



UniversitätsKlinikum Heidelberg

**CaL**Tech

# 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

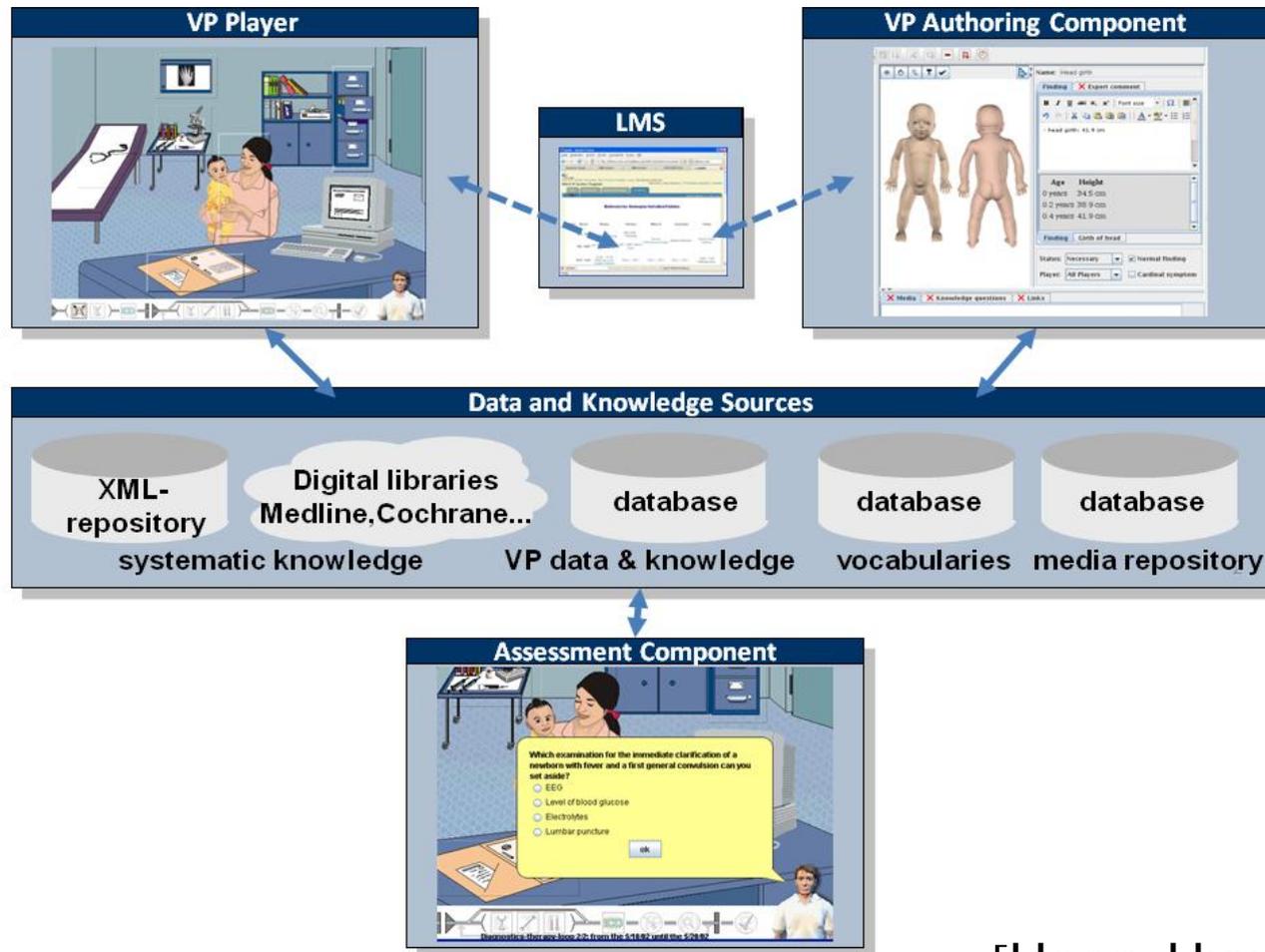
- Some diseases are seasonal
- patients with severe diseases cannot serve as educational subjects for a large number of medical students
- the average stay time of patients in hospitals has decreased over the last years.

# 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, Huwendiek 2010]

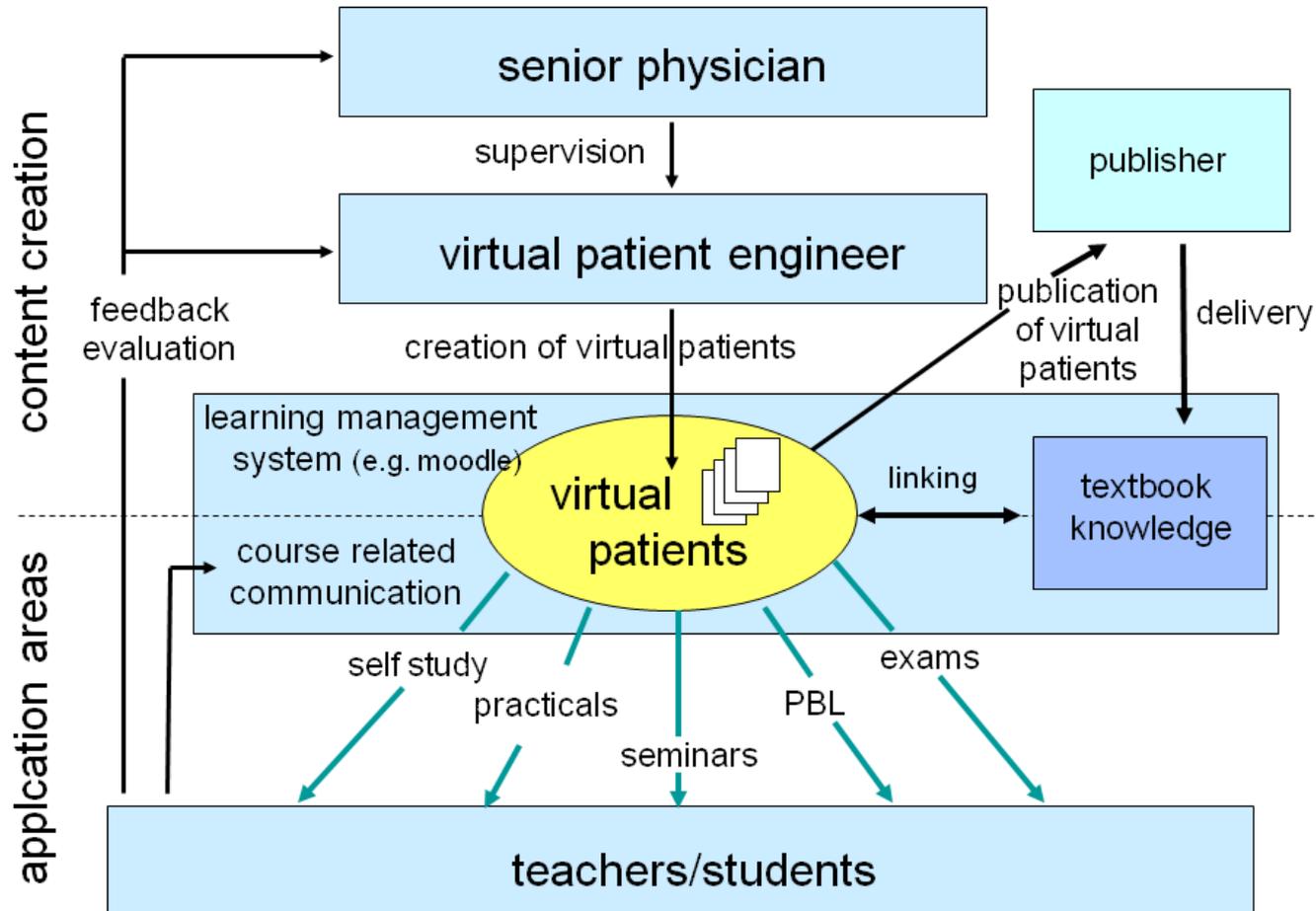
# CAMPUS Authoring Component

The screenshot displays the CAMPUS Authoring Tool interface for a case titled "Infant with fever". The interface is divided into several sections:

- Case Structure Tree (Left):** A hierarchical tree view showing the structure of the case. The tree includes sections like "Information", "Introduction", "Medical History", and "Physical examination". Under "Physical examination", there are sub-sections for "APGAR-score", "Auscultation", "Blood pressure / pulse", "Body mass and weight", "Functional testing", and "Inspection". The "Head girth" item is highlighted in blue.
- 3D Model (Center):** A 3D model of an infant, shown from both front and back views.
- Examinations – Data and Metadata (Right):** A panel for entering data and metadata for the selected finding. It includes a text area for "Expert comment" (containing "- head girth: 41.9 cm"), a table for "Age" and "Height", and a section for "Girth of head". The "Status" is set to "Necessary" and "Normal finding" is checked. The "Player" is set to "All Players".
- Media / Question / Links (Bottom):** A panel for adding media, questions, or links. It has a large text area and buttons for "New", "Edit", "Remove", and "Edit rights".

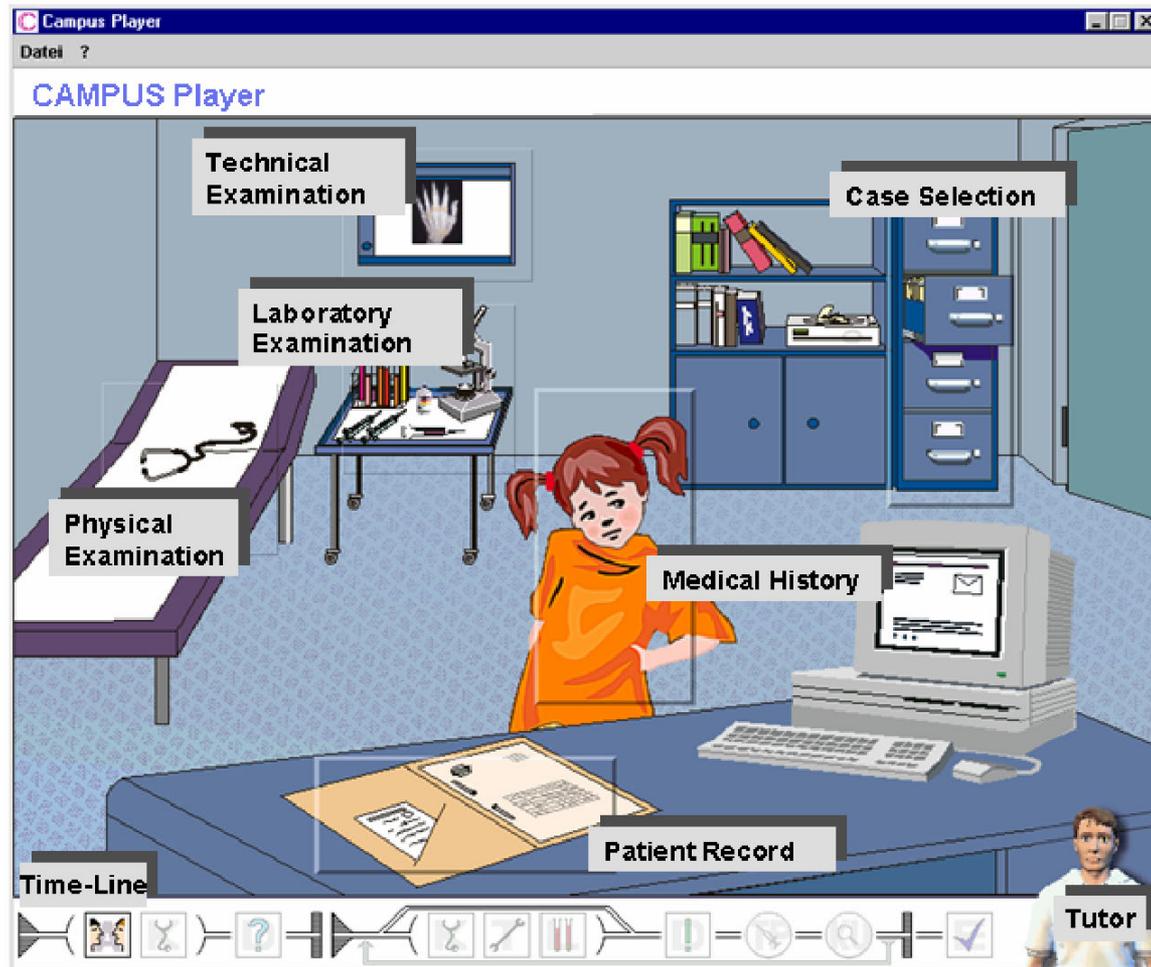
The title bar of the application reads "CAMPUS Authoring Tool: Infant with fever". The menu bar includes "System", "Edit", "Learning Object", "Extras", and "Assessment (beta)". The status bar at the bottom right shows "Logged in as: Der CAMPUS-Admin".

# Authoring

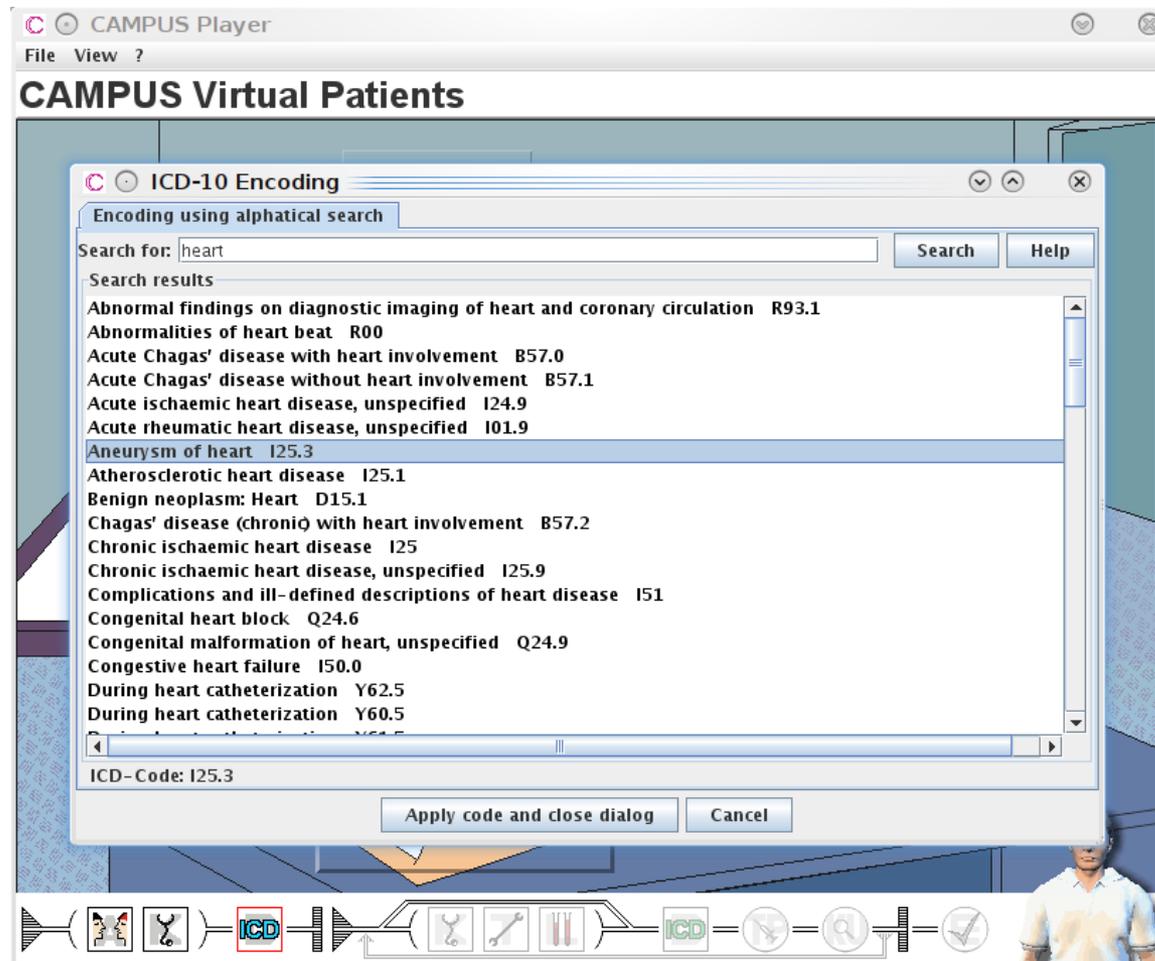


[Haag, Fischer 2010]

# CAMPUS Classic Player



# Simulative approach: Diagnoses



# Constructive alignment [Biggs]:

Coordination of learning objectives, teaching and learning activities and assessment tasks

## Intended Learning Objectives



### Differential diagnostic skills:

- Successful diagnosis and treatment of Virtual Patients
- Active usage of medical knowledge

## 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

## 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

Block IV Section Template

Elektronischer Studienplan HeiCuMed-Pädiatrie

Woche1	Uhrzeit	Montag	Dienstag	Mittwoch	Donnerstag	Freitag
	8:15 - 9:00	8:15 - 10:00 Einführung zum Modul	8:00 - 8:40: Fortbildung			
	9:00 - 10:00	und Fallbesprechung	8:45 - 10:00: Seminar Fieber	Seminar Entwicklungsstörungen	Seminar Wachstum	Seminar Akutes Abdomen
	10:15 - 11:45	10:00 - 11:00 Einführung zu den Virtuellen Patienten	POL-1 / CBT-1	POL-1 / CBT-1	POL-1 / CBT-1	10:00 - 11:00 Fallbesprechung

# Exemplary Integration: Seminar

**Seminar: Fieber beim Kind**

Dr. J. **Seminar: Fever in children**

**Learning Outcome**

**Lernziele: (häufige Ursachen für Fieber bei Kindern in unterschiedlichen Altersstufen)**

1. Nach dem Besuch des Seminars können Sie:
  1. Die häufigsten Ursachen von Fieber beim Neugeborenen, Säugling, Kleinkind und Schulkind benennen
  2. Diagnostische Maßnahmen zur Abklärung bei unklarem Fieber benennen
  3. Notfallsituationen mit Fieber benennen
2. Bis zur Prüfung können Sie zusätzlich (Selbststudium):
  1. Das Vorgehen bei Fieber im Neugeborenenalter (early-onset/late-onset Sepsis) beschreiben
  2. Die Symptome von typischen Kinderkrankheiten (Masern, Mumps, Windpocken, Scharlach, Exanthema subitum) beschreiben

**Vorausgesetztes Wissen für dieses Seminar:** keines

**Assumed Knowledge**

**Ausdrücklich empfohlene Nachbereitung:**

**Books**

**Bücher:**

- Speer/Gahr Pädiatrie 2. Auflage Seiten 543-549
- Muntau A.: Pädiatrie. Intensivkurs zum GK III, 2007: S.
- (Muntau A.: Pädiatrie. Intensivkurs zum GK III, 2004: : S.115 ff, "Infektiologie" u.a.)

**Interaktive Betreuung eines pädiatrischen virtuellen Patienten (CAMPUS-Pädiatrie):**

Kleinkind mit Hinken (klassische Darstellungsweise), Kleinkind mit Hinken (vereinfachte kartenbasierte Darstellungsweise)

**Virtual Patients**

Fertig

# Secure CAMPUS VP Assessment System

The screenshot displays the user interface of the Secure CAMPUS VP Assessment System. On the left, a navigation pane shows a tree structure of assessment components: 'Sören Evaluation (1/6) (abhängig)', 'Sören Fall1 (2/6) (abhängig)', 'Fallabschnitt 1 (1/3)', and 'Fallabschnitt 2 (2/3)'. The main area contains a question: 'Welche vier Laboruntersuchungen führen Sie zumindest durch?'. Below the question is a dropdown menu with the following options: 'ENA', 'Adrenalin', 'ENA-Screening (n-RNP, Sm., SSA/SSB, Scl-70)', 'Glutaryl-CoA-Dehydrogenase-Aktivitätsbestimmung', 'Noradrenalin', 'Thrombozytenfunktionstest (Plättchenaggregationstest)', and 'von Willebrand-Faktor Multimerenanalyse (WF-Multimere)'. A light blue box with the text 'Long Menu Question' is overlaid on the right side of the dropdown menu. At the bottom, a 'Vorschau' (Preview) pane shows a sequence of assessment sections: 'Fall 1 Sektion 1', 'Fall 2', 'Fall 2 Sektion 1', 'Fall 2 Sektion 2' (highlighted), 'Fall 2 Sektion 3', 'Fall 3', 'Fall 3 Sektion 1', 'Fall 3 Sektion 2', and 'Fall 3 Sektion 3'. A 'Preview' label is overlaid on this pane. The bottom status bar includes a progress indicator (3/25), a text input field for 'Nachricht an den Prüfer:', and a 'Senden' button.

# 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

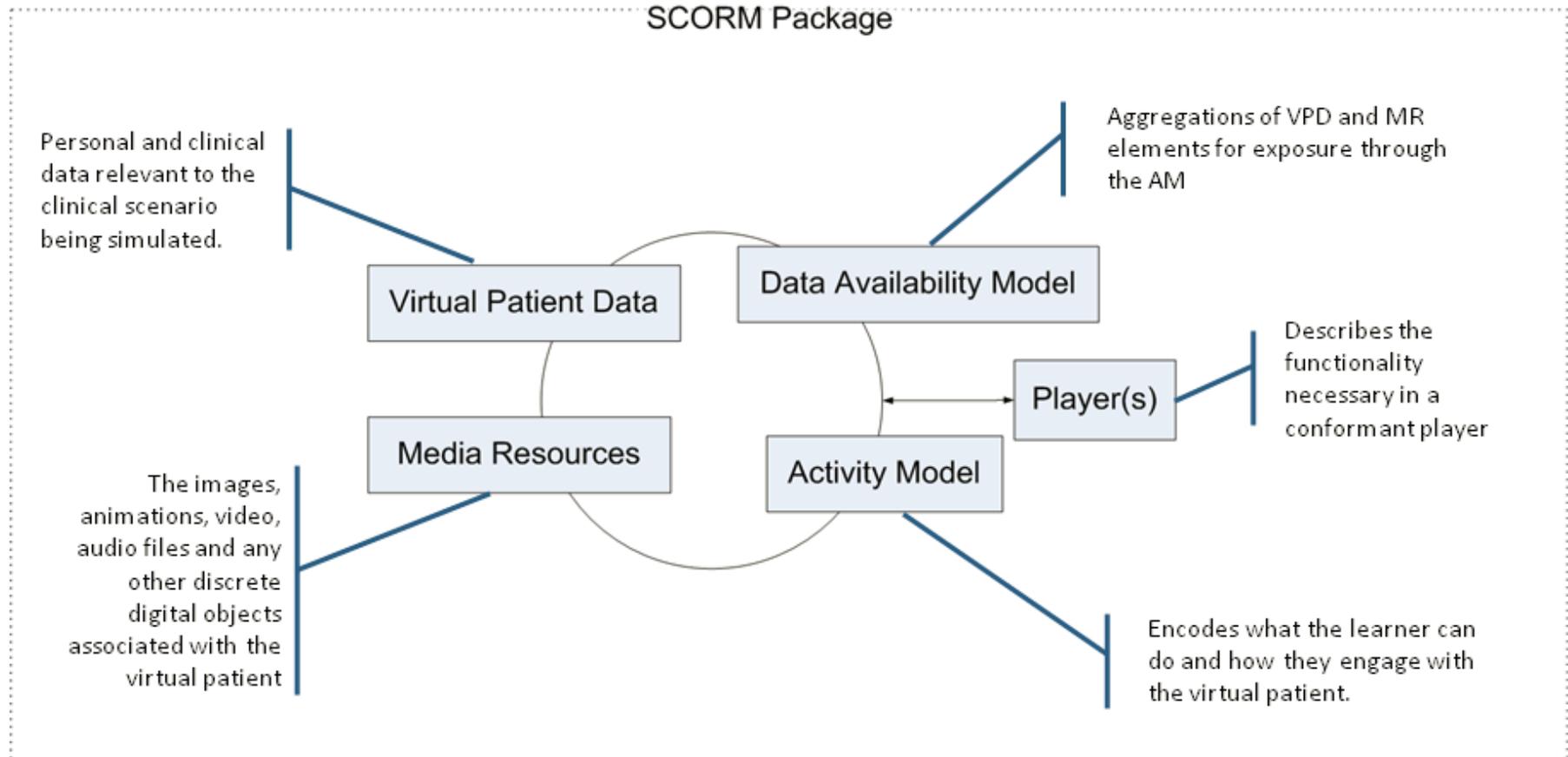
# Virtual Patients for Research

- 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 Working Group 2010]

# CAMPUS Card-Player: Native VP

The screenshot displays the CAMPUS Card-Player interface. On the left, there is a sidebar with the CAMPUS logo and several icons representing different categories: a folder, a document, a photo, and a red box. The main area shows a medical history card for a patient named Katrin M. The card is titled "Medical history" and lists several categories of questions:

- Category: Current history (23 questions)**
- Category: Miscellaneous (8 questions)**
- Category: Past history (1 question)**
- Past operations and illnesses** (checked): From which illnesses, e.g. childhood illnesses, has your child suffered recently? Did your child lie in hospital? Did it undergo any surgery? Does your child suffer from any chronic diseases?  
Answer: She has not been seriously ill until now.
- Category: Pregnancy, delivery, development (14 questions)**
- Delivery** (checked): In which week of gestation was your child born? How old were you when your child was born? How did the delivery progress? Can you tell me the birthweight, length and head circumference of your child when it was born? What was the Apgar score?  
Answer: Catherine was born after an uneventful pregnancy in the 40th week of pregnancy. I was 24 years old at that time. There were no problems during the birth. Catherine was 50 cm long, had a weight of 3540 g and had a head girth of 34 cm.
- Nutrition-breast feeding-additional food** (checked): Did you give any breast feeding? If so, how long did you give breast feeding? When did you start the bottle feeding? When did you start to give additional food? How much additional food do you give?  
Answer: I breast fed Catherine for 4 months. After that I gave her hypoallergenic milk. For the past two weeks she has been getting additional mashed fruits, mashed vegetables and porridge.
- Perinatal- and neonatal period** (checked): Were there any particularities with regard to the child during the first weeks after the delivery?  
Answer: No.
- Psychomotor development-general** (checked): Did the development stand still or decline? In how far? When?  
Answer: No.
- Pregnancy** (checked): How did the pregnancy progress? Did you take any medicine, alcohol or nicotine during pregnancy?  
Answer: There were no complications during the pregnancy. I did not take any medications. I did not drink or smoke.
- Food aversion** (checked): Is there any particular food that your child does not like?  
Answer: No, she is still breast-fed.
- Nutrition-diet** (unchecked)

At the bottom of the card, there is a legend for the selection status:

- correct** (green box)
- wrong not selected** (blue box)
- wrong selected** (red box)

The patient's name "Katrin M." is displayed below a placeholder image of a woman. The interface also includes a navigation bar at the bottom with various icons and a play button.

# Card Player: OpenLabyrinth VP

The screenshot displays the CAMPUS eVIP-Player interface. The window title is "CAMPUS eVIP-Player - Shiretoko". The menu bar includes "File", "Edit", "View", "History", "Bookmarks", "Tools", and "Help". The address bar shows "CAMPUS eVIP-Player".

**CAMPUS**

On the left sidebar, there are icons for a folder, a notepad, a photo album, and a red gift box.

**Case Study Text:**

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 bout before it begins again. I start shivering 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.

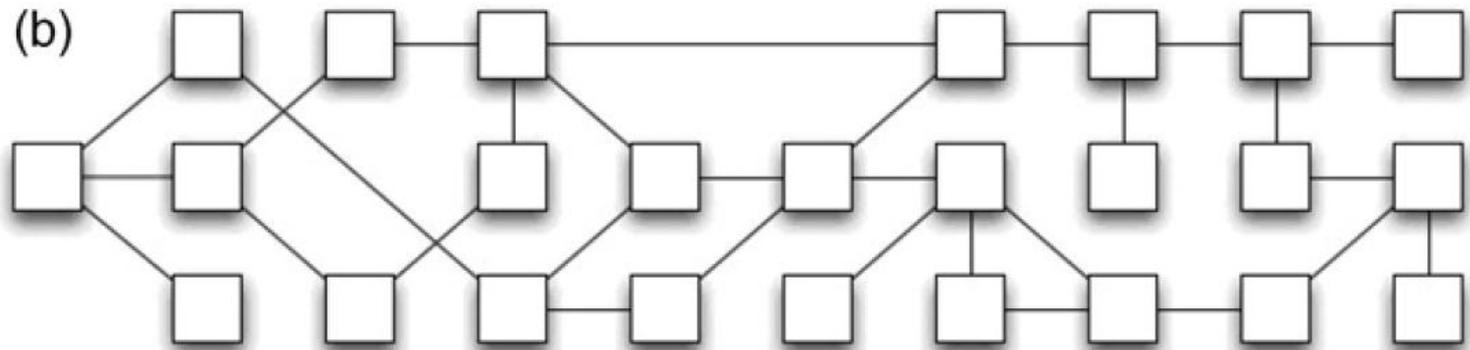
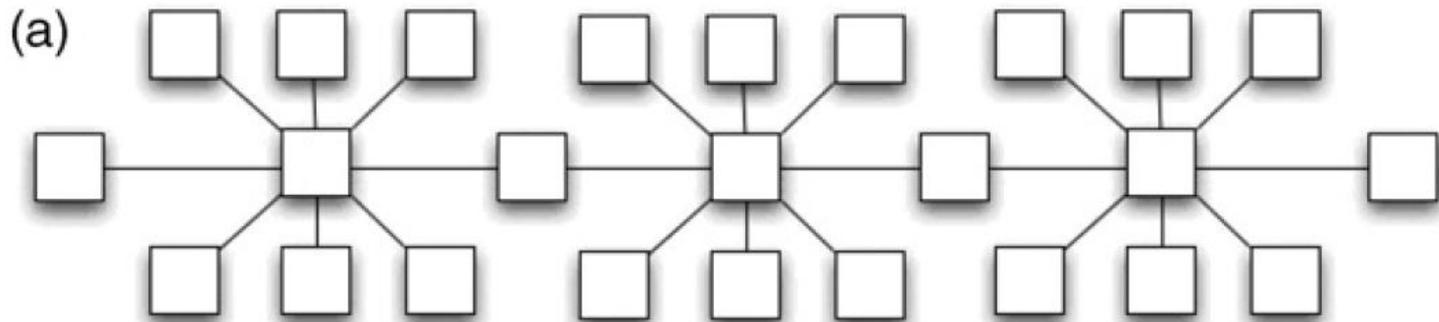
I have tried taking some Paracetamol, it helps a little, but only for a short while. I am very worried doctor."

Which of the following options would you consider doing first?



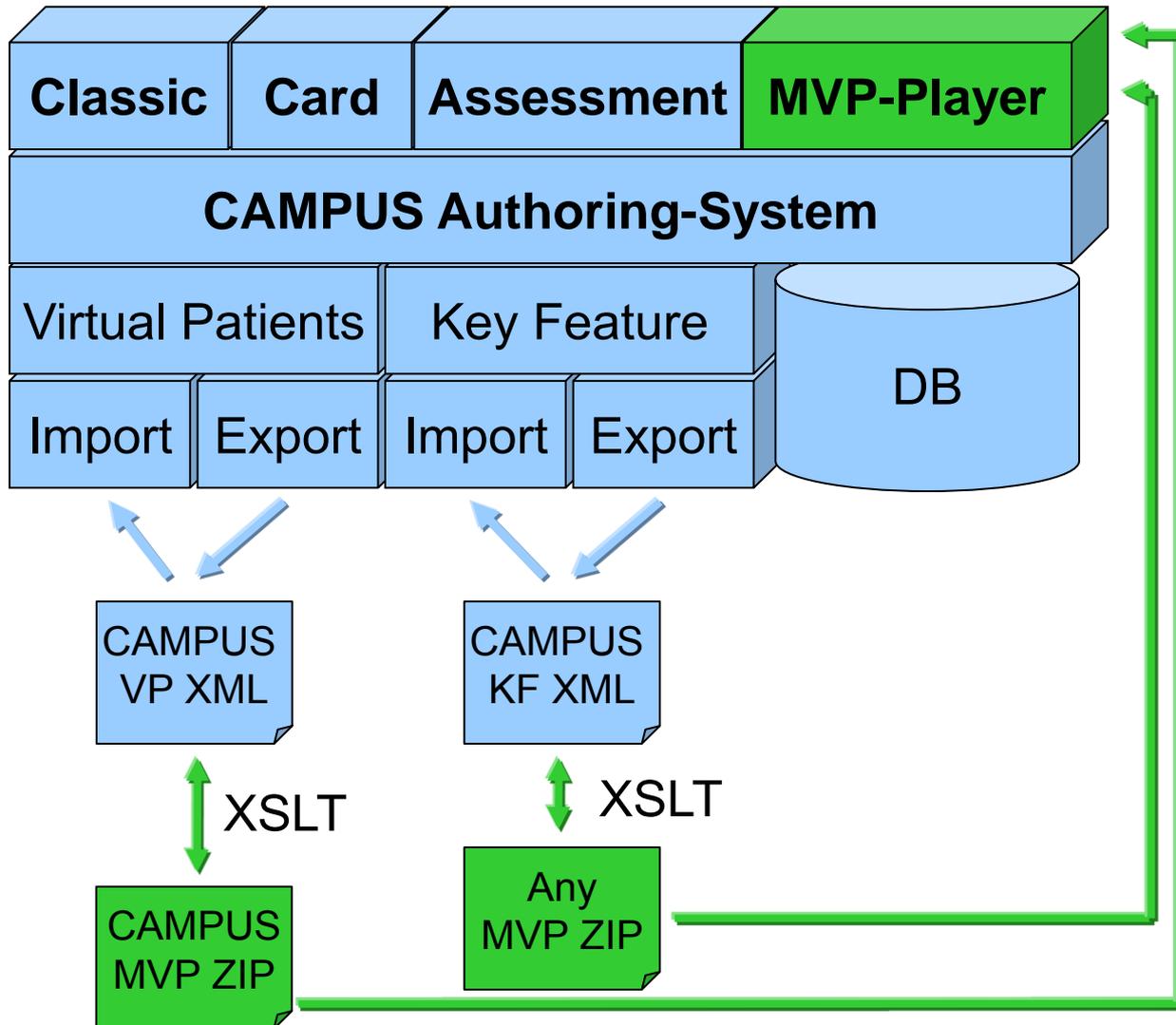
Take his temperature   Take patient history   Prescribe Paracetamol   Physical exam (early)   Prescribe Antibiotics

# Path type variations of VPs



[Huwendiek et al 2009]

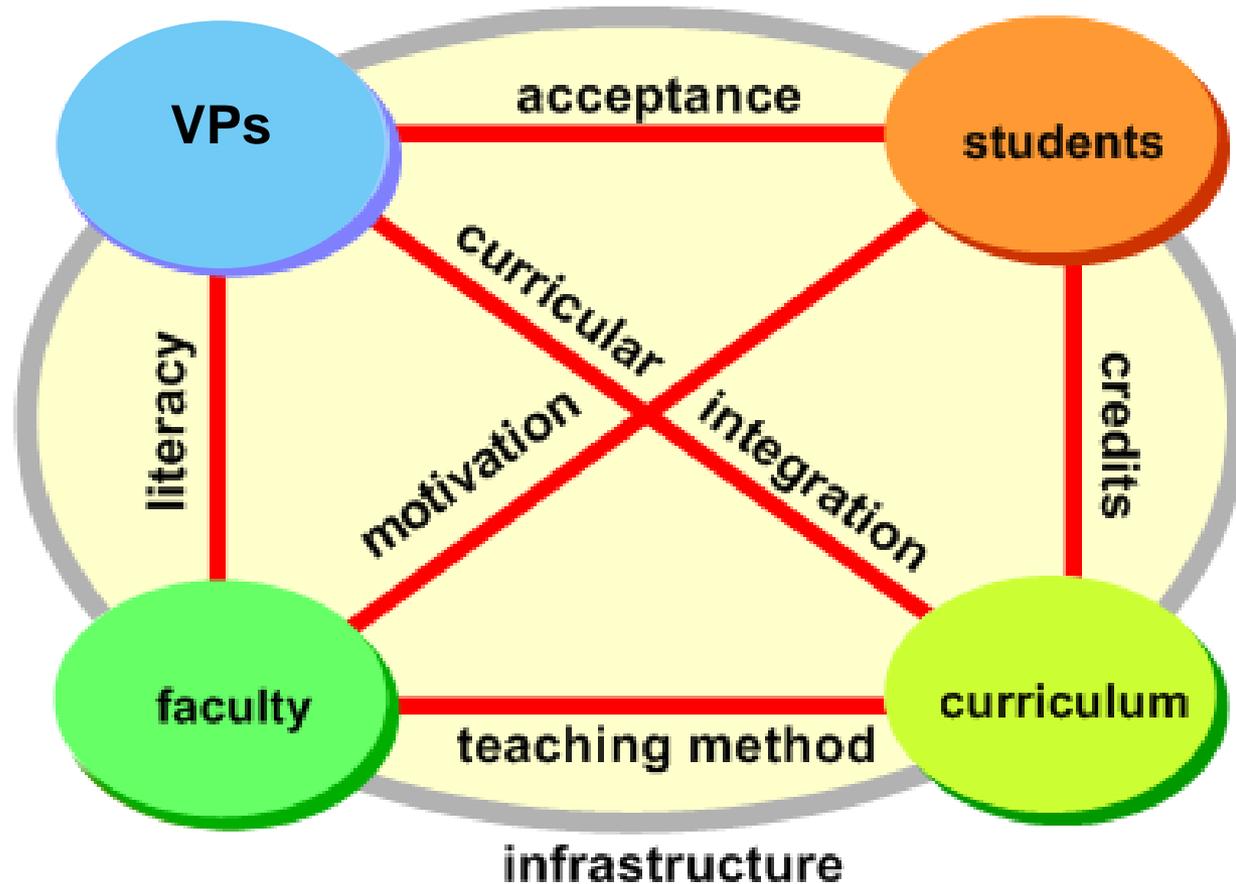
# MVP support in CAMPUS



# International cooperation

The screenshot shows a Mozilla Firefox browser window displaying the eVIP website. The browser's address bar shows the URL <http://www.virtualpatients.eu/>. The website's header features the eVIP logo, which consists of the letters 'eViP' in a stylized font surrounded by yellow stars, and the text 'electronic Virtual Patients' to its right. Below the logo, it states 'Co-funded by the European Commission' and includes the European Union flag. A navigation menu below the header contains links for 'HOMEPAGE', 'ABOUT »', 'RESOURCES »', 'NEWS »', and 'EVIP MEMBERS AREA »', along with a search bar. The main content area is titled 'Welcome to the eViP website!' and contains the following text: '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**'. To the right of this text is a video player showing a man, identified as 'Dr David Davies, University of Warwick, UK', speaking in front of a computer monitor. The video player has a play button and a progress bar showing '0:00 / 1:06'. At the bottom of the website, there are three links: 'Welcome to eViP', 'eViP Virtual Patients', and 'eViP VP Toolkit'. The browser's status bar at the bottom left shows 'iLyting.com gelesen'.

# Summary





## Contact:

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