Simulation in pharmacy practice education: one step towards competency-based outcomes

Afonso Miguel Cavaco
Helena Marques
Rui Silva

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Simulation in pharmacy practice

- Previous information
  - Conflict of interest
    - The author has exclusive teaching and research duties at the public institution Faculty of Pharmacy, University of Lisbon, Portugal
    - The author declares no financial or any other relationships with the organizations, companies, brands or products mentioned in this presentation

Simulation in pharmacy practice

- Presentation outline
  - Experiential learning in healthcare education
  - Simulation for healthcare training
    - Computer simulation in healthcare and pharmaceutical sciences
  - Final remarks

Simulation in pharmacy practice

- Presenter's origin

Simulation in pharmacy practice

- Capital city of Lisbon

Simulation in pharmacy practice

- Faculty of Pharmacy, University of Lisbon

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- Experiential learning
  - The process of active learning through experience, i.e. one's learning while reflecting on what s/he is actually doing (Patrick F, 2011)
    - Distinct from didactic learning e.g. exemplification - passive role of learners
    - Distinct from hands-on learning, which does not require reflection from learners
  - A method of educating through first-hand experience
    - Effective for adult learners
      - Learning should be personally significant or meaningful, from real engagement
    - Skills and competencies are better acquired from "doing" rather than "knowing what to do" e.g. text-based learning

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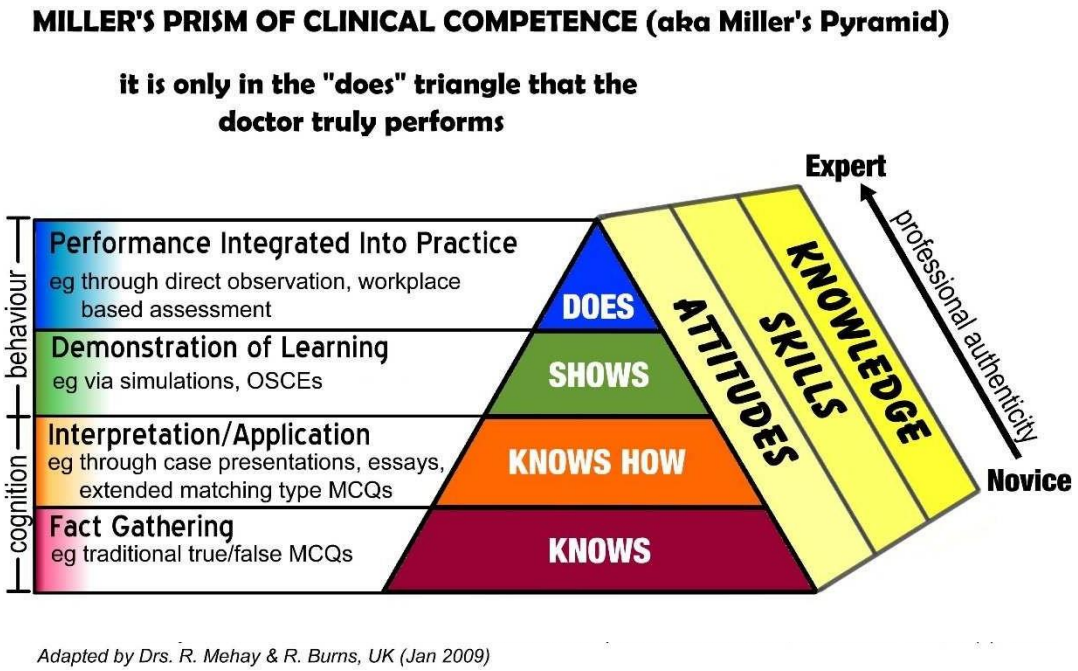
- Learning levels and clinical competence
  - Miller's pyramid (Miller, 1990)



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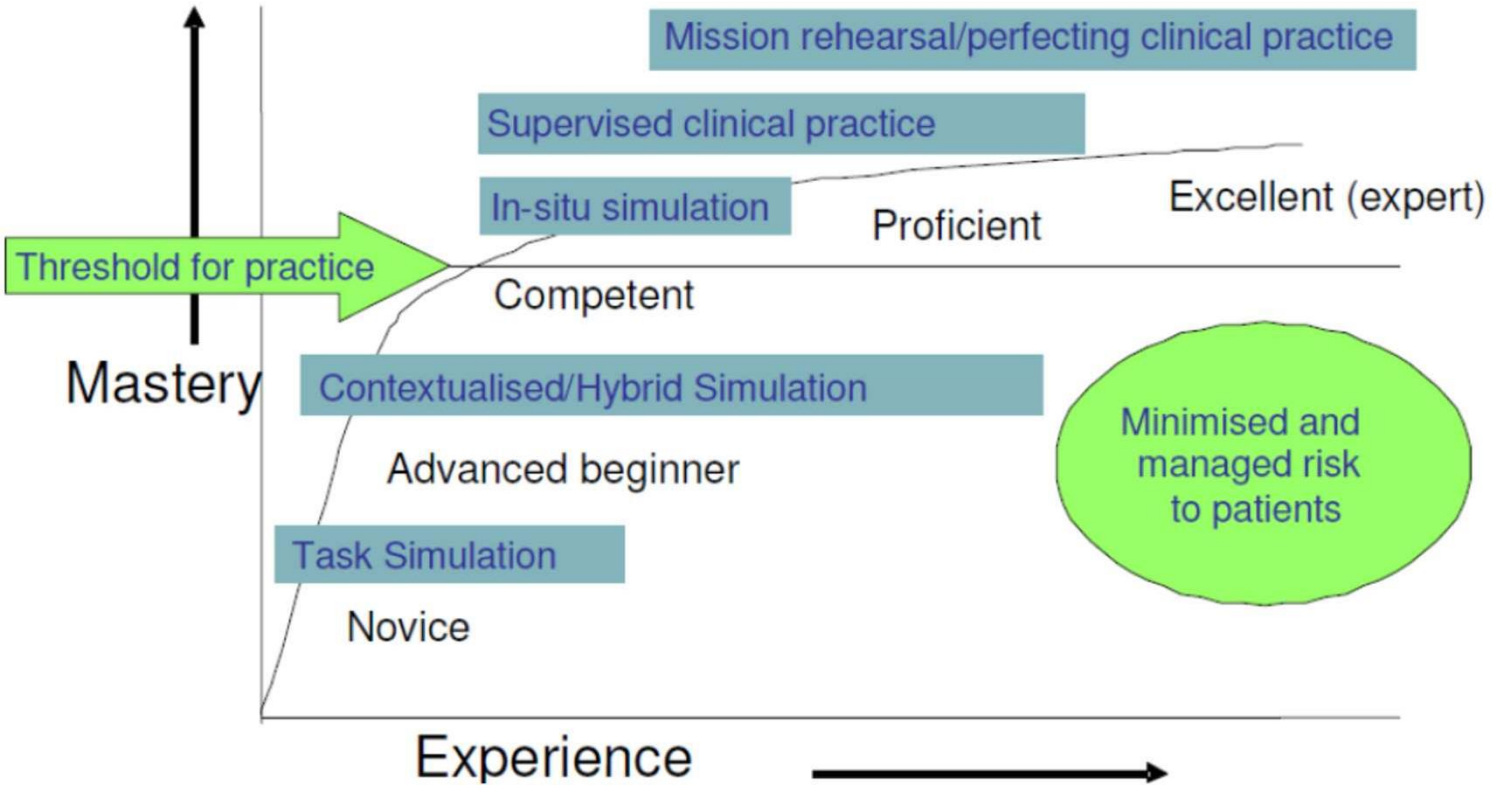

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- Simulation: one definition (Lin K et al., 2011; Smithson et al., 2015)
  - Teaching and assessing the acquisition of skills and competences through an interactive experience that was conceived as a professional activity
    - Used since ancient Greece e.g. final theatre rehearsal
    - In healthcare is used since the 70s (USA) e.g. simulated patients and video recording of the episode
      - Healthcare professions: medicine and surgery, nursing, pharmacy, dental medicine, physiotherapy, occupational therapy, etc.
  - The main goal is to mimic a practice situation as real as possible, thus promoting the development of the expected professional abilities

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- Simulation
  - Main advantages
    - Safety of those involved, especially the patient
      - Allows making mistakes and to observe the consequences i.e. learning
    - Enables repetition, thus increasing professional confidence
      - By increasing practical experience, allows correction and reduction of failures and errors, thus reducing anxiety when carrying out tasks
    - Establishes a nexus between theory and practice
      - Improves the level of fitness to practice
    - Supplements the potential limitations of practical experiences e.g. infrequent cases e.g. during the apprenticeship
    - Uses a controlled learning environment i.e. the same configuration, immediate feedback, review and evaluation, for all students
    - Contributes to alleviate problems related to lack of human teaching resources

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- Simulation
  - Main disadvantages
    - It is not actually real i.e. not equivalent to work with real patients
      - Personal/emotional fluctuations and environmental distractions are absent
    - Educational gains depend on student acceptance, motivation and involvement
      - Very specific simulations (e.g. blood pressure procedure on a dummy arm) may lack the acquisition of other associated important skills
    - Cost of the equipment (due to its sophistication)
    - The need for operators prepared to use all the potential that the simulation offers (technical and clinical training)
    - Lack of guarantee in the educational return considering the investment
      - Do students achieve better fitness for practice comparing with to traditional training?

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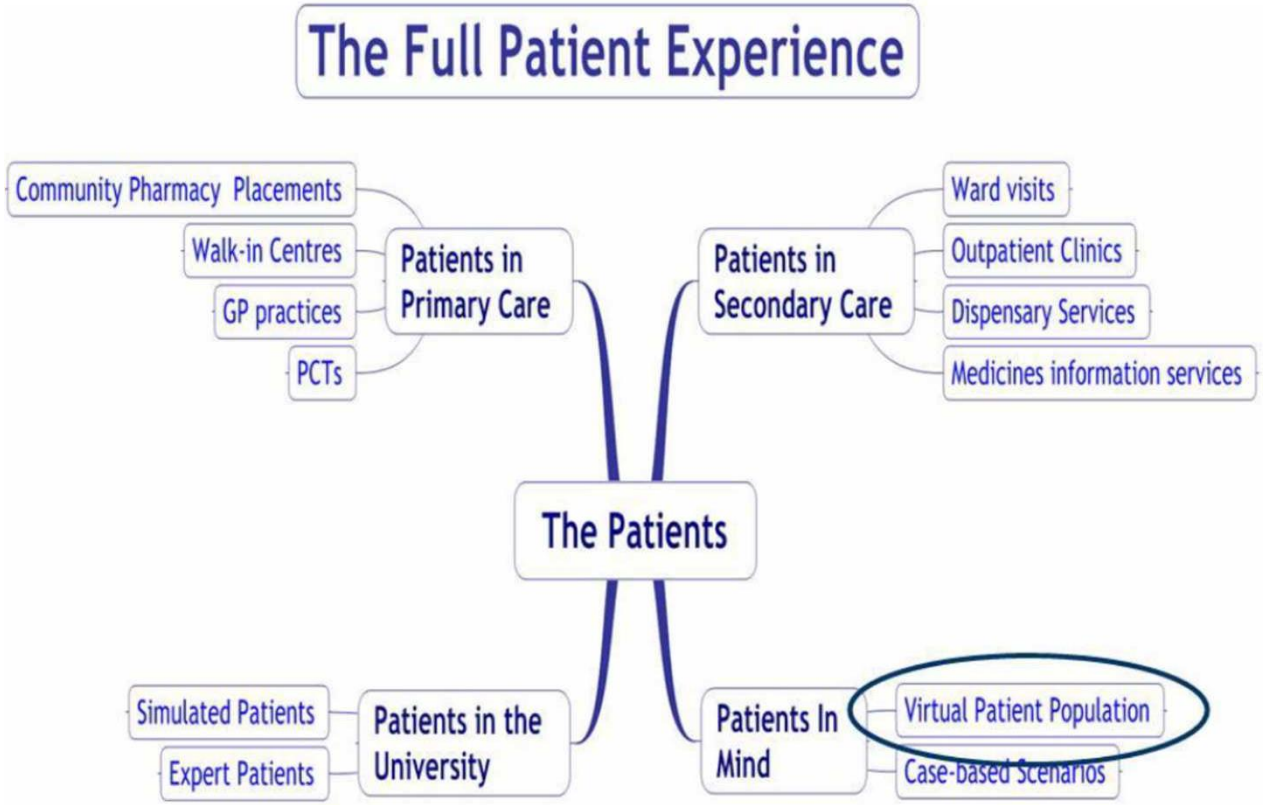
- The central element of healthcare simulation: the patient (in UK)



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- Types of simulation in healthcare training, according to the support: human or technological (Lin K et al., 2011)

- Human: simulated patients (SPs)
  - Real and experienced patients (Basheti, 2014)
    - Non-invasive tasks e.g. simple clinical procedures and other interventions
  - Simulated or standardized patients (Smithson et al., 2015)
    - Real people, generally healthy actors, trained to portray patients, from clinical history (with past and present signs and symptoms) to the display of emotions
    - Non-invasive tasks e.g. development of communication and interaction skills (information and education about medication use)

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- Main advantages of SPs
  - High users' acceptance and satisfaction
  - Effective acquisition of knowledge and skills
  - Good acceptance as an evaluation tool e.g. OSCEs
- Main disadvantages of SPs
  - Limitations as to the transfer of knowledge, scalability and standardization of training and assessment
  - In general, not possible intense repetition and improvement
  - Main barrier: the costs associated with training and SPs recycling i.e. use of the same simulated patient for different scenarios

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- Technological (1): mannequins or high-fidelity human simulators (HFM) (Seybert, 2011, Crea, 2011)
  - Mimicry of human physiology and behavior e.g. sounds of the heart and breath, blood pressure, sweating, cyanosis, tremor, etc.
  - May represent a specific pathology or a variety of disease states, responding to physiological and pharmacological interventions
  - An example: https://www.youtube.com/watch?v=M36Ph2UwzH0
  - Other models for specific clinical tasks: moderate fidelity simulators
    - Devices designed to assist in specific techniques and skills e.g. endoscopic surgery simulator, preserved animal tissue for suture training, etc.

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- Main advantages of HFM
  - Programming and control of parameters (initially and responses) for infrequent or less accessible clinical situations to the inexperienced professional
  - Higher educational efficacy compared to case resolution, including in pharmacotherapy (Chin et al., 2014; Seybert et al., 2007 and 2008)
  - High acceptance with a positive impact on interdisciplinary work skills (Fernandez et al., 2007; Tofil et al., 2010; Maidhof et al., 2012; Ling et al., 2013)

- Main disadvantages of HFM
  - High cost of acquisition (and maintenance, up to $ 90,000 depending on functionalities), adding to costs of auxiliary equipment e.g. beds, vital signs monitors, etc.
  - Space required for the equipment
  - Initial presence of a specialist to support programming

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- Technological (2): computer-based simulation (CS)
  - Simulation of "paper and pencil“ clinical cases, carried out through local software or via web, e.g. e-learning platforms (Marriott, 2007; Noori et al., 2014)
    - Allows easy access to different educational materials (e.g. video demonstrations) for a large number of clinical cases
    - There is the possibility of longitudinal therapeutic follow-up
  - Allows the management of a large number of students simultaneously, including online assessment of their knowledge
    - Generates savings on human resources and time

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- Main advantages of CS
  - Allows a quick introduction of parameters to fit a growing variety of scenarios and practical requirements
    - E.g. unstable pediatric patients, rare or poorly understood diseases, terminal care of rapid evolution, inter-professional conflicts, etc.
  - Unlike the mannequins, allows to appreciate the consequences of the long-term clinical decisions in the patient (and the health team)
    - Focus beyond "physical actions“, focusing the user on decisions that also involve emotional intelligence
  - Evidence supports the positive effects of computer simulation on gaining knowledge and skills, transferable to healthcare delivery (Ravert, 2002; Kane-Gill, 2011)

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- Main disadvantages of CS
  - In general, focused on a specific task, with unequal training for ancillary skills
  - Difficulties in reproducing unexpected factors of human interaction e.g. less rational attitudes, environmental disturbances, etc.
  - Doubts about the learning effectiveness: studies show the best solution is blended learning i.e. first CS and/or HFM , then supervised clinical experience (Curtin et al., 2011)

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- Virtual reality by CS
  - Videogame type of simulation, designed and developed through computer graphics for the learning of tasks and specific situations
  - The most affordable form of simulation
    - Running in most computers and other electronic devices, through a dedicated software or web pages
    - Possible to create many different environments, from interaction with a 2 or 3D virtual patient (VPs) to augmented reality and immersive virtual environments
      - Use of VR headsets and/or rooms with 3D projection and visualization
  - Examples: https://www.youtube.com/watch?v=vrE7KGpAi50 https://www.youtube.com/watch?v=e-P3bOzP9TU

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- Virtual reality is possible to combined with other simulation options, as well as (simultaneously) with different health professionals
  - Allows interaction for inter-professional education

- Simulation in clinical pharmacy practice: examples
  - Patient evaluation training
    - Physical assessment and objective clinical data: mannequins and clinical records in computerized databases
    - Patient interview and subjective clinical data: simulated and virtual patients
      - Therapeutic interventions e.g. in pharmaceutical care and drug therapy management
  - Communication skills training
    - Personal counselling of patients and caregivers: simulated and virtual patients
    - Interaction with other professionals: immersive simulation labs

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- Additional issues in clinical simulation
  - *How to assess knowledge and skills acquired by simulation?* (Bray et al., 2011)
    - For knowledge assessment: e.g. traditional written and/or oral testing
    - For skills assessment: e.g. check list of behaviors
      - Recorded manually by external observers (OSCE type)
      - Automatic record made by the mannequin and/or the simulation software
  - Assessment should go beyond clinical skills, including also critical thinking, behavior adequacy and team interaction
    - Assessment also of users' confidence/self-efficacy, with pre- and post-use of the application (including satisfaction)
  - *Where is the frontier between CS and serious games?* (Bindoff et al., 2014; Hookham et al., 2015)
    - Serious games usually provide less verisimilitude, being captivating i.e. attractive and entertaining by using progression levels, peer competition and final prizes

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- Final remarks
  - Simulation has an undeniable role in achieving a proficient level of skills through a safe training environment
    - However, it must continue to evolve into realism to become an inevitable training tool
  - Clinical simulation benefits from previous robust learning in areas essential for pharmacy practice e.g. semiotics, therapy, communication
    - Simulation should only be implemented when the local practice paradigm and aimed learning objectives are defined and stable
  - CS evolution is unstoppable e.g. patient holographic visualization for precision medicine, BUT without missing the greater purpose pharmaceutical education: pharmacists' contribution to health and well-being of human beings

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- Thank you for your attention

  - Contacts
    - www.ff.ulisboa.pt
    - acavaco@ff.ulisboa.pt
    - +351217946456

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