Virtual Patients for Education, Assessment and Research

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Virtual Patient

• “…specific type of computer program that simulates real-life clinical scenarios; learners emulate the roles of health care providers to obtain a medical history, conduct a physical exam, and make diagnostic and therapeutic decisions”

[AAMC 2010]
Popular synonyms

• Case-based training systems
• Interactive Patients
• Patient Simulations
Reasons for the lack of real patients

• Some diseases are seasonal
• patients with severe diseases cannot serve as educational subjects for a large number of medical students
• the average stay time of patients in hospitals has decreased over the last years.
Acceptance of Virtual Patients

- High acceptance among students and medical teachers
- Judged as an effective learning method
- Practical approach has been assessed very positively
- Requested for all clinical subjects
- One Virtual Patient per week desired

[Huwendiek et al. 2006a, Huwendiek et al 2006b]
The CAMPUS Virtual Patient System

[Haag, Huwendieck 2010]
CAMPUS Authoring Component

Examinations – Data and Metadata

Case Structure Tree

Media / Question / Links
CAMPUS Classic Player
Simulative approach: Diagnoses

![ICD-10 Encoding interface](image)
Teaching and Learning Activities

Virtual Patients (VPs):
- Interactive usage of VP (decision making)
- Supervision of VP from admission to discharge

Usage (Blended Learning):
1. Tutor supervised practical
2. Follow-up to seminars
3. Preparation for bedside teaching
4. Self study

Assessment Tasks

Virtual Patient in the examination:
- Assessment of decision-making authority with key-feature exams
- Especially assessment of clinically relevant key decisions

Intended Learning Objectives

Differential diagnostic skills:
- Successful diagnosis and treatment of Virtual Patients
- Active usage of medical knowledge

Constructive alignment [Biggs]:
Coordination of learning objectives, teaching and learning activities and assessment tasks

Integration in the learning management system AthenaMed:
Integration of intended learning objectives and VPs in AthenaMed. Provision of communication tools.
Exemplary Integration: Timetable of the pediatric module
Exemplary Integration: Seminar

Seminar: Fever in children

Learning Outcome

- Seminar: Fieber beim Kind

Assumed Knowledge

- Vorausgesetztes Wissen für dieses Seminar: keine

Explicitly recommended follow-up

- Ausdrücklich empfohlene Nachbereitung:
  - Bücher:
    - Speer/Gehr Pädiatrie 2. Auflage Seiten 543-549

Virtual Patients

- Interaktive Betreuung eines pädiatrischen virtuellen Patienten (CAMPUS Pädiatrie):
  - Kleinkind mit Hinken (klassische Darstellungsweise), Kleinkind mit Hinken (vereinfachte kartenbasierte Darstellungsweise)
Secure CAMPUS VP Assessment System

Long Menu Question

Welche vier Labortests führen Sie zumindest durch?

ENA
- Adrenalin
- ENA-Screening (n-RNP, Sm, SSA/SSB, SCI-70)
- Citrullin-CoA-Dehydrogenase-Aktivitätsbestimmung
- Noradrenalin
- Thrombozytenfunktions test (Plättchenaggregations test)
- Vom Willebrand-Faktor Multimeranalyse (WF-Multimer)
Assessment with Virtual Patients: Practical Implementation
Summative assessment with Virtual Patients

• Acceptance among students (n=192)
  – Likert scale: 1=”disagree” to 5=”strongly agree”

• Average
  – Useful way to assess: 3.6
  – Is easy to practical use: 3.8
  – Assessment is close to reality: 3.6
  – Assessment supports the practical training: 3.5
Virtual Patients for Research

• How must Virtual Patients be designed to optimally facilitate learning?
• How can we adapt Virtual Patient design for different learning objectives?
• How can we integrate Virtual Patients into the curriculum so that they have the best possible impact on students learning?
Medbiquitous Virtual Patients Working Group

• Mission: „…to develop XML standards and Web services requirements to enable interoperability, accessibility and reusability of Web-based virtual patient learning content.”
Medbiquitous Virtual Patient (MVP) Components

- **Virtual Patient Data**: Personal and clinical data relevant to the clinical scenario being simulated.
- **Media Resources**: The images, animations, video, audio files and any other discrete digital objects associated with the virtual patient.
- **Data Availability Model**: Describes the functionality necessary in a conformant player.
- **Activity Model**: Encodes what the learner can do and how they engage with the virtual patient.
- **Player(s)**: Aggregations of VPD and MR elements for exposure through the AM.

[Virtual Patient Working Group 2010]
Card Player: OpenLabyrinth VP

Joseph is seen by the on-call consultant in Accident and Emergency. A nurse calls Joseph's wife to come to the hospital. The consultant is pleased you referred this patient before he deteriorated any further. He decides to admit Joseph to a general ward.

I don't feel very well at all doctor. I've been feeling feverish, it comes and goes, but I don't get over the last hour before it begins again. I start shaking and feel sweaty.

I don't feel like eating. I feel nauseous but haven't been sick; yet.

I also have a terrible headache. It gets worse during the fever.

My muscles ache as well, especially my back, and it's not getting any better.

I have tried taking some Paracetamol, it helps a little, but only for a short while. I am very worried doctor.'

Which of the following options would you consider doing first?

- Take the temperature
- Take patient history
- Prescribe Paracetamol
- Physical exam (e.g., head-to-toe)
- Prescribe Antibiotics
Path type variations of VPs

[Huwendiek et al 2009]
MVP support in CAMPUS

CAMPUS Authoring-System

Virtual Patients  Key Feature
Import  Export  Import  Export

DB

CAMPUS Authoring-System

MVP-Player

Classic  Card  Assessment

CAMPUS VP XML  CAMPUS KF XML

XSLT

CAMPUS MVP ZIP  Any MVP ZIP

XSLT
International cooperation
Summary

[Diagram showing relationships between VPs, students, curriculum, credits, motivation, integration, teaching method, literacy, acceptance, and infrastructure.]
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