

# A pilot study of user acceptance and educational potentials of virtual patients in transcultural psychiatry

Ioannis Pantziaras<sup>1</sup>, Olivier Courteille<sup>2</sup>, Richard Mollica<sup>3</sup>, Uno Fors<sup>4</sup>, Solvig Ekblad<sup>1</sup>

<sup>1</sup> Cultural Medicine, Department of Learning, Informatics, Management and Ethics, Karolinska Institutet, Sweden

<sup>2</sup> Center for Medical Education, Department of Learning, Informatics, Management and Ethics, Karolinska Institutet, Sweden

<sup>3</sup> Harvard Program in Refugee Trauma (HPRT), Massachusetts General Hospital, USA

<sup>4</sup> Department of Computer and Systems Sciences, Stockholm University, Sweden

Correspondence: Ioannis Pantziaras, Cultural Medicine, Department LIME, Karolinska Institutet, Berzelius väg 3, Level 4, SE-171 77, Stockholm, Sweden. Email: ioannis.pantziaras@ki.se

Accepted: 16 July, 2012

## Abstract

**Objectives:** The purpose of this pilot study was to evaluate user acceptance, educational potentials and face and construct validity of a dedicated Virtual Patient system for refugee trauma cases, designed to enhance clinical, interpersonal, social and cultural competence.

**Methods:** We developed a Virtual Patient system portraying a female refugee – mediated by a still image and pre-recorded voice – that was evaluated by an invited group of physicians (n=9) working as residents in Psychiatry (n=8) and General Medicine (n=1). The participants were invited to provide insights/feedback about the system's usefulness and its educational value.

**Results:** Scores across our sample were high regarding the Virtual Patient system's realistic nature (median value: 5 on a 7-point scale) as well as the Virtual Patient's ability to mirror the course of a real clinical investigation (median

value: 6 on a 7-point scale). The system was said to provide a good environment for safe training of clinical and communicative skills. The system's face and construct validity were also demonstrated. Proposed future improvements will include the implementation of detailed feedback from a Virtual Advisor and/or the Virtual Patient him/herself, the use of video-simulated patients and the ability to formulate clinical questions in free text.

**Conclusions:** This dedicated Virtual Patient system was well received by the participants. They appraised it as having a good potential for training in relationship to the clinical encounter and the management of traumatized refugees.

**Keywords:** Transcultural psychiatry, virtual patients, clinical encounters

## Introduction

Global population mobility has increased dramatically over the past four decades. Policy-making on migration and health is performed within sector silos and has varied goals.<sup>1</sup> Migration is an extremely complex procedure that severely influences the individuals' health.

Studies have shown that, among other things, immigrants generally exhibit above-average rates of risk factors for cardiovascular diseases, diabetes, obesity and chronic conditions.<sup>2</sup> Moreover, a large proportion of refugees and

asylum seekers have experienced traumatic situations that give rise to multiple and often complicated psychiatric symptoms such as Post Traumatic Stress Disorder (PTSD),<sup>3</sup> the most common mental health problem in this group, followed by mood disorders.<sup>4</sup> Differences in language and culture, however, as well as different patterns of communicating needs about health, make the diagnosis and treatment of common mental disorders a challenging task.<sup>5</sup> There is therefore a crucial need to increase the competence

of psychiatrists and primary health care physicians in identifying and treating PTSD by enhancing their ability to give a trauma story a sensitive reception and integrate it in a treatment plan for non-English speaking patients, employing a biopsychosocial approach which in theory is the goal model.<sup>6,7</sup>

The proper teaching and assessment of the non-technical skills involved in patient-centered clinical interviewing are complex matters.<sup>8,9</sup> Interpersonal, social and cultural competences are reported to be critical dimensions of clinical interviewing skills for the provision of health care to refugee patients with mental illness.<sup>10</sup> Interpersonal competence, a key component of patient-centered care, has been shown to affect recovery from illness and the costs of chronic mental diseases by improving the patients' understanding of their condition and reducing their anxiety.<sup>11,12</sup> Moreover, good verbal and non-verbal communication skills in history taking are crucial for clinical learning.<sup>13</sup> Social competence has been defined as "a process based on knowledge, skills and attitudes that support effective interaction between the physician and patient despite the social distance that separates them".<sup>14</sup> Finally, cultural competence depends on the practitioner's ability to overcome cultural differences in order to build an effective relationship with the patient by, for example, "exploring patient's beliefs and values, finding common ground, being aware of own biases and discrimination affecting minority groups and effectively using interpreter services when needed".<sup>15</sup> We know that achieving cultural competence is a long process<sup>16,17</sup> that calls for self-monitoring and self-assessment skills.<sup>18</sup> In medical school curricula, interpersonal, social and cultural competences have traditionally been an informal ingredient in clinical training, without specific focus on these skills. According to Mollica et al.<sup>19</sup> the barriers to communication with immigrants/refugee populations need to be lowered by increasing the knowledge and skills of doctors in primary health care. The incorporation of formal training on these important clinical interviewing skills in medical curricula would potentially improve health care for refugees and other immigrant populations.

Computer-based patient case simulations, called Virtual Patients (VPs), are a fairly new paradigm in medical education. A globally accepted definition of virtual patients is: 'An interactive computer simulation of real-life clinical scenarios for the purpose of healthcare and medical training, education or assessment'.<sup>20</sup> Most VP systems include interactive features for illness history-taking, physiological examinations and lab/imaging tests, as well as features for diagnosis, therapy and feedback.<sup>21,22</sup> The emergence and implementation of VPs in medical education during the last 10–15 years have mostly focused on medical students to enhance their "interviewing assessment skills", clinical reasoning and clinical decision-making skills in a safe, individualized, and cost-effective manner.<sup>23</sup> Much less

emphasis has been placed on the enhancement of clinical interviewing skills.<sup>24</sup> To our knowledge, there are hardly any reports on the use of VPs for training to encounter and manage traumatized refugees.

The main aim of this pilot study was to evaluate the user acceptance and educational potential of a dedicated VP system for refugee trauma cases, designed to enhance clinical, interpersonal, social and cultural competence. A subsidiary aim was to evaluate the VP system's face and construct validity.

## Methods

### Construction of the Virtual Patient

In the latter part of 2009 we developed a preliminary version of a special refugee trauma VP-system called RTSim (Refugee Trauma Simulation), based on our previous work on VPs for undergraduate education as well as on the Harvard Program in Refugee Trauma's (HPRT) extensive clinical experience with Bosnian refugees resettled in the United States and in Bosnia Herzegovina. The system, which is designed to harbour a large number of cases, was developed with the aid of Adobe Flash CS4 Professional™ at an estimated cost, including technical expertise for case creation, of about USD 50,000. User interaction was menu-driven and no session timeout was implemented. Our current VP is based on the "Mrs. K" case from HPRT and portrays "Katarina", a 45-year-old female Bosnian refugee patient with previous trauma exposure, presenting with PTSD, depressive symptoms and headache. The VP was depicted in a still image enhanced with pre-recorded voice responses in the Bosnian language. "Mrs. K", a traditional paper case, has been extensively used in HPRT's statewide training of Primary Care Physicians (PCPs) in the Commonwealth of Massachusetts (n=20 trainings, 150 PCPs) over the past five years.<sup>25</sup>

The VP system allows user interaction in the following areas of medical care: (1) medical interview, including a comprehensive list of history questions (n=148) for investigating the chief complaint, history of the present illness, and social history; (2) physical examination (including mental status examination); (3) screening instruments, including the Harvard Trauma Questionnaire (HTQ) and the Hopkins Symptom Checklist (HSCL-25)<sup>6</sup>; (4) laboratory tests and imaging studies; (5) additional data (i.e. information about country of origin, laws about migration in the host country and links to relevant sources of information in the world wide web); and (6) preliminary assessment (i.e. treatment plan).

Each history question elicits an associated patient response in the Bosnian language, immediately followed by a Swedish oral interpretation provided by a Virtual Interpreter (VI). The preliminary assessment module consists of open-ended questions to get the participants to present a structured summary of the patient's history, a preliminary

diagnosis and a summary of a treatment plan. This module is followed by an automated and individualized feedback regarding actions taken, their appropriateness and the quality of case management. The feedback consists of a list of actions taken during the medical examination (including questions asked, laboratory tests ordered and physical examinations performed), followed by a comment on whether or not they were appropriate. It also presents a summary of the case management and a parallel presentation of the patient's history, suggested diagnosis and treatment plan as provided by the participant and proposed by the virtual advisor (the expert), respectively. The face and construct validity of the VP system were evaluated in this pilot study.

### Participants

Our participants were obtained by e-mailing an invitation to all physicians working as residents in psychiatry at two major university hospitals in Sweden (Karolinska University Hospital in Stockholm, and Uppsala University Hospital), (n=92). The invitation was accompanied by an information leaflet with general instructions about the purpose of the study, technical requirements, information about voluntary participation, what was expected of participants, contact details with the research team, and a consent form to be filled in. A total of eleven psychiatry residents (five males and six females) agreed to participate. In order to achieve an equal distribution by gender, one male resident doctor in general medicine with working experience in psychiatry was also approached and responded positively.

The participants' mean age was 32 years (men: 31.5 years; women: 32.5 years). Their ethnicity was Swedish for 75% and the remaining 25% had a foreign background (all Europeans). No information was obtained about the level of their training.

Nine of the 12 resident physicians (four women and five men) completed the study and returned completed questionnaires after the on-line interactive session with the VP. The other three participants did not complete the case due to "computer problems" and/or "lack of time" and were therefore excluded from the study. A female participant failed to provide data regarding the "Overview of Clinical Worldview" during the pre-test on-line questionnaire, and a male participant did not provide data regarding current cognitive and affective states during the pre- and post-test questionnaire. These two participants were therefore excluded from the analysis of the specific data.

### Study design

Upon returning the signed consent form, the participants obtained access to an on-line version of the actual VP-system (client-based web version with individual login, accessible from the participant's home or office). The system's first section consisted of an on-line pre-test version of a questionnaire (hereinafter referred as the KI-VP-

Learning Experience Questionnaire (KI-VP-LEQ)) that had to be filled in prior to interaction with the VP. It was technically impossible to complete any pre-test measures after submission of this questionnaire and once the VP interaction had begun. The participants were then invited to explore and work through the VP-based version of the "Mrs K" case. Directly upon completion of the case, the participants gained access to and were asked to fill in the on-line post-test version of KI-VP-LEQ, which aims to provide insights/feedback about perceived usefulness and educational value. In view of its design (no real patients involved), this pilot study was not assessed in terms of Swedish ethical legislation. However, we took all ethical considerations into account during the rigorous recruitment procedure and at every step in planning, performing and analysing the data, with consent form and information sheet, as well as the right to withdraw from the study at any time without any explanation.

### Collected data

Our study design involved a mixed methodological approach generating both quantitative and qualitative data (1. user interaction in log files, 2. questionnaires, and 3. interviews).

#### 1. User interaction in log files

All the participants' detailed interactions with the system (e.g. complete history of medical questions asked, physical examinations performed and lab tests ordered, detailed use of screening instruments for traumatized refugees, as well as accessed resources) were registered systematically and chronologically in log files.

#### 2. Questionnaires

In preliminary studies, construct items used in the KI-VP-LEQ demonstrated high reliability and criterion validity.<sup>26,27</sup> The pre-test version consisted of two sections. The first ("Overview of Clinical Worldview") aimed to examine the participants' self-reported emphasis on aspects of clinical care during a "real life" medical examination. This overview encompasses various dimensions of clinical care, rated by level of emphasis on a scale from 1 (no emphasis) to 5 (full emphasis). The questionnaire consists of 10 items, divided into two parts, depicting the level of emphasis the clinician usually places on (a) data collected during the medical examination, and (b) root causes of the disease. The first part asks the participant to rate the level of emphasis he or she places during a medical examination on (1) chief complaint, (2) history of present illness, (3) physical examination, (4) mental status examination, (5) laboratory tests, and (6) traditional healing examination. The second part examines the level of emphasis that is placed on root causes of the disease: (1) biological, (2) psychological, (3) social, and (4) spiritual.

The pre-test version's second section aimed to elicit the participants' preconceptions, attitudes and expectations about the VP by collecting baseline data on a 7-point Likert scale about 19 items having to do with current cognitive and affective states prior to the session with the VP. These items concerned statements (e.g. "I feel self-confident", "I am sure I will succeed very well in this exercise") with response sets "1=Highly disagree, to 7=Highly agree", or emotions, i.e. "How would you describe your emotions right now?" with response sets "1= stressed, to 7=relaxed".

The post-test version of KI-VP-LEQ, accessed on-line directly upon completion of the case, aimed to reflect the participants' cognitive and affective states during the session with the VP by using 16 items on a 7-point Likert scale (e.g. "I felt deeply engaged in the tasks during the exercise" and "I experienced this exercise as realistic") with response sets "1=Highly disagree to 7=Highly agree". It also included open-ended questions about the perceived quality and usefulness of the VP-program, as well as general opinions about the learning experience (e.g. "What are your first impressions and comments?", "What needs to be improved in the design of a VP case with a refugee trauma background?"). In order to address factors that had contributed or would contribute to the VP being experienced as realistic, the participants were asked to rate 9 aspects or components of the system (e.g. interactivity, authenticity, recorded voice) with response sets "1=Does not contribute at all, to 7=Highly contributes". The same questions were used to identify the most important clinical dimensions to be assessed in the summative feedback.

### 3. Interview

We also conducted individual in-depth follow-up interviews by telephone in order to get further insights into the participants' learning experience and attitudes toward the VP. We collected data through open-ended questions about the participants' perception of the usefulness and educational potential of the VP case, perceived engagement, student empowerment, virtual interpreter, virtual advisor and feedback.

### Data analysis

Since the sample was too small for significance testing, quantitative data were analysed by producing primarily descriptive statistics using Stata v10.1. The analysis included baseline item-by-item measures and median values for computing the average rating of the Likert scale questions included in KI-VP-LEQ. The responses to the questions were primarily used as an evaluation of the realistic nature and usefulness of the VP-system. Face validity, defined as "the extent to which the examination resembles real life situations",<sup>28</sup> was evaluated in terms of acceptance (perceived usefulness) of the model and assessments of the degree of realism of the patient simulation in relation to the actual task. This concept for evaluation of the face validity

of simulation systems has been used by various other validation studies in virtual learning environments.<sup>29</sup> In order to examine the VP's construct validity, defined as "a set of procedures for evaluating a testing instrument based on the degree to which the test items identify the quality, ability and trait it was designed to measure"<sup>30</sup>, we studied the correlation of actual performance during the VP session with self-reported clinical worldview. The questions asked by the participants during the interactive session with the VP were therefore divided into six categories depicting different aspects of history taking: (a) current and past somatic health history (n=16), (b) current and past medication (n=11), (c) family and social history (n=24), (d) spiritual history (n=3), (e) current and past psychiatric history (n=71), and (f) mental status (n=11). Using a thorough review of the log-files, the number of questions actually asked about each relevant category was then calculated for each participant. Descriptive statistics were used to determine whether the participants' self-reported clinical worldview was mirrored in their actual performance during the VP session.

The qualitative data included the participants' responses during nine telephone interviews (conducted shortly after the interaction with the VP) lasting between 21 and 35 minutes (mean duration 29 minutes). The analysis of the transcribed interviews was based on in-depth reading of transcripts, independent identification of recurrent themes and, finally, comparison of the identified recurrent themes. Inductive content analysis, based on Graneheim and Lundman's model<sup>31</sup> and conventional content analysis based on Hsieh and Shannon<sup>32</sup> were applied.

## Results

### Overview of the questionnaires in relation to actual learning activity during the interaction with the Virtual Patient

Table 1 shows for reference the emphasis on various components of clinical care as self-reported in the "Overview of Clinical Worldview" section of the pre-test questionnaire (median values) and includes the emphasis placed on collected data during a "real-life" medical examination as well as on root causes of the disease. This table reveals that participants self-reported that they place a high level of emphasis on data collected during a medical examination regarding the patients' chief complaint (median value 4.5 on a 5 point scale) and a lower level on data about traditional healing examination (median value 2.5 on a 5 point scale). Similarly, they place a high level of emphasis on biological causes of the disease (median value 4 on a 5 point scale) and lower emphasis on spiritual causes (median value 2.5 on a 5 point scale). Analysis of the participants' actual performance during the VP session in relation to the self-reported clinical worldview showed that only one participant scored 3 in the "Biological root causes" item and did not ask any of

the 16 available questions about current or past somatic health history. Those who scored 4 (n=5) asked a mean of 2.5 questions out of 16 available (15.6%) and those who scored 5 (n=2) asked a mean of 7.5 questions (46.9%). Similarly, the participants who scored 3 in the “Social root causes” item (n=3) asked a mean of 8.5 questions out of 24 available (35.4%) concerning family and social history, whereas those who scored 4 (n=3) asked a mean of 12.3 questions (51.3%) and those who scored 5 (n=2) asked a mean of 16 questions (66.7%).

Table 1. Self-reported dimensions of clinical care (pre-test questionnaire) ranked by level of emphasis (1=no emphasis; 5=full emphasis)

Variables	All (N=8)	Male (n=5)	Female (n=3)
<b>Collected data</b>			
Chief complaint	4.5	5	4
History of present illness	4.5	5	4
Physical examination	3	3	3
Mental status examination	4.5	4	5
Laboratory tests	3	3	2
Traditional healing examination	2.5	3	2
<b>Root causes</b>			
Biological	4	4	4
Psychological	4	4	4
Social	4	4	3
Spiritual	2.5	3	2

A majority of the participants (n=6) scored 4 on the “Psychological root causes” item and asked a mean of 37.2 questions out of 71 available (52.4%) about current and past psychiatric history. The participants who scored 5 (n=2) on the same item asked a mean of 37.5 questions (52.8%) in the same category. As expected, all participants scored low on the “Spiritual Root Causes” item and asked few or no related questions (n=3). Those who scored 2 (n=4) asked a mean of 1 question out of 3 available (33.3%), those who scored 3 (n=3) asked a mean of 0.3 questions (10%) and the one who scored 4 (n=1) asked 1 question (33.3%).

In evaluating the use of laboratory tests ordered during the interaction with the VP the participants who scored low in clinical worldview actually ordered fewer lab tests and vice versa. The participants who scored 2 in the “Laboratory tests” item (n=2) did not order any lab-tests during the interaction with the VP, whereas those who scored 3 (n=4) ordered a mean of 6.3 lab-tests and those who scored 4 (n=4) ordered a mean of 7. A similar observation concerned the number of physical examinations performed in relation to the score in the “Physical Examination” item when the data were analysed by gender but not in the overall analysis.

**Reported perceptions and emotional reactions during the learning experience**

Figure 1 illustrates the participants’ perceptions and

emotional reactions to the VP learning experience as self-rated directly after the interactive session with the VP by using the post-test version of KI-VP-LEQ.

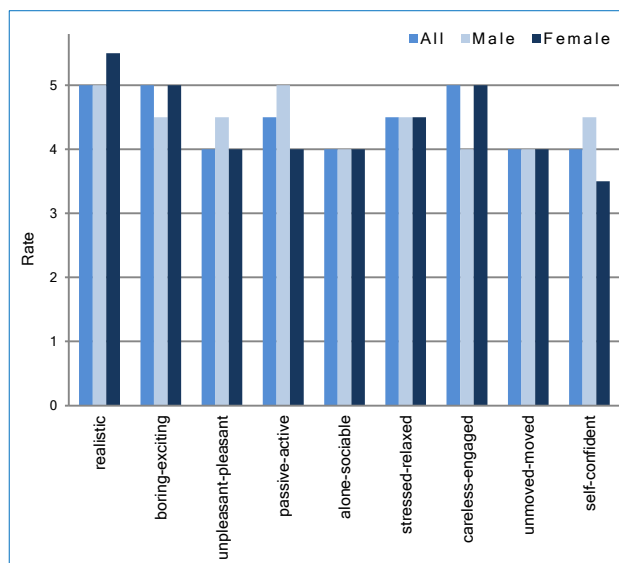


Figure 1. Self-rated perceptions of and emotional reactions to the VP learning experience (1=highly disagree; 7=highly agree). N=8 (median values)

The learning experience with the VP-prototype was perceived positively, with high figures for realism, interest, and engagement, as well as positive signs of emotional attachment (measured as the VP’s ability to evoke an emotional reaction). This was confirmed during the follow-up interviews, in which a majority of the participants described their learning experience with the VP as “interesting”, “exciting”, “inspiring” and “authentic”:

*“It was really interesting and inspiring. The whole structure was realistic, despite the fact that there was no ordinary interaction in the room with access to body language and facial expression”* (participant 11).

When measured by the question “How would you describe your emotions during the exercise?”, with response rate “1=not moved, to 7=moved”, the VP’s ability to evoke an emotional reaction was rated as 4 (median value), with females scoring equally with males.

The VP was perceived as very realistic by the participants (median value: 5 on a 7-point scale), with females scoring higher (5.5) than males (5). Figure 2 presents the factors which contributed to the VP being experienced as realistic by the participants, as rated on the post-test KI-VP-LEQ. However, most of the participants would have preferred a videotaped patient instead of just interacting with a still patient image with a pre-recorded voice. They indicated that a video-based patient would have better mirrored a realistic patient encounter (e.g. not only voice-based but also including communication cues like body language and facial expressions) and thereby led to a stronger behavioural and emotional impact on participants.

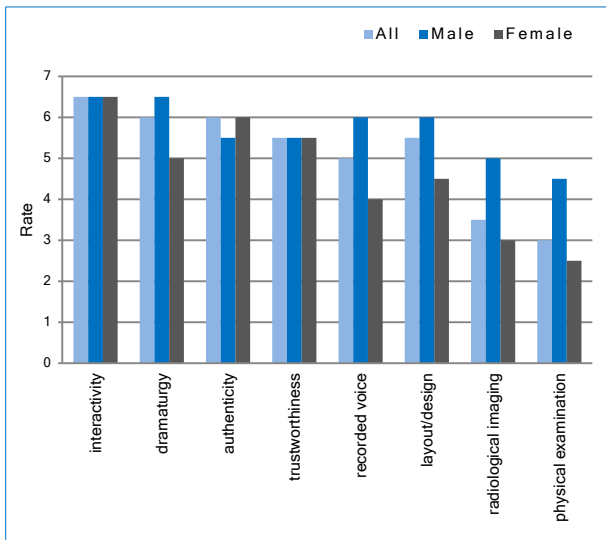


Figure 2. Factors that contributed to the VP being experienced as realistic (1="does not contribute at all"; 7="contributes highly"). N=8 (median values)

### Attitudes to and expectations about the Virtual Patient

Analysis of the relevant item from the post-test version of KI-VP-LEQ showed that the participants considered the VP to be an educational tool that mirrored well the course of a real clinical investigation, allowing them to apply their knowledge (median value: 6 on a 7-point scale). Qualitative analysis of the follow-up telephone interviews showed that the VP was consistently seen as a promising educational tool for psychiatry in general and transcultural psychiatry in particular, suitable above all for use early in psychiatric residency, as well as for medical training in primary health care and for instructing medical students. Three-quarters (75%) of the participants considered that training with virtual patients can lead to increased knowledge about diagnosing and clinical care of traumatized refugee patients with mental illness. It was also considered to be an appropriate tool for collaborative learning (for example in small groups or pairs or in intercultural settings):

*"While working together, one can exchange ideas, develop with the help of other ideas and incorporate own ideas in others' work"* (participant 6), and

*"much more exciting to work together in a case with a colleague, to learn from another person and get a new perspective"* (participant 1).

Whether training individually or collaboratively, the participants saw this VP-prototype as a promising way to increase knowledge about diagnostic and communicative skills in clinical encounters with traumatized refugee patients. The participants also reported that the VP system was suitable for repetitive training without setting patients at risk and in situations where real patients are not available.

Compared with a paper case, the VP was rated in the post-test version of KI-VP-LEQ as significantly better (median value: 6 on a 7-point scale) and was described during the interviews as "much better", "much more interesting" and "more realistic". The participant's active role in the interaction with the VP (Figure 3) was stated as one of the advantages of the VP compared with the paper case:

*"Here you have to search for information by yourself, in the same way as with real patients"* (participant 2) and

*"I would lose my interest with a paper case. Here I remained focused and interested"* (participant 6).

Compared with a real patient, the VP was experienced as a good alternative when no patients are available but would evoke less engagement and empathy because of the lack of non-verbal cues (one-way reactive conversation):

*"a lot of signals get lost (with a VP)"* (participant 11) and

*"the most important is that facial expressions and body language are missing. The voice does not say everything."* (participant 2).

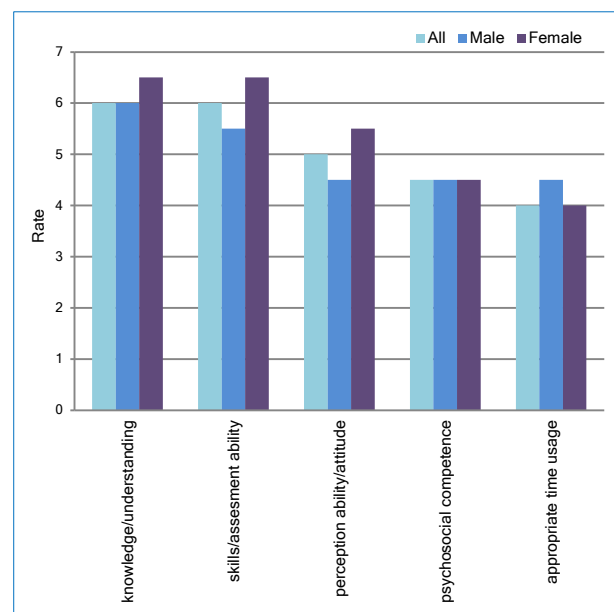


Figure 3. Participants' preferences about aspects of clinical training they would like to receive feedback about from the virtual advisor. (1="not important"; 7="very important"). N=8 (median values)

### Suggestions for further future improvements

According to our participants, an enhanced and more realistic and authentic simulation of a patient encounter should include:

#### Virtual Advisor (VA)

The participants considered that the summative feedback provided after completion of the VP session was an

important learning component of the VP-system (6 on a 7-point scale; 1=not important, 7=important). A VA was proposed as an enhancement of the automated feedback and would introduce the case, be available “on demand” throughout the case/investigation, inform about remaining time, and finally provide a personalized and constructive feedback in relation to the participant’s self-rated clinical world view. It was suggested that a VA could, for instance, comment on the participants’ display of appropriate (or inappropriate) interview behaviour and of supportive (or non-supportive) attitudes in the summative feedback of the VP session. Figure 3 shows the participants’ ranked preferences in the assessment of alternative learning outcomes in the feedback section. There was a tendency for female participants to rate higher than male participants on skills/assessment ability, knowledge/understanding, perception ability/attitude, whereas male participants rated higher on appropriate time usage.

#### *Virtual Interpreter (VI)*

A VI should be displayed during the interactive dialogue with the VP in the medical history section. He/she should introduce him/herself and inform about his/her ethical and professional role in the interpretation process. A VI was proposed as an important ingredient for transcultural clinical interviews involving foreign language and culture. The presence of a VI was suggested as a valuable learning component in cases where misbehaviour, wrong interpretation (unintentional or not, incl. problems with dialect, condensed summary and/or omission), the patient’s own agenda, and the patient-interpreter relationship (gender aspects) might critically challenge the participant-VP interaction.

#### *Feedback from the VP’s perspective*

Participants also wanted to have specific feedback from the VP him/herself regarding the way they encountered him/her and managed his/her medical problem. They considered that more focus on the patient’s own concerns and expectations would contribute to increased awareness and understanding.

#### *The ability to formulate own questions*

Most of the participants expressed a wish to be able to formulate in their own words the questions they would like put directly to the patient. Besides leading to an increased sense of realism and engagement, this user modality would save the time spent on looking for an adequate follow-up question in the multiple-choice menu-based repository.

## **Discussion**

The main aim of this study was to evaluate the perceived usefulness and educational potential of the described VP technology for simulating refugee trauma cases. Overall, the participants’ responses were positive and this Virtual

Patient prototype was perceived as a promising educational tool that, especially when implemented early in medical training, could lead to increased knowledge in the area of caring for traumatised refugee patients with mental illness. Other positive comments focused on the VP being an appropriate educational tool for individual and collaborative learning, providing a good environment for safe training of clinical and communicational skills, in a much more efficient way than a paper case. The system’s realism was rated high, with female participants rating higher than males and also reporting higher engagement during the virtual encounter. Male participants, on the other hand, reported being more self-confident and active during the interaction than female participants. One plausible explanation of these gender-related differences can have to do with previously reported findings that, compared to men, women in general,<sup>33</sup> but even female medical students (including graduating seniors), specifically<sup>34</sup> have less experience of computers and may therefore be more easily impressed by new technology, more excited when using it but at the same time less self-confident and more passive. In future studies, baseline data about previous exposure to computers and/or e-learning environments, as well as videogame experience, should be collected and analysed. The qualitative data also indicated that the participants felt that not being in a position to formulate own questions in free text was a limitation. This confirms previous findings from similar studies, that users who cannot construct their dialogue experienced a sense of being guided in a particular direction during the interactive conversation.<sup>35</sup>

In terms of validity, the participants’ positive attitude favours the system’s face validity (i.e. whether the user perceives the system as doing what it is supposed to do). We also examined whether this self-reported perception was supported by objective observations of the participants’ actual performance during the interaction with the VP in relation with their pre-test self-reported rating of clinical overview. These data indicate that the participants had a tendency to ask more history questions concerning the dimensions of clinical care which they had previously rated high. In other words, we observed that performance during the actual examination of the VP reflected the participants’ self-reported attitudes and perceptions about possible root causes of the patient’s symptomatology, giving support for the system’s construct validity.

Further improvements suggested by the participants include a more detailed and holistic delayed feedback by a Virtual Advisor supplemented by the Virtual Patient him/herself (e.g. the patient’s own opinion), as well as a continuous on-demand feedback based on the user’s actual performance during the virtual encounter that should cover topics such as assessment ability, knowledge, attitudes, appropriate management of time and psychosocial competence. These features can potentially enhance the development of self-monitoring and self-assessment skills, crucial

qualities needed in the process of developing intercultural and interpersonal competence.

### Limitations of the study

One of the limitations of this pilot study is the small study population. The sample was too small for statistical significance testing, which weakens our results and limits their generalizability. Selection bias due to the non-random selection of the participants may also influence our results. Furthermore, our sample included mainly resident psychiatrists (and only one from primary health care), thereby limiting the ability to draw conclusions about the perceived educational potential of this tool among primary health care physicians.

Our results were also based on the participants' self-reported (subjective) experiences, without any external observations or registered data that could delve more deeply into parameters such as emotional engagement, flow of user interaction, and attitudes towards the VP. Physiological recordings and video observation of the participants while interacting with the VP can provide useful complementary data in future studies. Although this was not an aim of the present study, it must be stressed that, due to the lack of relevant objective data and participation restricted to a single training session, no conclusions can be drawn about the extent to which this educational activity actually led to any improvement on clinical, interpersonal, social and cultural competence. New control studies that randomize interventions (i.e. training with VP vs. standard training) should assess the actual impact on these areas as well as on patient care outcomes. An estimation of the KI-VP-LEQ's criterion validity and reliability should also be performed in a future control study.

### Conclusions

Although virtual clinical encounters are a novel paradigm in psychiatry training, most of the participants in this pilot study considered our virtual patient prototype to be a promising educational tool that can be used as a safe environment for training clinical, interpersonal, cultural and social competence. The VP prototype was also perceived as a tool that realistically reflected the course of a real clinical investigation, allowing the participants to apply their clinical knowledge.

Our educational model based on VPs in transcultural psychiatry favours a cognitive constructivist pedagogy and a situated learning approach, important characteristics of medical education of the third millennium, promoting the development of patient-centred interviewing skills. Effective patient-centred interviewing skills have been associated with improved health outcomes, including "patient health, patient and physician satisfaction and general practice management".<sup>9</sup>

Future improvements of this prototype should include the technical possibility of formulating questions during

history-taking (either in text form or as speech recognition), the implementation of a Virtual Advisor that would give tailored individualized feedback during the course of the case, feedback from the patient giving insights about the patient's perception of the student's actions, and the implementation of video recording of the VP. Future larger-scale studies should support an unbiased selection of participants by means of randomization and include the collection of subjective qualitative and quantitative data related to parameters such as the participants' engagement, concentration, physical arousal and attitudes, as well as patient care outcomes.

### Conflict of Interest

The authors declare that they have no conflict of interest.

### References

1. Zimmerman C, Kiss L, Hossain M. Migration and health: a framework for 21st century policy-making. *PLoS Med.* 2011;8(5):e1001034.
2. McKay L, Macintyre S, Ellaway A. Migration and health: a review of the international literature. Occasional paper no 12. Glasgow: Medical Research Council, Social and Public Health Sciences Unit; 2003 [cited 2012 Jan 24]; Available from: <http://www.sphsu.mrc.ac.uk/library/occasional/OP012.pdf>.
3. Fazel M, Wheeler J, Danesh J. Prevalence of serious mental disorder in 7000 refugees resettled in western countries: a systematic review. *Lancet.* 2005;365(9467):1309-14.
4. Carta MG, Bernal M, Hardoy MC, Haro-Abad JM. Migration and mental health in Europe (the state of the mental health in Europe working group: appendix 1). *Clin Pract Epidemiol Ment Health.* 2005;1:13.
5. Rosenberg E, Richard C, Lussier MT, Abdool SN. Intercultural communication competence in family medicine: lessons from the field. *Patient Educ Couns.* 2006;61(2):236-45.
6. Mollica RF. Textbook of global mental health: trauma and recovery. A companion guide for field and clinical care of traumatized people worldwide. Cambridge, MA: Harvard Program in Refugee Trauma; 2011.
7. Mollica RF. Healing invisible wounds: paths to hope and recovery in a violent world. New York: Harcourt Press; 2006.
8. Lein C, Wills CE. Using patient-centered interviewing skills to manage complex patient encounters in primary care. *J Am Acad Nurse Pract.* 2007;19(5):215-20.
9. Lyles JS, Dwamena FC, Lein C, Smith RC. Evidence-based patient-centered interviewing. *J Clin Outcomes Manage.* 2001;8(7):28-34.
10. Ekblad S, Roth G. Transcultural psychiatry and refugee psychiatry. In: Herlofson J, Ekselius L, Lundh L, Lundin A, Mårtensson B, Åsberg M, editors. *Psychiatry.* Lund: Studentlitteratur; 2009.
11. Epstein RM, Hundert EM. Defining and assessing professional competence. *JAMA.* 2002;287(2):226-35.
12. Michalec B. Learning to cure, but learning to care? *Adv Health Sci Educ Theory Pract.* 2011;16(1):109-30.
13. van Dulmen AM, Holl RA. Effects of continuing paediatric education in interpersonal communication skills. *Eur J Pediatr.* 2000;159(7):489-95.
14. Loignon C, Haggerty JL, Fortin M, Bedos CP, Allen D, Barbeau D. Physicians' social competence in the provision of care to persons living in poverty: research protocol. *BMC Health Serv Res.* 2010;10:79.
15. Saha S, Beach MC, Cooper LA. Patient centeredness, cultural competence and healthcare quality. *J Natl Med Assoc.* 2008;100(11):1275-85.
16. Bennett MJ. Towards ethnoculturalism: A developmental model of intercultural sensitivity. In: Paige RM, editor. *Education for the intercultural experience.* Yarmouth: Intercultural Press; 1993.
17. Ekblad S, Lindencrona F. Train the trainers together! - Interprofessional collaboration for the development of new educational innovations to introduce a transcultural perspective into undergraduate programs at a medical university. All together better health IV Conference; Stockholm: Stockholm & Linköping University; 2008.



18. Lane HC. Metacognition and the development of intercultural competence. 13th international conference on artificial intelligence in education; Marina del Rey, CA; 2007:23-32.
19. Mollica RF, Kirschner K, Ngo-Metzger Q. The mental health challenges of immigration. In: Thornicroft G, Szmulker G, Mueser KT, Drake RE, editors. *Oxford Textbook of Community Mental Health*. Oxford: Oxford University Press; 2011.
20. Ellaway R, Poulton T, Fors U, McGee JB, Albright S. Building a virtual patient commons. *Med Teach*. 2008;30(2):170-4.
21. Bergin RA, Fors UGH. Interactive simulated patient: an advanced tool for student-activated learning in medicine and healthcare. *Comput Educ*. 2003;40(4):361-76.
22. Zary N, Johnson G, Boberg J, Fors UG. Development, implementation and pilot evaluation of a web-based virtual patient case simulation environment-Web-SP. *BMC Med Educ*. 2006;6:10.
23. Cook DA, Triola MM. Virtual patients: a critical literature review and proposed next steps. *Med Educ*. 2009;43(4):303-11.
24. Stevens A, Hernandez J, Johnsen K, Dickerson R, Raj A, Harrison C, et al. The use of virtual patients to teach medical students history taking and communication skills. *Am J Surg*. 2006;191(6):806-11.
25. Carballo M. report of an evaluation of a Harvard trauma program project funded by the World Bank post conflict unit in the Canton of Travnik, Bosnia and Herzegovina (BiH). Geneva: International Centre for Migration and Health (ICMH); 2003.
26. Courteille O. Computer simulations of the clinical encounter - perceptions and emotional aspects. [Ph.D. Thesis]. Stockholm: Karolinska Institutet; 2008.
27. Winberg TM, Hedman L. Student attitudes toward learning, level of pre-knowledge and instruction type in a computer-simulation: effects on flow experiences and perceived learning outcomes. *Instructional Science*. 2008; 36(4):269-287.
28. Moorthy K, Munz Y, Sarker S, Darzi A. Objective assessment of technical skills in surgery. *BMJ*. 2003;327:1032-1037.
29. Bajka M, Tuchschnid S, Streich M, Fink D, Szekeley G, Harder M. Evaluation of a new virtual-reality training simulator for hysteroscopy. *Surg Endosc*. 2009;23:2026-2033.
30. Gallagher AG, Ritter EM, Satava RM. Fundamental principles of validation, and reliability: rigorous science for the assessment of surgical education and training. *Surg Endosc*, 2003;17:1525-1529.
31. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004;24(2):105-12.
32. Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. *Qualitative Health Research*. 2005;15(9):1277-88.
33. Schumacher P, Morahan-Martin J. Gender, Internet and computer attitudes and experiences. *Computers in Human Behavior*. 2001;17(1):95-110.
34. Kron F, Gjerde C, Sen A, Fetzters M. Medical student attitudes toward video games and related new media technologies in medical education. *BMC Med Educ*. 2010;10(1):50.
35. Hayes-Roth B, Saker R, Amano K. Using virtual patients to train clinical interviewing skills. *AAAI Fall Symposium on Virtual Healthcare Interaction*; Arlington, VA; 2009:35-40.