Virtual Patients: Repurposing and Collaborative Development

Introduction

Recent years have brought a large number of initiatives aimed at the sharing and reuse of e-learning resources. These include both the creation of technical specifications for the interchange of educational content [22] as well as the development of theoretical frameworks and guidelines for building exchangeable learning objects [18]. The purpose of these initiatives was to remove the barriers that hindered the introduction of new media in education (e.g. limited time, money and personnel resources), to build original, sophisticated digital content and to improve technical or instructional know-how in the development of e-learning resources.

Virtual patients (VP) [3, 14], defined as ‘interactive computer simulations of real-life clinical scenarios for the purpose of healthcare and medical training, education or assessment’ [6], may be regarded as examples of specialised reusable learning objects (RLO) and thus treated as subjects for exchange. The line of thinking is supported by the fact that the cost of authoring virtual patients is high (as shown in a study by Grace Huang et al [13]) and that this could be lowered by building common repositories of virtual patients [8]. Specifications for healthcare education standards developed by the MedBiquitous organisation [22] form the technical foundation for educational content transfer between medical universities. Initiatives like the EC-supported project electronic Virtual Patients (eViP) [1] build communities and technical infrastructure to facilitate the exchange of virtual patients. Since the direct transfer of virtual cases between individual institutions is often not feasible due to language, culture, technical or instructional differences, the cases are adapted to the individual needs of institutions in a process called “repurposing”.

After its very promising initial phase, the process of exchange of virtual patients needs to be carefully examined to verify empirically its assumed benefits and drawbacks. Previous studies have already reported on the preliminary outcomes of different repurposing types at individual institutions [12, 19] within the eViP project. In progress are studies to compare the time efforts of repurposing virtual patients between different institutions [16].

The goal of this study was to collect opinions on repurposing as a method of authoring educational cases at Jagiellonian University Medical College, being one of the institutions involved in the eViP project. Unlike the previously mentioned studies it is not intended to touch upon the topic of measuring quantitative outcomes of the repurposing process (as e.g. time effort) or to survey students’ satisfaction with using repurposed virtual patients, but to focus on the group of people involved directly in the repurposing process. This paper presents their subjective opinions concerning the adaptation of virtual pa-
tients in comparison to creating them from scratch. Because of obvious limitations (e.g. a small, highly heterogeneous group of study subjects) this work should be qualified as a pilot study that prepares the ground for a larger, more rigid, cross-institutional evaluation of the repurposing process.

**Background**

Involved in the European project eViP since September 2007, Jagiellonian University Medical College (UJ) has an interdisciplinary team that has repurposed 33 virtual patients from the project repository and created 26 new educational cases (until February 2010). Four different skill sets are required within the team: learning resource translator, subject matter expert, learning technologist and technical developer.

The translators transfer the text content of the repurposed cases from foreign languages (in our case English and German) into Polish. This requires not only language proficiency but also knowledge of medical terms. At UJ this role is played predominantly by final year medical students with previous experience in studying at foreign universities (Socrates-Erasmus exchange programme). Subject matter experts are medical or healthcare specialists working in most cases at the university hospital. Until now, it included specialists in Internal Medicine, Cardiology, Neurology, Haematology, Anaesthesiology, Allergology, Gynaecology, Nephrology, Radiology, Obstetrics, Nursing, Gastroenterology, Infectious Diseases, Ophthalmology and Oncology. As part of the repurposing process, subject matter experts read and correct the translated content of the virtual patient, adapt it to local conditions, update it to reflect the latest medical knowledge and suggest new elements to be included into the case. Learning technologists [20] liaise between subject matter experts and technical developers. Learning technologists on one hand understand the content of virtual patients and make it more suitable for teaching purposes, but on the other hand know the technical constraints of the virtual patient system used by the institution. Technical developers solve the IT problems in transferring virtual patients between different systems, work on the technical localisation of multimedia objects (e.g. adding language captions to movies or images), enrich the content by adding new multimedia and manage the technological issues (student accounts, learning outcome measurements etc). In some rare cases one person played more than one of the above described roles (e.g. translator and subject matter expert or learning technologist and technical developer) but in all cases one of the roles was always dominant.

UJ uses within the eViP project the linear virtual patient system CASUS® developed at LMU Munich by Instruct AG [9].

**Methods**

The questionnaire study was carried out between October 2009 and January 2010 and included 22 staff members involved in the eViP project at UJ as translators (3), subject matter experts (15), learning technologists (2) and technical developers (2). The inclusion criteria for a person was that (s)he had to have been involved in the creation or repurposing of at least two VP cases. The majority of respondents had a medical background (64%), including 11 practitioners (7 medical doctors, 2 nurses, 2 midwives) and 3 students in their sixth year of medicine. The two learning technologists had a biological background (anthropology) and the two technical developers were graduates in computer science.

A survey containing twenty eight questions regarding the preferences and difficulties in repurposing and creating new virtual patient cases was prepared for the purpose of the study. It included 19 five-point Likert-scale questions, 5 multiple choice questions, and 4 free-text questions. The questionnaire was implemented in Microsoft Word. All answers were collected in Microsoft Excel and a preliminary analysis was carried out with the Statssoft Statistica 8.0 package. Opinions were analysed using descriptive statistics and Spearman correlation coefficients (r). The application of statistical methods was limited due to the small size of the sample. For calculating the descriptive measures (average, median) of Likert-questions the assumption was made that “Strongly Disagree”=1 point, “Disagree”=2 points, “Neutral”= 3 points, Agree=4 points”, “Strongly Agree”=5 points. Answers not given were omitted from calculations.

**Results**

The results obtained are shown in tables 1-5. Answers’ frequencies on general questions regarding the repurposing and new VP creation process are presented in table 1. The majority of the respondents agreed that repurposing cases makes sense (68%) and that repurposing was for them an interesting experience (59% people strongly agreed and only one person disagreed). The process of creating new VP cases was an interesting experience for as much as 73% of respondents. The question directly surveying the preference for repurposing or creating new cases gave no clear answer (the percentage of people in favour of one method was almost equal to the proportions of the second method, the majority was either neutral or skipped that question). It is worth mentioning that 68% of staff members agreed that repurposing taught them how to create virtual patients. Half of the respondents agreed or strongly agreed (46%) that the process of adaptation left enough room for self-initiative, but 23% disagreed. The attitude of 45% was positive towards the future repurposing of their cases – only three respondents (14%) had a negative opinion.

The following statistical analysis suggested that there are significant correlations between the answers to some of the above questions and the number of cases repurposed by our staff members. In other words: the more cases an author had repurposed the more likely (s)he was to agree that repurposing makes sense (r=0.44; p<0.05) and that their cases would be repurposed by other authors in the future (r=0.82; p<0.05). We did not observe a correlation between the number of repurposed cases and positive answers given to the question regarding the educational potential of repurposing. This suggests that the repurposing of even two or three cases could be enough to develop sufficient skills to author new virtual patients. Table 2 presents opinions regarding which VP elements can be transferred between different countries. The most popular were patient history, examination results and methods of history taking. By far the least popular answer was the litera-
ture references. Other unpopular answers included the selection of diagnostic methods and multimedia. However the difference in the average score between these two answers and the remaining answers was not as striking as in the case of literature references.

Table 3 summarises opinions regarding the overall content of the institutional virtual patient repository. The respondents had no strong opinion about whether it was better to have a specialised or broader scoped database (37% vs. 41%). The majority of people disagreed with the statement that VPs should present rare rather than common diseases: 68% disagreed and no one agreed. Most of the polled agreed with the opinion that VPs should be created by people involved directly in teaching (and not e.g. boards of experts or commercial companies): 14 (65%) agreed, no one disagreed.

In the opinions of respondents, the most time-consuming activities during repurposing and also during the creation of VPs from scratch were: the creation of knowledge questions with feedback, the description of diagnostic actions and therapeutic effects, and multimedia (table 4). These aspects of virtual cases require from specialists knowledge not only of their daily clinical practice, the newest medical advances (e.g. diagnostic and treatments methods that may not be available in their hospital) but also pedagogical skills. The same previously mentioned elements of virtual patients were perceived as the most problematic whether repurposing or creating from scratch. Additionally, respondents marked the selection of diagnostic methods as a troublesome activity when creating cases anew. The reason may be a lack of diagnostic and therapeutic standards as well as legal and financial limitations in availability of modern techniques in some of Polish hospitals.

Despite oft-reported problems with preparing multimedia objects, most of the authors enriched virtual patients by adding images (82%), tables (76%) and figures (65%). Half of them included patients’ images, and several people included movies or audio files in the repurposed cases (table 5).

Discussion

In general, respondents liked both creating new medical cases and repurposing. The fact that there was no clear preference for any method of acquiring VPs may be explained by one of the free text comments in the forms which indicated that the respondents’ attitude towards repurposing depended strongly on the particular case. Some of the cases were easy to adapt, whereas repurposing others took more time than creating them from scratch. The important issue seems to be the difficulty with finding cases in the pool of VPs that meet the expectations of teachers and fitting them into an existing medical curriculum with defined learning objectives. Further studies could follow this lead and attempt to define criteria for assessing the usability of VP cases for repurposing before the actual adaptation begins.

Most of the cases were repurposed from German into Polish language and culture. Even though there are surely many differences in socioeconomic and medicolegal conditions between these countries, the differences are not as striking as reported in other studies (e.g. between Sweden and Colombia [10] or Scotland and Malawi [4]). This explains the fact that in our study the respondents rated the patient history as the element that could most likely be transferred between different countries. However, this result is unlikely to be repeated in studies as described by Fors et al [10] or Dewhurst et al [4]. An objective study should compare different repurposing scenarios: nationally, between neighbouring countries on a similar development level, and long distance educational content transfers.

The low rating for the transfer of literature references is explainable by the presence of local national guidelines and the fact that Polish students are seldom encouraged to use international materials (published in English) for learning. This observation is also supported by the results of a Romanian study in which it was showed that even students who claimed to have very good English skills learned less efficiently from virtual patients presented in English than in their native language [10].

A very interesting point was raised in a free text comment by one of the respondents: that the repurposing of virtual patients makes sense only if the case comes with the full set of original medical data of the patient. This allows reasonable additions to be made to the case when repurposing. Otherwise, just by inventing different details the case loses authenticity and value. This statement is supported by another opinion from the questionnaire that the repurposing of images and multimedia is feasible only if they are available in a raw, editable format, without hard encoded captions or pointers. The concept of open source multimedia in medical learning objects has already been postulated in literature by Ellaway and Martin [7]. However we should be aware of the fact that storage and transfer of open source materials usually adds additional work for the authors of original virtual patients without giving them any clear incentive to do that.

Surprising at first glance but understandable after consideration was the poor opinion of multimedia as an element that could be transferred while repurposing. Time saved on developing multimedia was often regarded in literature as one the greatest benefits of reusable learning objects (e.g. [5, 11]). However, if we consider the scenario of moving, for example, videos between different countries with different cultures (e.g. different languages, different hospital equipment) it becomes clear that most of multimedia material cannot be reused or significantly loses value in a different context. On the other hand, the problem of repurposing foreign multimedia materials inspired some of the authors of adapted cases to enrich them with new images, movies, schematics and tables.

The lack of confusion regarding ownership and copyright issues was noticeable while evaluating free text comments regarding obstacles to reusing virtual patients and comparing them with previous studies which focused on attitudes to sharing digital teaching resources [23]. This could be explained by less rigid policies regarding the reuse of educational material at our institution compared to US schools, or by the clarifications made within the eVIP project while developing Intellectual Property Rights Guidelines for creating and repurposing virtual patients [2].

The results of this study do not allow us to answer the fundamental question of whether repurposing or creation from scratch should be preferred. The answers collected do not show a clear tendency, and the results were additionally confused by the fact that the group examined contained small numbers of staff members from various backgrounds with diff-
The study had clear limitations that were difficult to avoid in the setting of one project and one institution. Improvements should definitely include a method for acquiring staff member opinions. Even though the questionnaire enabled the insertion of free text answers, most of the respondents filled in the Likert-scale fields and skipped the opportunity to give free text comments. Qualitative focus group studies (as in [15] or [22]) would definitely help in assessing the opinions of staff members in more detail. However, the value of this pilot study lies in pointing the way for future large scale studies.

We intentionally did not investigate the most natural assumptions regarding the money and time savings of repurposing, leaving it to other studies to do this (e.g. [16]). However, what came out as an initially surprising but very positive side effect was the knowledge transfer of new instructional methods while repurposing virtual patients. After repurposing most of the staff members at UJ felt more confident in developing their own new cases. Even though attempts were made to introduce virtual patients at UJ before 2007 [17] it was the eViP project and the repurposing of cases from other more experienced partners that changed the attitude of many towards this learning method. In the personal opinion of the authors of this paper this benefit dominated the others that are anticipated to be shown in other studies. This observation is in line with other studies in which virtual patients have already been reported as a driver for change in medical and healthcare professional education [4, 21].

Summary

This paper shows preliminary results from a pilot study into the preferences regarding the development or repurposing of new cases. For the majority of staff members polled, the repurposing of existing cases was a great way to start introducing virtual patients at a university with no previous experience in using this method of teaching, and on top of this, the respondents enjoyed creating new cases. Limitations of repurposing were detected, such as problems with access to source material, difficulties in transferring multimedia between different cultures, and strong dependencies on national guidelines which consequently caused some of our specialists to prefer the creation of new cases to repurposing. Because the study failed to give a clear answer concerning the preferences of teaching staff, further research is needed to investigate in more detail the reasons for difficulties in adapting virtual patients at local institutions. We hypothesise that the development of an evaluation tool that could assess the repurposing potential of a case could help in selecting the right content for repurposing, and in this way save time lost on working on VP cases that are not transferable. However, it is also possible that the value of repurposing diminishes with time and experience gained in developing virtual patients. Being very interesting at the beginning to learn the possibilities of a new tool, repurposing becomes limiting in further cases when the content author prefers to implement their own educational ideas.

References

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