The potential of Virtual Patients in medical education and CME
Presentation Outline

1. Virtual Patients
2. Barriers
3. Potential
4. Summary & Discussion
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” [Cook, Triola 2009]
The CAMPUS Virtual Patient System

[Haag, Huwendiek 2010]
Example: CAMPUS Player – Virtual Patient from University of Maastricht

<table>
<thead>
<tr>
<th>Name</th>
<th>Henri Roberts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>male</td>
</tr>
<tr>
<td>Age</td>
<td>47 years</td>
</tr>
<tr>
<td>Height</td>
<td>1.76 m</td>
</tr>
<tr>
<td>Weight</td>
<td>92 kg</td>
</tr>
</tbody>
</table>

You are on duty in the emergency department when Mr Roberts presents with severe abdominal pain. He looks grayish, is lightly perspiring and clearly in great pain. He is bending forward clutching his belly with his hands. Your supervisor is busy with a serious trauma patient and asks you to see Mr Roberts in cubicle 4 and examine him. ‘Call me when you have gathered all necessary information and then you can summarize the findings and discuss the differential with me’ she says.
Medical History
Medical History: Feedback
Physical Exam
Knowledge Question

The reasoning process resulting in a diagnosis always includes the weighing of alternative diagnoses. For each of the alternative hypotheses you have to consider independently if the findings speak against, in favour or neither against nor in favour of that hypothesis. Try to apply this reasoning process for all the alternative diagnosis given in this exercise.

- abdominal aortic aneurysm
- acute appendicitis
- acute gastritis
- acute mesenteric ischemia
- acute myocardial infarction of inferior wall
- acute pancreatitis
- acute pyelonephritis
- acute retention of urine
- cholecystitis
- colic of gallbladder
- diverticulitis
- gastric ulcer with perforation
- inguinal hernia with obstruction
- irritable bowel syndrome
- obstipation
- obstructive ileus
- pneumonia of inferior lobe of lung
- poisoning by drugs, medicaments and biological substances
- portal vein thrombosis
- renal colic
- rupture of spleen
- torsion of testis
Lab test
Technical Examination: Feedback
Epicrisis

Important questions the authors would have asked are:
1) Do you use alcohol? In what amount? Alcohol abuse is a risk factor for developing a pancreatitis. But high alcohol consumption can also cause stomach complaints.
2) Where is the problem located? Epigastric pain radiating to the back speaks in favour of a pancreatitis, cholecystitis and gastric problems.
3) How did it start? How long ago? How is the frequency of complaints? Continuous pain doesn’t speak in favour of gallstones.
4) How do the complaints influence your daily activities?
5) Do you have a loss of appetite?
6) Do you have to belch more frequently? Do you suffer from heartburn?
7) Did your eyes or skin have a yellowish color?
8) Did you have to vomit? Do you throw up blood sometimes?
9) Do you have any rise of temperature?

Summary
A 47-year-old pub owner with a history of angina pectoris, hypertension and duodenal ulcer presents at the emergency department with severe constant pain in the middle part of the upper abdomen. The pain started during the night and is increasing. He has vomited several times. He drinks 15-20 glasses of beer per day and smokes 30 cigarettes. There are no changes in bowel movements. Physical examination shows a man in very severe pain bending forward. Blood pressure is 180/80 mmHg and pulse in 104 bpm. Temperature is 36.2 degrees Celsius. His right upper abdomen and epigastrium are tender, but no muscular tension or rebound tenderness is palpable. Blood tests: strongly elevated CRP and ESR. Clearly elevated ASAT, GGT and amylase. Abdominal X-ray shows no free air below the diaphragm. Abdominal ultrasound shows an enlarged choledochus duct, congested gall bladder without gall stones and normal abdominal aorta. MRCP showed a distended choledochus duct probably caused by local pressure on the choledochus duct in the pancreatic head by focal pancreatitis or early pseudo cyst formation. Gall stones were not visible, and tumour formation in the pancreas head was considered unlikely.

Conclusion: pancreatitis, probably caused by alcohol abuse.
CAMPUS Authoring Component

Examinations – Data and Metadata

Case Structure Tree

Media / Question / Links
Usage of Virtual Patients

• More widespread in Medical Education than in Continuing Medical Education (CME)
  – Pubmed search
  – Internet search

[http://www.inmedea-simulator.net]

[http://www.pubmed.com]

[http://app.casus-cme-akademie.de/cme/app/homepage_cme.html]
Virtual Patients in Second Life

Barriers

• Significant higher costs compared to traditional CME activities
  – Effort for Virtual Patient authors
    • 20 hours to many 100 hours depending of complexity of Virtual Patient, interactivity and usage of multimedia
  – Administration and Support for Virtual Patient Platform
    • Authoring component
    • Player component
    • Assessment component

• Usability problems
• Difficulties to find sponsors
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 or health professionals in CME courses

• The average stay time of patients in hospitals has decreased over the last years
CME courses with real patients

• There is also a lack of appropriate real patients

• The organisation of on-site courses for CME courses is very time-consuming

• Participants of the courses have travel and accommodation expenses and loss of earnings
Acceptance of Virtual Patients

• High acceptance among students and medical teachers

• Judged as an effective learning method

• Practical approach has been assessed very positively

[Huwendiek et al. 2006a, Huwendiek et al 2006b]

• Requested for all clinical subjects
Authoring

senior physician

virtual patient engineer

publisher

creation of virtual patients

feedback evaluation

content creation

publication of virtual patients

delivery

virtual patients

learning management system (e.g. moodle)
course related communication

textbook knowledge

linking

self study
practicals
exams

PBL

seminars

teachers/students

application areas
International cooperation

Welcome to the eViP website!

This site is dedicated to bringing you information about the eViP programme, a collaboration between nine universities and MedBiquitous Europe. eViP is co-funded by the European Commission.

eViP aims to create a bank of 320 repurposed and enriched virtual patients. These virtual patients will be available under a Creative Commons Licence.

You can also read news about developments in the eViP programme, and our coverage of meetings and events.

Contact us for further details

[http://www.virtualpatients.eu/]
Inter-professional blended learning with virtual patients and practical training

- Improve paediatric emergency care

[Lehmann et al. 2011]
Paediatric emergency care

Knowledge

Team-communication

Practical skills

[Lehmann et al. 2011]
# Formative Assessment

This is your overview of the cases that you have edited:

**Subject of the case:** all

**Comparison of cases with the average:**
- Correctness
- Editing time

**Compare a particular case section:**
- Medical history
- Physical exam

<table>
<thead>
<tr>
<th>Name of Case</th>
<th>Case Number</th>
<th>Correctness</th>
<th>Editing Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tingling hands</td>
<td>160111</td>
<td>40% / Ø 80%</td>
<td>01:20 / 01:23</td>
</tr>
<tr>
<td>Neck and shoulder pain</td>
<td>160125</td>
<td>82% / Ø 80%</td>
<td>00:50 / 01:14</td>
</tr>
<tr>
<td>Diminished strength arm</td>
<td>160148</td>
<td>100% / Ø 80%</td>
<td>01:40 / 01:33</td>
</tr>
<tr>
<td>Neck pain</td>
<td>160130</td>
<td>78% / Ø 80%</td>
<td>01:00 / 01:03</td>
</tr>
<tr>
<td>Headache</td>
<td>160456</td>
<td>36% / Ø 76%</td>
<td>00:30 / 01:00</td>
</tr>
<tr>
<td>Liver injury</td>
<td>19</td>
<td>41% / Ø 42%</td>
<td>02:00 / 02:03</td>
</tr>
<tr>
<td>Neck pain2</td>
<td>160963</td>
<td>60% / Ø 58%</td>
<td>01:55 / 01:40</td>
</tr>
<tr>
<td>Broken leg</td>
<td>161852</td>
<td>100% / Ø 76%</td>
<td>01:10 / 00:50</td>
</tr>
<tr>
<td>Fever</td>
<td>161741</td>
<td>100% / Ø 100%</td>
<td>01:30 / 01:28</td>
</tr>
</tbody>
</table>

[Yilmaz, Haag 2014]
**Constructive alignment [Biggs]:**
Coordination of learning objectives, teaching and learning activities and assessment tasks

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**Intended Learning Objectives**

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

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**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

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**Assessment Tasks**

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

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Integration in the learning management system AthenaMed:
Integration of intended learning objectives and VPs in AthenaMed.

[Huwendiek]
Summary

• Virtual Patients are a valuable tool to improve medical education and CME

• Authors can use comfortable authoring software to create highly interactive and outcome-focused Virtual Patients

• Authoring of high-quality Virtual Patients is very expensive

• There are some possibilities to reduce costs

• Don’t forget: „Assessment drives learning“!
Questions / Contact?

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