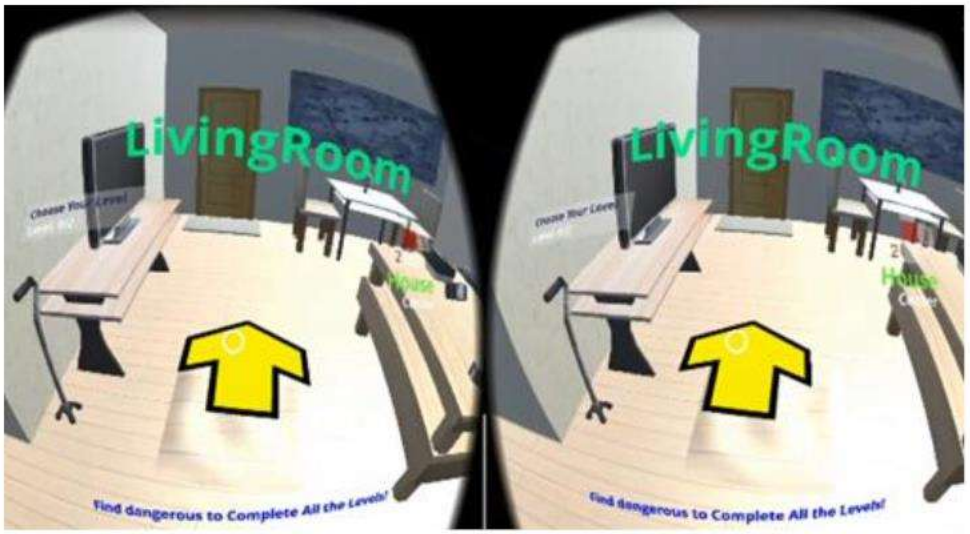
- Students would identify risks for patients and health care providers in a virtual hospital environment学生在虚拟医院中确定患者和护士的风险

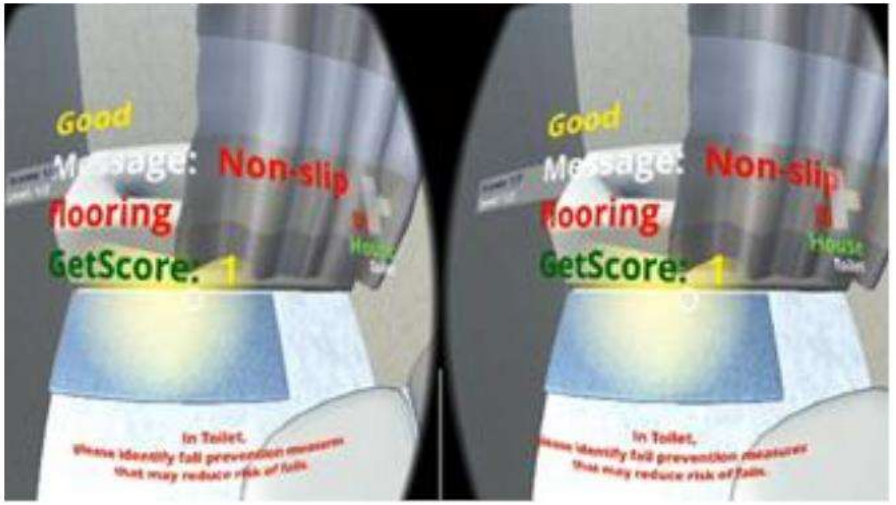




Example 1: Virtual reality application for teaching safety 虚拟教学: 安全

- Students would identify extrinsic factors for fall in a virtual home environment 学生将识别虚拟家庭环境中“跌倒”的外部因素





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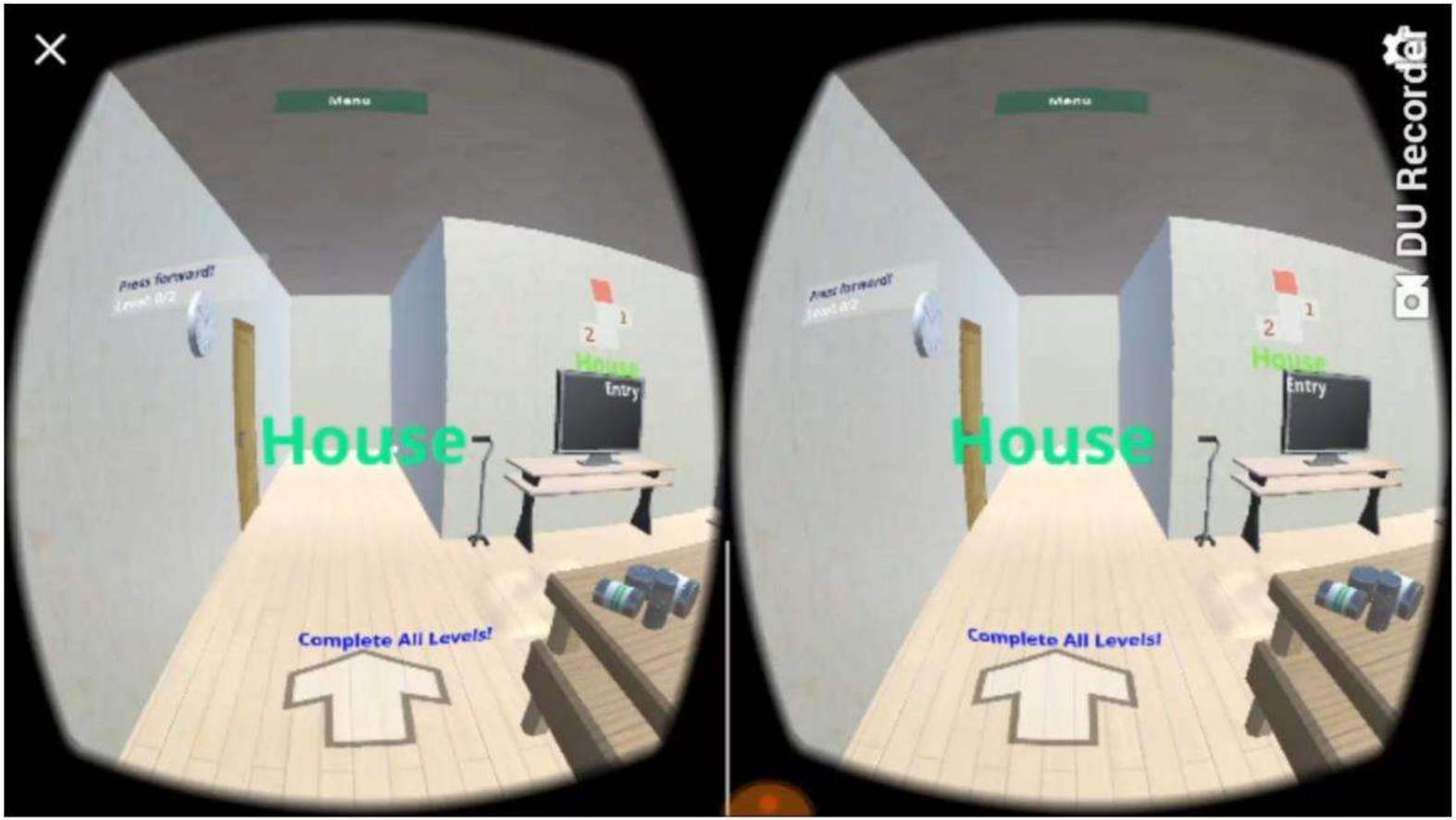
Virtual reality application for teaching safety
虚拟教学: 安全



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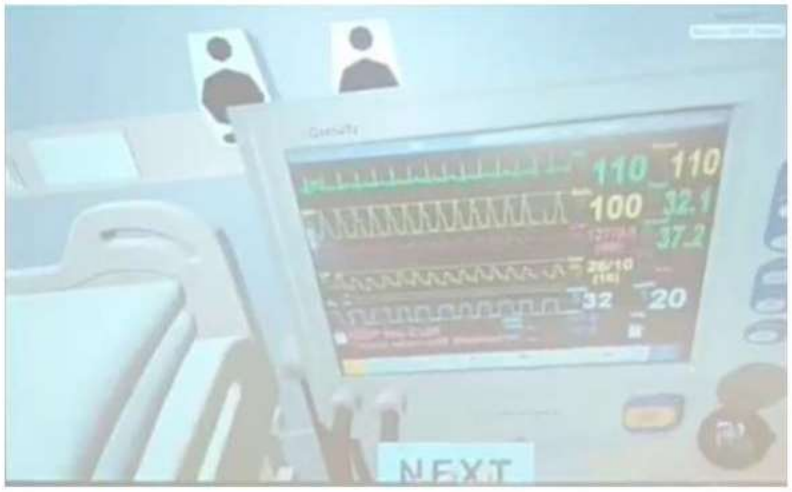
Example 2: Virtual reality for teaching paediatric intravenous infusion虚拟教学: 小儿静脉输液

- A courseware: 3 scenarios has been developed课件：已经开发了3个方案
- Scenario 1: Pediatric intravenous infusion assessment 方案1：小儿静脉输液评估



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Example: Virtual reality for teaching paediatric intravenous infusion虚拟教学: 小儿静脉输液

- Scenario 2: Problems solving during intravenous infusion方案2：静脉输液时的问题解决

Example 2: Virtual reality for teaching paediatric intravenous infusion虚拟教学: 小儿静脉输液

Scenario 3: Manage complications during intravenous infusion
处理静脉输液期间的并发症

有效回应

Example 2: Virtual reality for teaching paediatric intravenous infusion虚拟教学: 小儿静脉输液

Data collection:

- A self-developed survey to examine students' perception and satisfaction towards the VR courseware自行设计的问卷，用于评估学生对VR课件的看法和满意度
  - There were 243 students enrolled in this course.
  - 232 valid responses有效回应were received.

- 22 students recruited for qualitative interviews

	Strongly disagree (%)	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	Strongly agree (%)
The VR courseware enhance my learning interest增强我的学习兴趣	0%	4.5%	1.8%	61.0%	32.7%
The VR courseware help me gain a better understanding of nursing knowledge and skills on the designated topic.	0%	1.8%	7.6%	59.2%	31.4%
The VR courseware help me learn at my own pace.	0.5%	5.4%	14.0%	50.7%	29.4%
Knowledge and skills gained through the VR courseware enhance my confidence in handling related situations in the clinical environment增强我在临床处理相关情况的信心	0.8%	3.6%	11.7%	56.5%	27.4%
The VR courseware enhance my critical thinking ability.	0.4%	5.4%	14.8%	52.0%	27.4%
The VR courseware enhance my problem-solving ability.	0.5%	3.6%	10.3%	56.5%	29.1%
Using VR experience is more engaging and interesting in comparison to traditional lectures.	0.9%	2.2%	5.4%	47.1%	44.4%
More VR courseware should be developed and adopted in the future.	0.5%	1.3%	8.5%	49.8%	39.9%
The VR experiences enhance the overall quality of the course.	0.8%	1.8%	8.1%	50.7%	38.6%
Overall, I am satisfied with using VR courseware in the course.对使用VR课件感到满意	0.9%	1.3%	7.2%	54.7%	35.9%

Example 2: Virtual reality for teaching paediatric intravenous infusion虚拟教学: 小儿静脉输液

Qualitative findings定性研究结果

22 students were recruited for the interview.

- **increased their interest in learning** in the laboratory sessions. 增加了他们对实验室学习的兴趣
- Allowed to **make mistakes and learn from error**允许犯错误并从错误中学习
- VR scenarios were “real” and “similar to what they encountered during clinical practicum”真实且类似于临床实践
  - helped them to **think critically about IV care when they encounter similar situations in clinical**帮助他们进行批判性思考
- Suggested to have more VR scenarios with **acute conditions and complex nursing skills**建议开发更多急性病例和复杂护理技能的VR方案

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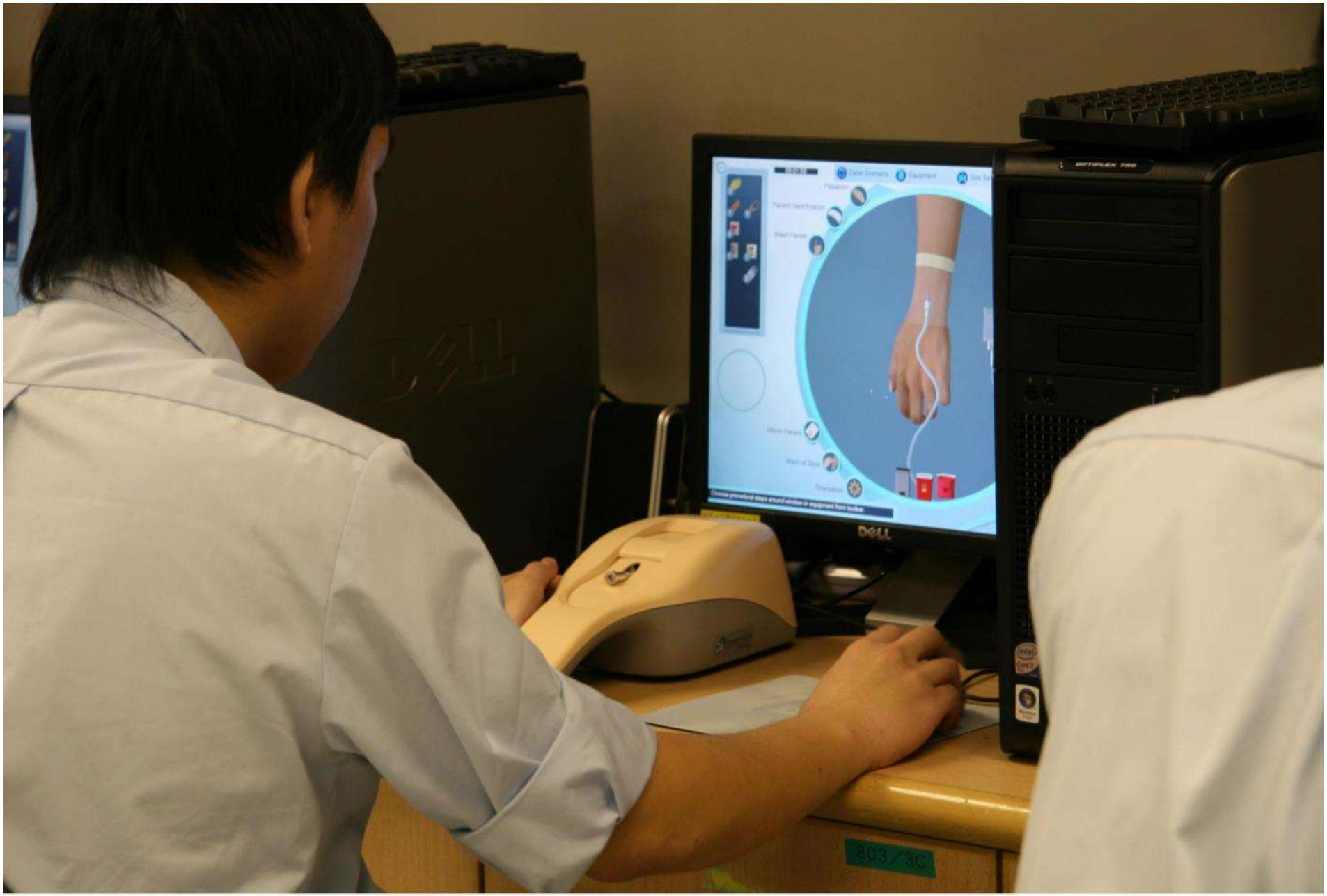

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Advanced Cardiac Life Support (ACLS) training 高级心脏生命支持培训

- Inexperienced nursing students may not have opportunity to practice the skills or to get involved in managing because of ethical considerations
- 由于伦理方面的考虑，没有经验的护理学生可能没有机会实践技能或参与管理

Advanced Cardiac Life Support (ACLS) training 高级心脏生命支持培训

- Cardiac arrest is an abrupt loss of cardiac function & is a clinical crisis 心脏骤停是心功能突然丧失, 是严重的危机
- The survival rate declines 7-10% for every minute delay in the initiation of resuscitation 复苏每延迟一分钟，存活率就下降7-10%
- Timely management with required knowledge and skills are essential 及时运用必要的知识和技能进行管理至关重要
- A simulation-based learning is therefore adopted for ACLS training to enable students to practice the skills and obtain relevant experience高级心脏生命支持培训采用模拟学习的方式，让学生实践技能，获得经验

Educational materials in the Nethersole School of Nursing of CUHK 香港中文大学那打素护理学院教学设施

- 4 simulation laboratories 四个模拟实验室
- Each laboratory simulated a real clinical setting with sophisticated, high-tech specialized cardiopulmonary resuscitation (CPR) manikins, (e.g. central and peripheral pulses, real cardiac and respiratory sounds, improved airway simulation)
  每个实验室模拟一种真实的临床环境，配以先进的高科技专业心肺复苏(CPR)人体模型(如中央和周围脉搏，真实的心脏和呼吸音，改进的气道模拟)

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Educational materials in the Nethersole School of Nursing of CUHK 香港中文大学那打素护理学院教学设施

- Each laboratory is equipped with 每个实验室配备
  - two high-fidelity manikins and one SimBaby 两个高保真人体模型和一个高级婴儿模拟病人
  - hospital beds 病床
  - a crash cart including a defibrillator with function of electrocardiogram (ECG) and pace-maker 急救车包括带心电图的除颤器和心律调整器
  - invasive and non-invasive airway supplies 侵入性和非侵入性的气道用品
  - fluid infusion devices 输液设备
  - a fluid drainage system 流体排水系统
  - an oxygen/suction headwall unit 一个氧/吸入端墙单元
  - a monitoring system 一个监控系统
  - an overhead table 一个高架桌
  - A video recording system with phones, video equipment and microphones 设有电话、录像设备及麦克风的录像系统


METRO lifeline

Scenario-based ACLS simulation learning
基于场景的高级心脏生命支持模拟学习

Student Learning Activities 学习活动

- a two-hour lecture for ACLS before simulation training
  模拟训练前，需参加一场2小时的ACLS讲座
- over 200 students will be divided into 12 groups with 16 to 17 students in each group 200多名学生的大班将被分成12个小组，每组16至17名学生
- each group will be divided into three teams and each team will have at least 5 members. Each member has a role to play in the team: 每组将分成三个团队，每队至少有五名队员。每个成员在团队中都有自己的角色:

  - one as team leader who is taking the lead to manage the whole situation and is also responsible for defibrillation 一人作为团队的领导，带头管理全局，同时负责除颤
  - one is responsible for CPR 一人负责心肺复苏
  - one is responsible for ventilation and intubation 一人负责通气和插管
  - one is responsible for medication and laboratory work 一人负责药物和实验室工作
  - one is responsible for documentation 一人负责文档

口服饮食
昏昏欲睡

Introduction of the scenario 方案介绍

- Setting the Scene 设置场景

The scenario takes place in an Accident and Emergency Department (AED). The patient, a 73-year-old man, attends AED for decreased general condition and he complains of shortness of breath with poor oral intake in the past few days. Pertinent medical history includes an open heart surgery undertaken 10 years ago. On admission, he is lethargic and not responding to verbal communication. During assessment, his condition suddenly changed and he becomes unresponsive.

场景发生在一个事故和急诊科(AED)。病人，一位73岁的男性，由于一般情况下降而进入AED，他诉说在过去几天呼吸急促和饮食不良。相关的病史包括10年前的一次开胸心脏手术。入院时，他昏睡，对语言交流没有反应。在评估期间，他的情况突然改变，变得无反应。

Introduction of the scenario 方案介绍

Scenario Objectives 方案目标 2

- Describe the principle and related care for defibrillation and Automated External Defibrillation 描述除颤和自动体外除颤的原理和相关护理
- Reassess patient condition at appropriate intervals 在适当的时间间隔重新评估病人的病情
- Document the assessment, intervention and evaluation findings 记录评估、干预和评估结果
- Demonstrate team approach in resuscitation 演示团队复苏方法
- Discuss how to manage ventricular fibrillation, pulseless ventricular tachycardia and asystole according to ACLS Algorithms 讨论如何根据ACLS算法处理室颤、无脉性室性心动过速和心搏停止

Running of the scenario 方案的运行

- Students are introduced to their assigned roles 介绍学生指定的角色
- They are provided with the the patient's medical record with information about his past medical history, chief complaints and current condition 向他们提供病人的医疗记录，包括既往史、主诉和目前状况
- The team leader approaches the patient to perform assessment and the patient suddenly becomes unresponsive 团队领导接近病人进行评估，病人突然变得无反应
- The student is required to respond to this critical condition and identify the cardiac rhythms during focused assessment, then intervene appropriately according to the ACLS Algorithm
  学生需要在集中评估期间对这种危急情况作出反应，并识别心律，然后根据ACLS算法进行适当的措施

Running of the scenario 方案的运行

- It will take approximately 15 minutes for each team to complete the scenario 每个团队大约需要15分钟来完成这个场景
- After all three teams have completed the scenario, there will be a 20-minute debriefing for discussion and evaluation in a whole group 所有三个团队完成方案后，有一个20分钟的汇报，供整个小组进行讨论和评估

Debriefing 汇报

- Questions for debriefing are as follows 汇报的问题如下

1. *What are the learning objectives? 学习目标是什么?*
   Ensure the learning objectives are achieved 确保完成学习目标
2. *What went well? 事情顺利吗?*
   Encourage students to identify their positive aspects of performance 鼓励学生发现自己表现的积极方面

   Ask for feedback from team members and observers 寻求反馈
3. *What would you do differently if you can do one more time? 如果你能再做一次，你会有什么不同的做法?*
   Encourage students to identify areas for improvement and discuss alternatives to the intervention 鼓励学生找出需要改进的地方，并讨论干预的替代方案
4. *How would you facilitate better communication and collaboration with team members? 你如何促进与团队成员更好的沟通和协作?*
   Emphasize the importance of team approach in resuscitation 强调团队方法在复苏中的重要性

Recommendations for future use 进一步使用推荐

- Students are no longer recipients of didactic contents but are active learners 学生不再是说教内容的接受者，而是主动的学习者
- The dynamic and interactive nature of simulation-based pedagogy can enhance students' experiential learning and reflective practice, and facilitate students to identify gaps between knowledge and practice 模拟教学的动态性和互动性可以增强学生的体验性学习和反思性实践，帮助学生识别知识和实践之间的差距
- The scenarios in the ACLS training require the integration and application of knowledge and skills rather than examining each as an individual function ACLS 培训中的场景需要知识和技能的整合和应用，而不是将它们作为单个功能进行检查
- A checklist for evaluation is recommended to be developed to facilitate effective discussion 建议制定一份评估清单，以促进有效讨论
- Positive feedback is critical for creating a respectful atmosphere for debriefing 积极的反馈对于创造尊重的氛围至关重要

Recommendations for future use 进一步使用推荐

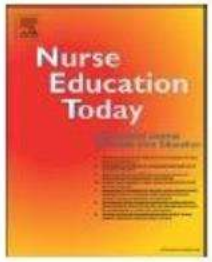
- Evaluation of best practice standards 评估最佳实践标准
- Use of credentialed simulation faculty 使用认证的模拟教员
  - Teaching staff have been specially trained in the use of simulation-based pedagogy to design context-rich and culturally specific simulation scenarios and run simulation training sessions for students 教学人员已经接受使用基于模拟的教学方法的专门培训，以设计丰富的环境和特定文化的模拟场景，并为学生运行模拟培训课程
  - All faculty members are capable of conducting debriefing with the video-recorded simulation practices to reflect critically about students' own performance and deconstruct events and mistakes that occurred during the simulation-based ACLS scenario for correction and future improvements 所有的教员都有能力使用录制的模拟实践视频进行汇报，以批判性地反映学生自身的表现，并解构在基于模拟的ACLS场景中发生的事件和错误，以便进行纠正和未来改进

PART TWO Research Example 1

Contents lists available at ScienceDirect

Nurse Education Today

journal homepage: www.elsevier.com/locate/nedt



模拟训练对护生心脏听诊知识、技能和焦虑水平的影响:一项随机对照研究

The effects of training with simulation on knowledge, skill and anxiety levels of the nursing students in terms of cardiac auscultation: A randomized controlled study

Aim 目的

- To compare the effectiveness of high-fidelity simulator and traditional teaching method on nursing students' knowledge and skill development in terms of cardiac auscultation and their anxiety levels
  比较高保真模拟机和传统教学方法对护生心脏听诊知识和技能的培养及焦虑水平的影响

Methods 方法

- Design: Randomized controlled study 设计： 随机对照研究

Research Example 1

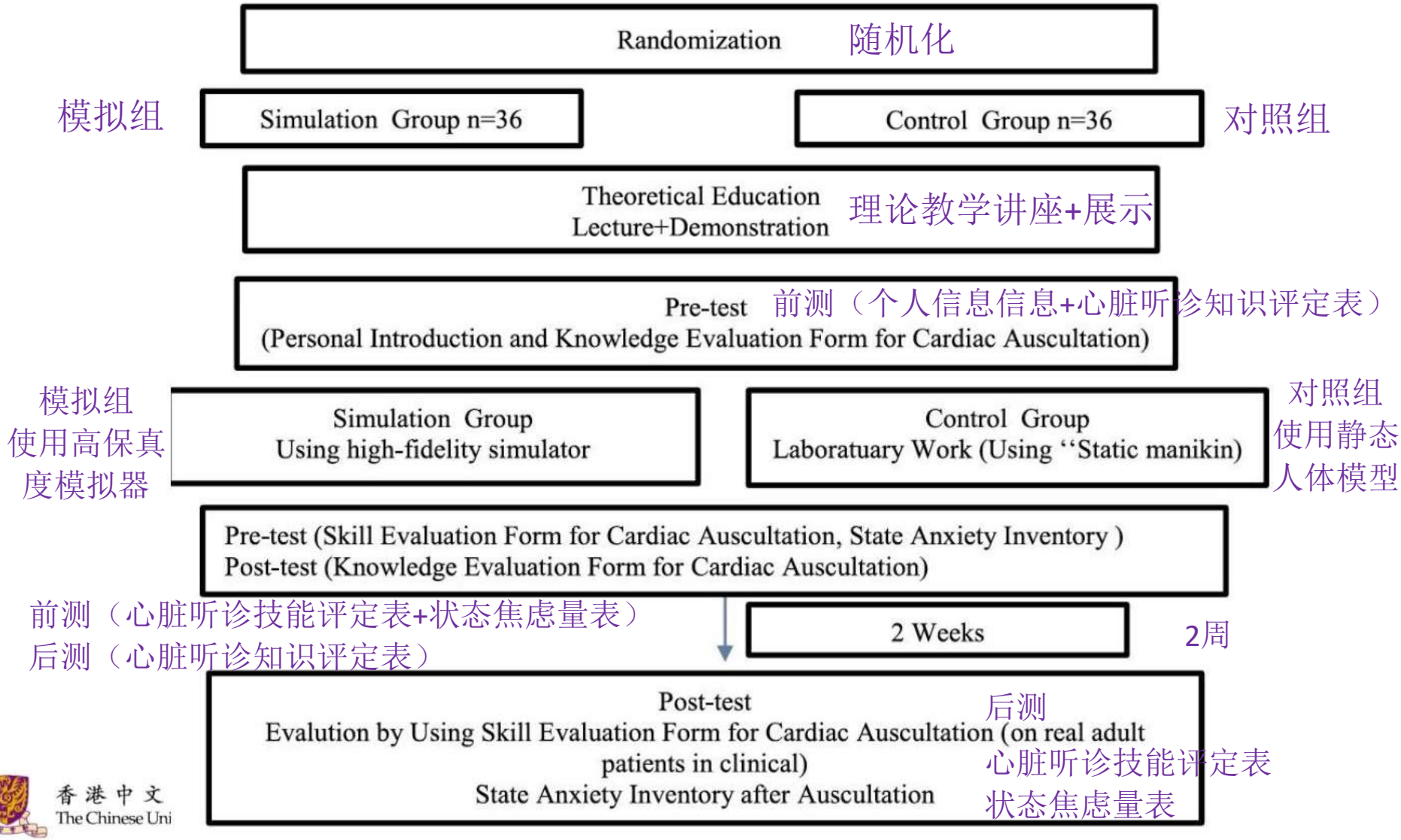
Methods 方法

- Participants: 72 first-year nursing students (simulation group=36, control group=36) 一年级护生72名(模拟组36名，对照组36名)
- Treatment:
  - All students received 2 hours lecture of theoretical presentation of Cardiac auscultation via a PowerPoint presentation and videos 所有学生都接受了2小时的心脏听诊理论讲座，讲座通过幻灯片和视频进行
  - **Intervention group:** a cardiac auscultation training by using a high-fidelity simulator in the simulation laboratory 干预组:在模拟实验室使用高保真模拟器进行心脏听诊训练
  - **Control group:** training with the traditional teaching method (the static manikin) in the skill laboratory 对照组:在技能实验室采用传统教学方法(静态人体模型)进行训练
  - After training, all students practiced their skills in the laboratory and on real patients in clinical setting under the supervision of the researcher 培训结束后，所有学生在实验室练习技能和临床环境下在研究人员的监督下，在真实的病人身上练习技能
  - An informing session was performed for all students to recognize their mistakes and answer their questions 为了识别学生的错误并回答问题，所有学生进行了一次报告会议

Research Example 1

Methods 方法

- Study flow diagram 研究流程图



Research Example 1

Results 结果

- Cardiac auscultation knowledge 心脏听诊知识

Table 2
Comparison of cardiac auscultation knowledge scores of pre- and post-test (N = 72)

Knowledge	Simulation group	Control group		
	$\overline{X'}$(min ± max)	$\overline{X'}$(min ± max)	z[a]	p
Pre test	64.00 (8.00 ± 100.00)	69 (28.00 ± 92.00)	−1.603	0.109
Post test	92.00 (62.00 ± 100.00)	83.00(36.00 ± 100.00)	−3.307	**0.001**
Pre- and post-test comparison of group	Z[b] = −5.220 **p < 0.001**	Z[b] = −3.689 **p < 0.001**		

$\overline{X'}$ = Median.
[a] Mann Whitney *U* test z value.
[b] Wilcoxon test Z value.

- Cardiac auscultation skill
  心脏听诊技能

Table 3
Comparison of cardiac auscultation skill scores of pre- and post-test (N = 72).

Skill	Simulation group	Control group		
	$\overline{X'}$(min ± max)	$\overline{X'}$(min ± max)	z[a]	p
Pre test	14.00 (0.00 ± 18.00)	13.50 (5.00 ± 32.00)	−0.643	0.520
Post test	25.00 (22.00 ± 27.00)	17.00 (9.00 ± 24.00)	−7.102	**< 0.001**
Pre- and post-test comparison of group	Z[b] = −5.239 **p < 0.001**	Z[b] = −4.242 **p < 0.001**		

$\overline{X'}$ = Median.
[a] Mann Whitney *U* test z value.
[b] Wilcoxon test Z value.

Research Example 1

Results 结果

- Anxiety in cardiac auscultation
  心脏听诊的焦虑

Table 4
Comparison of pre- and post-test anxiety scores for cardiac auscultation (N = 72).

Anxiety	Simulation group	Control group		
	$\overline{X}'$min ± max)	$\overline{X}'$min ± max)	z[a]	p
Pre test	40.50 (22.00 ± 74.00)	41.00 (32.00 ± 80.00)	−0.660	0.509
Post test	32.00 (20.00 ± 40.00)	44.00 (35.00 ± 52.00)	−7.149	< 0.001
Pre- and post-test comparison of group	Z[b] = −5.089 $p < 0.001$	Z[b] = −0.513 0.608		

$\overline{X}'$ = Median.
[a] Mann Whitney *U* test z value.
[b] Wilcoxon test Z value.

Conclusion 结论

- The use of high-fidelity simulator in nursing education was more effective than traditional method in terms of improving the students‘ knowledge, skill levels for cardiac auscultation and reducing their anxiety
  高保真模拟器在护理教育中的应用，在提高学生心脏听诊知识、技能水平和减轻焦虑方面，比传统方法更有效

Research Example 2

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Simulation and education

Simulation training enables emergency medicine providers to rapidly and safely initiate extracorporeal cardiopulmonary resuscitation (ECPR) in a simulated cardiac arrest scenario

模拟训练使急诊医学提供者在一个模拟的场景中迅速和安全地启动体外心脏骤停心肺复苏

Aim 目的

- Test the hypothesis that emergency medicine physicians and nurses can acquire and retain the skills to rapidly and safely initiate ECPR using high-fidelity simulation

  验证使用高保真模拟能够使急诊医师和护士获得并保持快速安全地启动ECPR的技能的假设

Research Example 2

Methods 方法

- Design: Prospective interventional study 设计：前瞻性干预研究
- Participants: Emergency medicine physicians and nurses with no prior ECPR/ECMO experience 没有ECPR/ECMO经验的急诊医生和护士
  - Each physician rotated through each of 3 roles: primary ECPR cannulator (MD1), assistant (MD2), and ultrasound/equipment helper (MD3) 每一位内科医生都要轮流担任三个角色：初级ECPR插管员(MD1)、助理(MD2)和超声/设备助手(MD3)
  - Each nurse rotated through each of 3 roles: nursing team leader (RN1) and two circuit primers (RN2 and RN3), one of whom guided the other through tasks using a checklist 每个护士轮流担任三个角色：护理组长(RN1)和两个循环启动者(RN2和RN3)，其中一人根据清单指导另一人完成任务

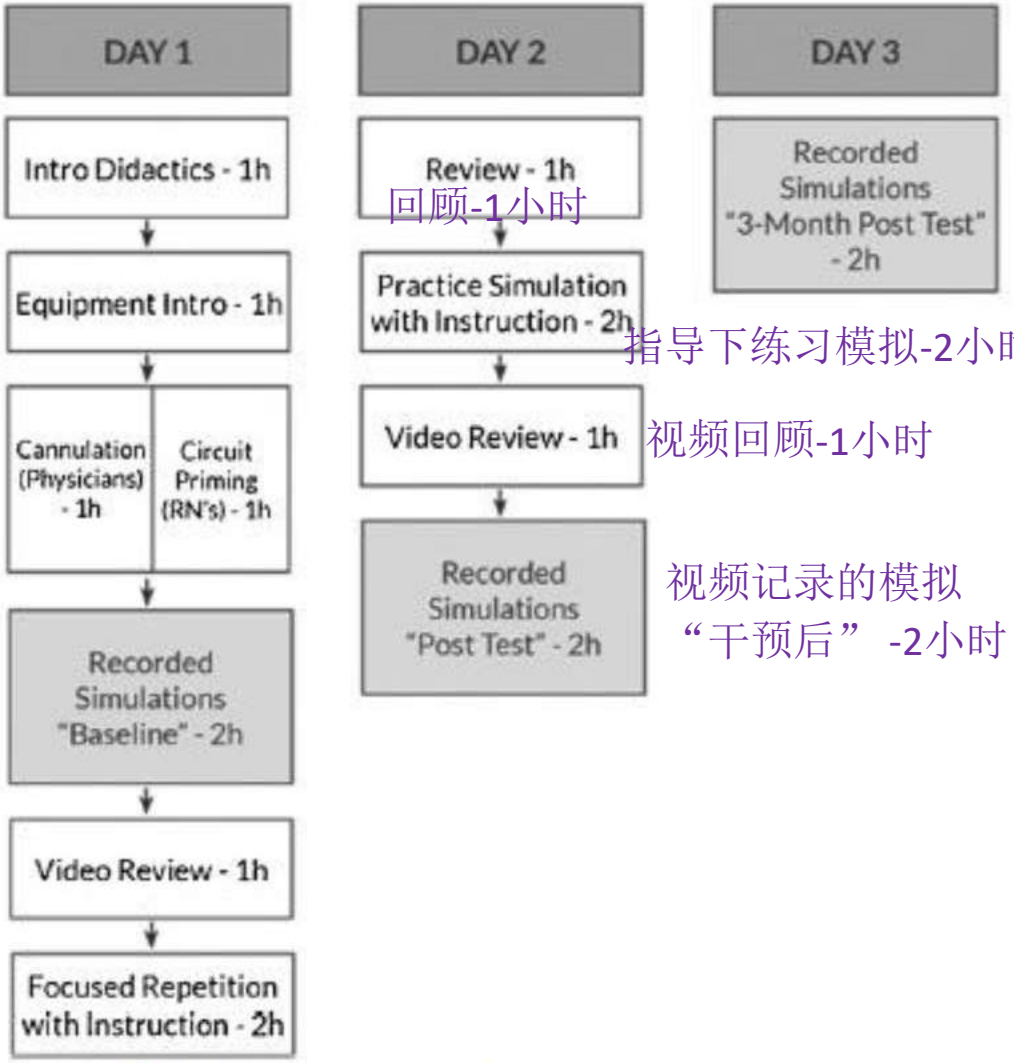
- Intervention: 干预
  - Teams of 3 physicians and 3 nurses underwent a two-day ECPR training course including didactics, hands-on training, and simulation 由三名医生和三名护士组成的团队接受了为期两天的ECPR培训课程，包括教学法、动手训练和模拟训练
  - Teams were videotaped initiating ECPR in a high-fidelity simulation scenario before and after simulation training 各团队在模拟训练前后高保真模拟场景中启动ECPR的过程被录像

Research Example 2

Methods 方法

- Training curriculum 训练课程

第一天 第二天 第三天



介绍性说教-1小时

设备介绍-1小时

插管（医生）-1小时

巡回引导（护士）-1小时

视频记录的模拟“基线” -2小时

视频回顾-1小时

指导下的集中重复-2小时

回顾-1小时

指导下练习模拟-2小时

视频回顾-1小时

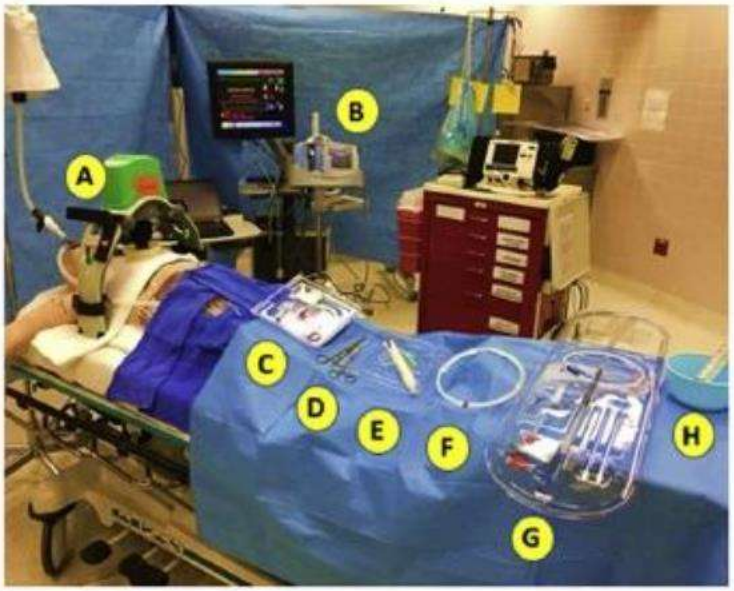
视频记录的模拟“干预后” -2小时

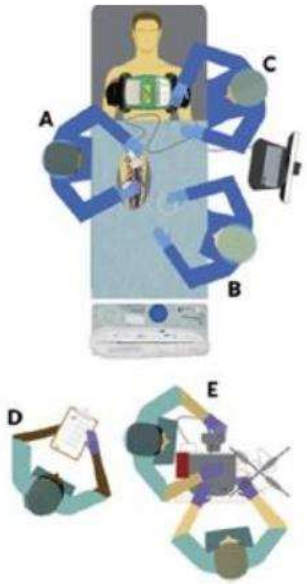
视频记录的模拟“干预后3个月” -2小时

Research Example 2

Methods 方法

- ECPR simulation training model　ECPR模拟训练模型





ECPR trainee roles

- A, cannulating physician;
- B, cannulation assistant;
- C, ultrasound and equipment runner;
- D, ECMO lead nurse;
- E, two-person ECMO circuit priming.

ECPR simulation setup including a full-scale resuscitation simulation space, CPR mannequin, resuscitation cart and typical simulation software. (A) mechanical CPR device; (B) vascular ultrasound; (C) central line kit; (D) tubing clamps; (E) vascular dilator kit; (F) long guidewire; (G) ECMO cannula kit; (H) catheter-tip syringe and bowl of saline flush

ECPR模拟设置包括一个全尺寸的复苏模拟空间，CPR人体模型，复苏车和典型的模拟软件。(A)机械CPR装置;(B)血管超声;(C)中线试剂盒;(D)管夹;(E)血管扩张器工具包;(F)长导;(G)ECMO套管盒;(H)导管尖端注射器和盐水冲洗碗

Research Example 2

Results 结果

- Secondary outcome: critical action checklist adherence
- 主要结果:在患者到达后30分钟内实现完整ECPR支持模拟的比例

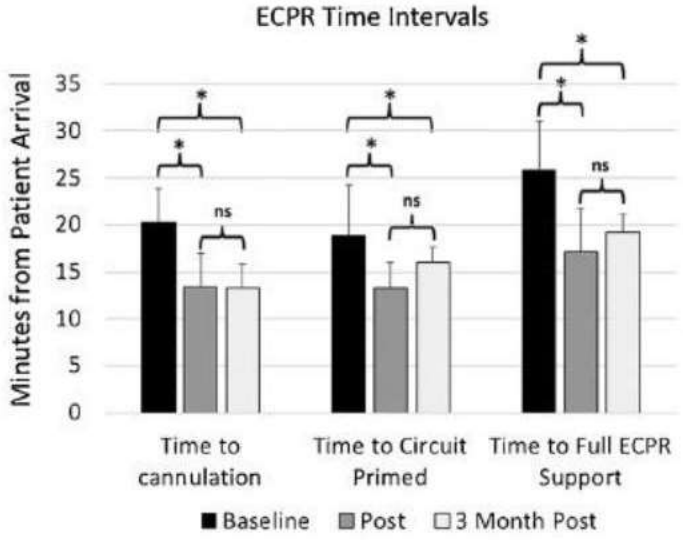
ECPR was successfully initiated within 30 min in ECPR在30分钟内成功启动

- 11/15 (73.3%) baseline simulations 基线模拟
- 15/15 (100%) post-test simulations 测试后模拟
- 15/15 (100%) 3-month post-test simulations 测试3个月后模拟

Although the improvement did not reach statistical significance (p = 0.06), the magnitude of the improvement (73%– 100%) is clinically important

虽然改善没有达到统计学意义，但改善的幅度在临床上是重要的

- Secondary outcome: time intervals required to complete cannulation, prime the circuit, and achieve full ECPR support 次要结果：完成插管、启动循环和实现完全ECPR支持所需的时间间隔



Research Example 2

Results 结果

- Primary outcome: critical action checklist adherence
- 主要结果: 关键行动检查表依从性
  - a statistically significant increase in the number of critical actions performed correctly between baseline (M = 40.3 ±1.8) and post-test (M = 43.6 ±0.6), (D = 3.3 actions, F (1, 4) = 13.2, p = 0.02) 显著增加
- Secondary outcome: incidence of safety violations

  次要结果：违反安全规定的发生率
  - no statistically significant differences in the average number of safety violations over time, F (2, 8) = 1.2, p = 0.35 无显著差异

Conclusion 结论

- High fidelity simulation training is effective in preparing emergency medicine physicians and nurses to rapidly and safely initiate ECPR in a simulated cardiac arrest scenario and should be considered when implementing an ECPR program. 高保真模拟训练对于急救医生和护士在模拟心脏骤停的情况下快速安全地启动ECPR是有效的，在实施ECPR程序时应该考虑。

Appy for PHD study

How to apply?

- Application forms available from
  - Graduate School, CUHK
    - Tel: 2609-8976, 2609-8977
    - Email: gradschool@cuhk.edu.hk
    - On-line application
      http://www.gs.cuhk.edu.hk/page/ApplicationforAdmission

Admission Requirements

- The general requirements of the Graduate School of the Chinese University of Hong Kong (http://www.gs.cuhk.edu.hk/page/EntryRequirements); and
- an outline research proposal with justification for the chosen area of research interest (1,000 words in English); and
- a Master's degree from a recognized university; or
- graduated from a recognized university and obtained a Bachelor's degree, normally with honours not lower than Second Class; or
- graduated from an honours programme of a recognized university with a Bachelor's degree, normally achieving an average grade of not lower than "B"; or
- completed a course of study in a tertiary educational institution and obtained professional or similar qualifications equivalent to an honours degree.

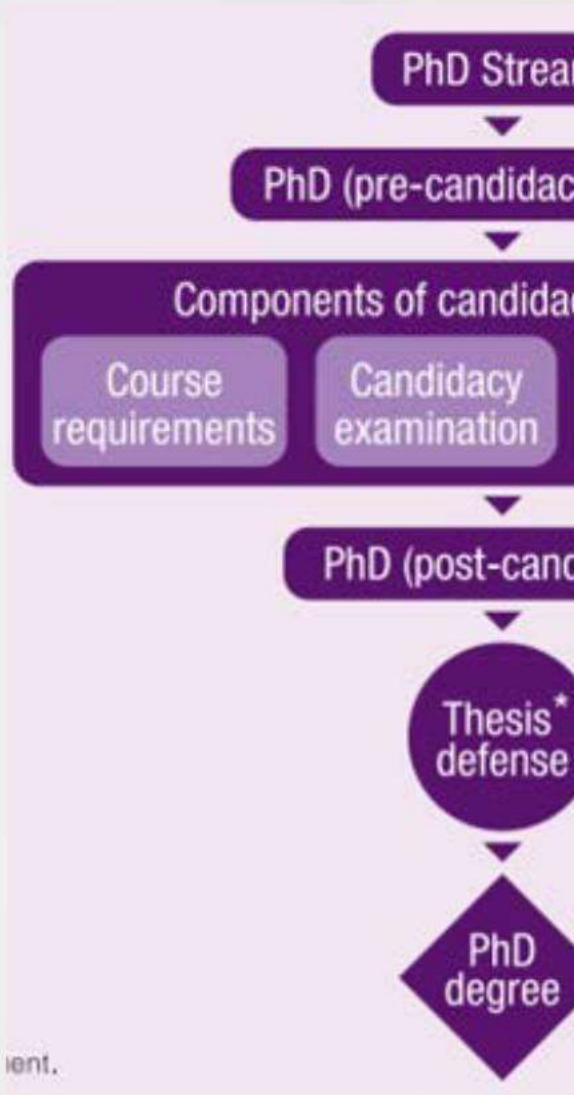
Overview of our MPhil-PhD programr

Full-time mode

- 36 months: entering with a research master's degree
- 48 months: entering without a research master's degree

Tuition fee

- HK$42,100 per annum



HKPFS scheme

- Part F: Past Research Experience and Proposed Research Plan
  1. **Past Research Experience** - Please describe your related experie participation in research projects
  2. **Proposed Research Topic**
  3. **Proposed Research Plan** - Please describe your proposed resear detailed objectives and methodology for doctoral research
- Part G: Vision Statement
  - Reasons for wishing to **pursue PhD studies** in Hong Kong
  - **Long-term career plan, aims and interests for future developme** graduation
  - Contribution that the applicant would like to make to the develop research in Hong Kong and to society

Thanks &
Welcome comments & suggestions

谢谢&欢迎提问及意见