

Using virtual patients in education

Bas de Leng

Faculty of Health, Medicine & Life Sciences, Maastricht University, The Netherlands

Summer course Monday June 23, 2008

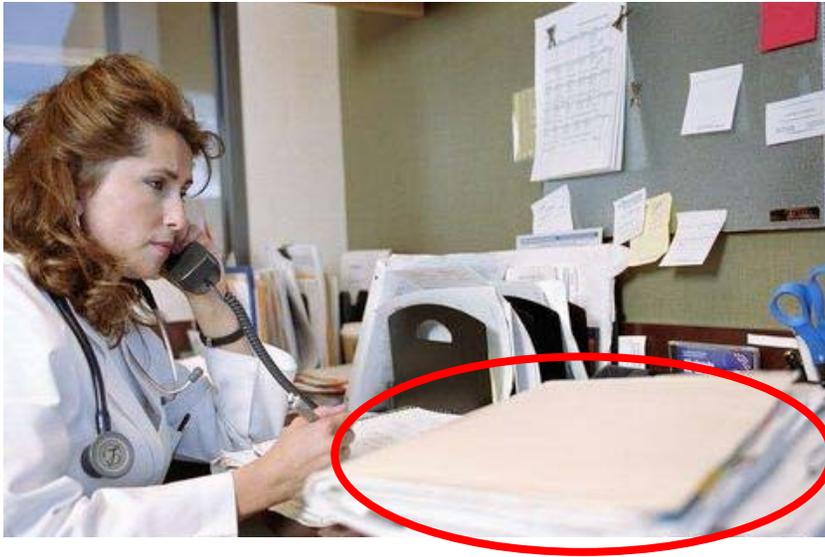


Faculty of Health, Medicine and Life Sciences



Universiteit Maastricht

What is a virtual patient?



- A virtual patient is a narrative scenario with interactivity allowing the learner to act as a health care professional.
- Two components
 - Patient case: patient data in multimedia format
 - Educational case: select content and interactivity for a specific educational goal (applying medical procedures or basic science knowledge, clinical reasoning)

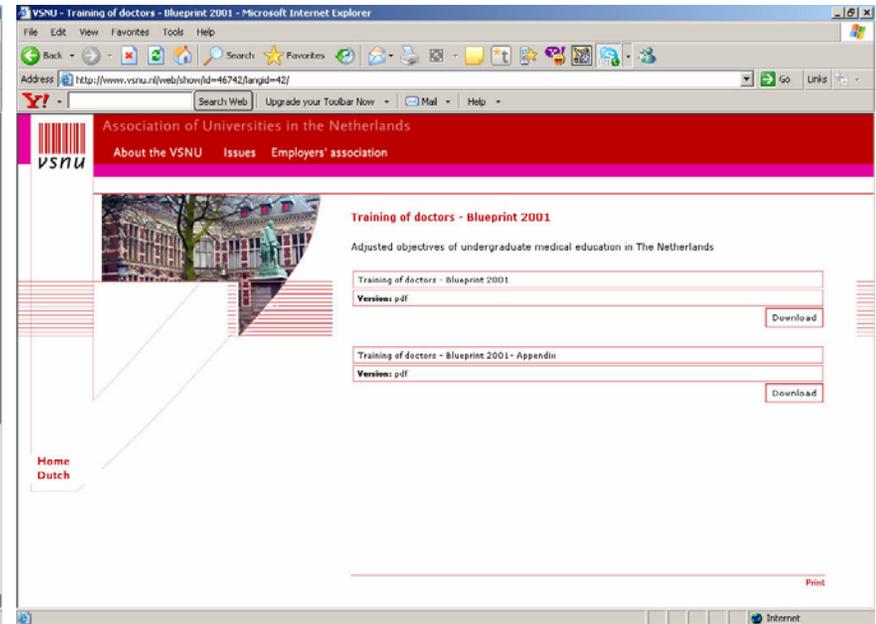
An example of a VP

The screenshot displays the CAMPUS Teaching and Learning System interface, which is divided into several windows and panels:

- CAMPUS Player** windows: Three instances of the application are open, each with a menu bar (File, View, ?).
- CAMPUS Teaching and Learning System**: The main title bar for the application.
- Physical** window: Shows a 3D anatomical model of a human torso.
- Patient record - Itching** window: Contains a 'View' section with tabs for 'Introduction' and 'History tab'. It lists several examinations with red exclamation mark icons:
 - CT-thoracic**: Extensive lymphom
 - CT-abdominal**
 - Ultrasound-upp**: The liver shows d
 - Punction-abdon**: During a second at was obtained. HistA 'Legend: Examination requisited' section is also present.
- CT-thoracic** window: Displays a large axial CT scan of the thorax. Below the scan, the text reads: 'Extensive lymphomas in the mediastinum.'
- Bottom Panel**: A navigation bar with various icons for navigation and a status bar at the bottom that reads: 'Diagnostics therapy loop 2/2; from the 7/16/02 until the 7/16/02'.

Why do we need virtual patients?

- To meet requirements of certifying agencies:
 - Liaison Committee on Medical Education (USA), Medical Council of Canada: formal lists of clinical pictures to be covered.
 - Association of Universities in the Netherlands (VSNU): list of clinical pictures as addendum to 'blueprint' as an exemplary overview.



Why virtual patients?

- Shortage of real patients
- Clinical reasoning is a complex cognitive activity in an ill structured knowledge domain. Need to:
 - combine different strategies reflecting the mental representation of medical knowledge: causal, formal, experiential knowledge.
 - to apply knowledge in a flexible way (cognitive flexibility theory).



Deliberate practice with:

- Workup of numerous cases with multiple connections.
- Selection of very specific cases.
- Deliberate sequencing of cases.
- Revisiting cases from different perspectives.

Why are VPs not omnipresent?

- Costly and time consuming to develop.
- Content and teaching method are not peer reviewed.
- Developed for specific context on isolated topics, no comprehensive coverage of curriculum.
- No structural funding for maintenance and update of VP collection.
- Teacher and student concerns: replacement of teachers and real patients, added to overloaded programme.
- No support for teachers in dealing with technical, pedagogical or strategic problems related to VPs.
- No empirical data on implementation and integration of VPs.

How to cope with these barriers?

- Collaborative and distributed development of VPs.
- Sharing VP collections: complementing, exchanging and re-using materials.

The image shows two overlapping browser windows. The top window displays the iVIMEDS website, which features a navigation menu with 'Overview', 'Services', 'Collaboration', and 'Partners'. A prominent banner reads 'think global... act local' with a background image of a woman wearing a headset. Below the banner is a login section for members. The bottom window shows the MedEdPORTAL website, which is a program of the Association of American Medical Colleges (AAMC). It includes a navigation bar with 'Home', 'Find Resources', 'Publish Resources', 'My MedEdPORTAL', and 'Login'. The main content area features a 'MedEdPORTAL Free Online Training Workshops' section and an 'About MedEdPORTAL' section.

The image shows a browser window displaying the eViP Electronic Virtual Patients website. The page has a blue header with the title 'eViP Electronic Virtual Patients' and the text 'Co-funded by the European Union'. Below the header is a 'Partners' section featuring logos for St George's, University of London (England), Karolinska Institutet (Sweden), LMU, The University of Warwick, Medizinische Fakultät der LMU München (Germany), University of Warwick (England), Universiteit Maastricht, Faculty of Medicine Maastricht University (Netherlands), and University of Heidelberg (Germany). On the right side, there is a search bar and a list of links under the heading 'eViP', including 'Welcome to eViP', 'Background & History', 'Vision & Objectives', 'Deliverables', 'Projects', 'Outcomes', 'Example', 'Glossary', 'Partners', 'Contacts', 'Weblog', 'Virtual Patients News', 'Join us', 'Links', and 'Disclaimer'. There is also a 'Subscribe' section with an 'eViP news' link and a 'Links' section with 'Member's login' and 'Project Wiki (restricted)'.

Sharing and re-using VPs

- Content: exported, transported, imported.
- Educational approaches, cultures, VP-systems: adapted to local needs.
- Re-usable learning objects.
- Common technical standard and data specification.
- MedBiquitous Consortium: MVP.



How to make a VP for the basic sciences?

- A VP is a narrative scenario with interactivity allowing the learner to act as a health care professional.
- Knowledge base contextualisation: VP vehicle to present knowledge.

Small assignment in pairs (10 minutes):

1. Choose a basic science topic that can be embedded in a VP.
2. How would you design the patient case and educational case with the focus on basic sciences and not patient management? Write this down in a few sentences.



How to apply a VP in education?



Virtual patient



1) Implement



2) Integrate

An example in a paediatric clerkship

- Wrap-up week after a 4 week paediatric work placement.
- VP presentation by a paediatrician complementing students' presentations of real patient encounters.

The screenshot displays a medical simulation interface with three windows. The left window shows an 'Introduction' page with a photo of a baby. The middle window is a 'Laboratory' test ordering screen with a list of tests and checkboxes. The right window shows 'Lab Tests' results for 'Diagnosis-Therapy-Loop 1'.

Laboratory Test Selection:

- Routine examination
 - Sodium
 - Potassium
 - Chloride
 - Creatinine
 - Glucose (Blood)
 - CRP
- Routine examination
 - Hemoglobin
 - Hematocrit
 - Erythrocytes
 - Leucocytes
 - MCV
 - MCH
 - Thrombocytes
- Select All

Request Lab Test

Lab Tests Results:

Selection by the case author: correct (green), wrong selected (red), wrong not selected (blue)

Your Selection: correct (green)

Diagnosis-Therapy-Loop 1

Indicated

Routine examination / Blood gas analysis (Arterial Astrup, Capillary Astrup)

Test	Value	Reference Range
O ₂ -saturation	97 %	(94 - 98 %)
Blood (capillary whole blood)		
pO ₂	49.1 mmHg	(71 - 104 mmHg)
Blood (capillary whole blood)		
BE	5.7 mmol/L	(-2 - 3 mmol/L)
Blood (capillary whole blood)		
HCO ₃	29.8 mmol/L	(21 - 26 mmol/L)
Blood (capillary whole blood)		
pCO ₂	43.7 mmHg	(26 - 42 mmHg)
Blood (capillary whole blood)		
pH	7.53	(7.35 - 7.45)
Blood (capillary whole blood)		

Routine examination / Clinical chemistry

Test	Value	Reference Range
CRP	1 mg/L	(0 - 5 mg/L)
Serum		
Glucose (Blood Glucose)	69 mg/dL	(35 - 70 mg/dL)
Blood (heparinized)		
Creatinine	3.8 mg/dL	(0 - 1 mg/dL)
Blood (heparinized)		
Chloride	95 mmol/L	(97 - 110 mmol/L)
Blood (heparinized)		
Potassium	3.1 mmol/L	(4 - 6 mmol/L)
Blood (heparinized)		
Sodium	132 mmol/L	(131 - 145 mmol/L)
Blood (heparinized)		

Face-to-face discussion

- Audience response system: response to anonymous polling as a trigger for f-2-f discussion.

Question 8

Have a close look at the results of the blood gas analysis. What do you think is wrong with Lars?

- compensated metabolic acidosis
- compensated respiratory acidosis
- compensated metabolic alkalosis
- compensated respiratory alkalosis
- decompensated metabolic acidosis
- decompensated respiratory acidosis
- decompensated metabolic alkalosis
- decompensated respiratory alkalosis

Submit

Poll results question 8

Have a close look at the results of the blood gas analysis. What do you think is wrong with Lars?

compensated metabolic acidosis	0 (0%)	
compensated respiratory acidosis	0 (0%)	
compensated metabolic alkalosis		3 (27.27%)
compensated respiratory alkalosis		1 (9.09%)
decompensated metabolic acidosis	0 (0%)	
decompensated respiratory acidosis	0 (0%)	
decompensated metabolic alkalosis		7 (63.64%)
decompensated respiratory alkalosis	0 (0%)	

Total votes: 11

Online discussions

- Discussion forum as an extension to the f-2-f session

Experimental environment - FHML Virtual Patients pilot for Paediatrics KG001

Users online: 1 (1 In this course) | Student View

Portal Homepage | My courses | My profile | My agenda | Reporting | Portal Administration | Logout

Virtual Patients pilot for Paediatrics > Learning path > Case Vomiting Infant for students

Build | Organize | Display

- Lars ✓
- Poll blood gas ✓
- EBM on therapy hypertrophic pyloric stenosis ✓

100%

New Thread

EBM on therapy hypertrophic pyloric stenosis

Title	Replies	Author	Views	Last post	Action
 conservative therapy	0	Bas de Leng	4	2008-06-10 17:39:49 By Bas de Leng	   
 pyloromyotomy	1	Bas de Leng	8	2008-06-10 17:38:39 By Bas de Leng	   

Take home message



- Stop building virtual patients alone, join a VP commons.
- Don't think in terms of isolated VPs, think of learning activities with a VP.
- Integrate VPs in blended scenario's in your curriculum.

Suggestions for further reading

- Homepage e-ViP project: www.virtualpatients.eu
- Berman, N., Fall, L., Maloney, C., & Levine, D. (2006). Computer-Assisted Instruction in Clinical Education: a Roadmap to Increasing CAI Implementation. *Advances in Health Sciences Education*.
- Ellaway, R., Poulton, T., Fors, U., McGee, J. B., & Albright, S. (2008). Building a virtual patient commons. *Medical Teacher*, 30(2), 170-174.
- Huang, G. M. D., Reynolds, R. M. P. A., & Candler, C. M. D. (2007). Virtual Patient Simulation at U.S. and Canadian Medical Schools. *Academic Medicine*, 82(5), 446-451.