Using patient cases to educate health professionals, patients, institutions, and society: the swallowing disorder example

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The problems and symptoms of patients are at the heart of medicine and pertinent to information, communication, and education. Patients present their problems to health professionals looking for relief and a cure, while institutions collect data about symptoms of patients and the way health professionals treated them to support society’s care providers in administrating and managing care. The information on the problems of patients and the way health professionals treated them, which is gathered and stored in patient files, is valuable as educational material in the field of medicine. Driven by the fast developments of new technical tools case-based information, communication and education starts to enter educational domains beyond the field of medicine, such as school systems and public health services. In our discussion we seek to understand and outline how to use the material gathered and stored in patient files to educate health professionals. Additionally, this paper gives examples of case-based education for all members of society.

Keywords: case-based learning; medical education; health-IT

Introduction

Imagine a patient suffering from solid food dysphagia and retrosternal pain when eating. Most likely he or she will seek medical advice, maybe even consult a specialist in a clinic for further evaluation. There his/her symptoms will be explored and documented—nowadays often in electronic health records (EHRs). Further diagnostic measures such as an endoscopy, functional studies, or imaging will be ordered and subsequently documented, and later decisions about the treatment and the progress thereof will be added to the patient file. Thus, with each day of practice, the health professionals working in specialized clinics contribute to building an archive of patient cases, leading to large local and in the near future well-connected databases. These archives are then used to serve society for building health systems as well as administrating and managing care, especially for people living with multiple complex clinical problems. In the field of esophagology, for example, patients with reflux diseases or successfully treated esophageal tumors may need lifelong care, which requires a structured and consistent documentation of all prior treatment and care to be effective.

An integral part of society’s responsibility is to educate health professionals in order to enable them to provide state-of-the-art treatment. At the same time, society is also responsible for educating patients enabling them to care for themselves and to interact with the health system sensibly. In the subsequent sections, we thus illustrate how patient cases influence the education of health professionals, using the example of medical students. Additionally, we illustrate how patient-case materials can support society’s endeavor to educate patients and patients-to-be.

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Educating medical students: from clinical observation and handwritten case books to virtual patients

The notion that the education of medical students should be based on sound scientific knowledge and comprehensive practical experience in treating patients dates back to the European Middle Ages. In the 13th and 14th centuries, doctors-to-be in Paris and Vienna had to undergo a practical medical apprenticeship, which complemented the canonically driven lectures at the universities. In the 16th century in Padua, the idea of generating medical knowledge through observation emerged. The students had to visit the clinic and search for “the single phenomenon in the individual case history.” Since the 18th century, organizing the students’ practical experiences systematically proved to contribute to their expertise as doctors. In Vienna, the clinical training of medical students included studying the most common examples of diseases and a variety of pathological phenomena. Students of medicine in Vienna were assigned the task of familiarizing themselves with anamneses, diagnoses, prognoses, therapies, and the causes of death. In New York, doctors were assigned the task of collecting material of educational relevance in handwritten case books in order to “conserve” it for later use, such as educational purposes. These case books included records on the anamnesis, diagnosis, prognosis, therapy, and cause of death (where applicable) of their patients as well as educational ideas.6–8

Recorded patient cases got progressively more important in medical education when universities observed a dramatic increase of students in the 19th century. In Vienna, this resulted in difficulties for the training of students at the clinic, so that the educational system had to be adapted. Health professionals switched to presenting patient cases in lecture theatres. This included having large groups of students observing doctors treating patients right there in the lecture theatre, but also listening to case presentations.6

Throughout the course of the 20th century, the use of information technology (IT) for documenting the symptoms, problems, and treatment plans of patients developed, starting with an article on an electronic data-processing system for medical records in the Lancet in the 1960s. Since then, the interest in using IT to document patient data increased steadily, and various terms referring to this field, such as “Medical Record Systems,” were defined as keywords for PubMed MESH in the 1990s.10 Clinical medical institutions, in particular hospitals of all capacities, implemented medical information systems, which were connected mostly locally within hospitals belonging to a single super-intendence. Consequences on the societal level followed in 21st century; the EU released the first e-health action plan in 2004,11 and the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act explicitly facilitated the implementation of health-IT in the United States, for example, by promoting the meaningful use of EHRs by U.S. physicians.12 IT also opened up new opportunities for sharing and discussing patient-related information interactively. Instead of having formal or informal meetings in person or over the phone, IT-tools, such as discussion forums or webinars, allow instant global communication.13 Nowadays, these tools are increasingly utilized by physicians to discuss cases with colleagues all over the globe14 for diagnostic purposes. Discussing cases interactively has been shown to improve patient care,15 and also proven to be an effective way of providing medical education for physicians16 and medical students.17,18 Health professionals interested in swallowing disorders can participate in several educational activities regardless of where they take place. The World Organization for Specialized Studies on Diseases of the Esophagus (OESO), for example, has been hosting a monthly clinical case discussion since 2009;19 see Figure 1 for an example case (case 63) presented in the OESO clinical case discussion from June 21 to 29, 2017. And the European Society for Swallowing Disorders (ESSD) offers clinical case discussions as part of their bimonthly webinars.20

Furthermore, the influence of the IT sector on the field of medicine also opened up new possibilities for preparing patient information for medical students. A so-called virtual patient consists of “medical case material” that has been compiled in order to help medical students improve their clinical reasoning skills.21 Virtual patient material can be presented in any form we consider suitable; currently, the most common form of presentation is the use of a computer program. The virtual patient’s story is either compiled using real patient files or made up using various types of available material.
The training with virtual patients can cover a wide range of cognitive levels (e.g., recognition of relevant knowledge, integrating information, deciding, providing the reasoning behind decisions) as well as a broad spectrum of learning goals (e.g., differentiating between possible diagnoses, interpreting diagnostic findings in light of a patient’s history, understanding nurses’ perspectives, etc.)

The advantages of integrating virtual patients in the training of medical students are numerous. They facilitate a systematic representation of relevant symptoms in a curriculum, regardless of the patients at the clinic at time of training. Additionally, as virtual patients are simulations, working with them provides an opportunity for practicing safely. Virtual patients that present a set of similar symptoms might also serve as a good training opportunity prior to meeting real patients showing such symptoms.

Educating patients: from doctor’s authority to patient-centered care and shared decision making

The notion of educating patients in order to improve their health behavior and therefore their health itself does not date back as far as the notion of educating medical students. Until the 1960s, the physician was considered to be responsible for the diagnosis and the subsequent treatment, while the patients had to conform to the physician’s treatment plans. Throughout the following decades, the inclusion of patients into medical education progressed steadily.

In the 1980s, the concept of patient rights and several patient advocacy organizations emerged. At the same time, various initiatives encouraged patients to actively improve their health by making changes to their lifestyle. By the 1990s, patients were expected to get involved in the decisions regarding their treatment plan and the dialogue between patients and health professionals turned toward more equal terms. This allowed for an increase in joint decision-making processes. Consequently, all health professionals, every institution, and all of society had and have to get involved not only in educating patients, but also in providing potential patients-to-be with basic knowledge on how the body functions. In the 21st century, the Internet, especially social media, has contributed to a complex network of paths for communicating with and informing the public, and it has become apparent that more and more
patients inform themselves prior to visiting their doctor.23

The swallowing disorder example shows that medical educational initiatives can reach even children, teenagers, and young adults. In Vienna, a case-oriented class for children, aged 7–12 years, was developed offering them an introduction to normal and abnormal forms of swallowing, including oropharyngeal and esophageal cases of human and animal patients. This class has been taking place annually since 2005 as part of the medical section within the Children’s University24 event at the Medical University of Vienna.

In the previous sections, we outlined how patient-case material contributes to the education of health professionals and patients. Patient cases link health professionals, institutions, and all of society, as all of them have an interest in recording case material and providing it for educational purposes. To inform their efforts in preparing virtual patients for meaningful learning further our discussion will focus on the question: What does it need to transform an EHR into a virtual patient?

The article draws on the interdisciplinary exchange initiated by The OESO-Foundation course on integrated information, communication and education in Medicine, which took place in 2017 in Geneva, where physicians, health-IT experts, and social scientists had shared their discipline’s knowledge related to using EHR for educational purposes. This summary is based on review studies identified through PubMed as well as perspective articles and various surveys. Michaela Wagner-Menghin contributes her experience in medical education as well as training in health professions. Alexander Hirsch’s expertise includes managing online learning events. Peter Pokieser’s expertise in designing virtual patients is based on his interest in cooperating closely with health-IT experts to identify further opportunities for using health-IT to support workplace-based learning.17,18

**What does it need to transform an EHR into a virtual patient?**

It has to be considered that the case material presented as a virtual patient may be more or less related to a real patient. The strongest relation occurs when doctors present pseudonymized patient data to discuss a specific case with colleagues.13 In such cases, transforming patient material into a virtual patient enables doctors to not only share a certain case with their colleagues in order to learn something new about their patients, but to do so online, using modern communication technology, such as webinars or discussion forums. Discussing the case with others adds different experiences and perspectives of experts to current issues. See Figure 2 for an example discussion that developed in the OESO clinical case discussion of Case 63. During such discussions, health professionals can also highlight and share links to relevant educational material. The discussion of virtual patients online can be compared to tele-medical actions. However, in such cases the discussion is not initiated by the patient herself/himself, which means that there is no direct legal relation between the patient and the health professionals discussing the case. Therefore, health professionals presenting patient cases have to ensure strict data protection and have to obtain the patient’s consent prior to transferring patient data in discussion systems, such as QUEST13 or Unified Patient Records.17

Less relation between a real patient and a virtual patient occurs when case material is selected for the simulation of clinical work with patient files for medical students. The starting point for developing this type of virtual patient is again pseudonymized or anonymized patient data. However, in contrast to virtual patients created to consult with colleagues, the virtual patients created for students need more editorial work to ensure the educational value of the material. Furthermore, special educational software solutions are necessary not only to present the virtual patient materials, but also to allow the recording of students’ decisions and answers in order to provide feedback. Figure 3 provides an example of how the virtual patient player “CASUS”25 records student’s answers and provides feedback.

To develop this type of virtual patient, we need a learning goal, a patient case illustrating this learning goal, as well as dedicated teachers and technicians, who prepare the material and the resources for the presentation and who also manage the discussions related to the learning material during and after the presentation. This four-step approach is supported by the review of Kim et al.26 concluding that virtual patients need to be relevant, realistic, engaging, and challenging in order to help students learn.

However, designing such a virtual patient is difficult, especially considering the requirements that
have to be met to fulfill the criteria mentioned above. Before an educator can develop relevant virtual patients, institutions have to pool the knowledge of experienced clinicians so that learning goals of societal relevance can be stipulated for each level of medical education (Fig. 4, Step 1). Only then an educator can select cases, which illustrate these learning goals meaningfully (Fig. 4, Step 2), and start communicating these learning goals to the learners (Fig. 4, Steps 3 and 4). Working on the case material should provide the student with the opportunity to use her/his knowledge and skills as if in real-life practice. Thus, the content of the case needs to be disclosed gradually as it would in real-life clinical practice, and it needs to not only contain pertinent information but also unnecessary information and sometimes cases should even lack some information. To fully engage students in the simulated situation of treating a patient, the presented material needs to be rich in content, include multiple voices and perspectives. Furthermore, learners should be able to influence the course and the outcome of the case through their decisions and actions. Of course, the cases also need to be challenging. Ideally this is achieved by presenting the students’ case collections containing cases of varying complexity including common and unusual cases.

The majority of teaching systems use reformatted patient data gathered from EHR, and do not use the EHRs directly, mainly, because the use of identifiers, language, and technology differs for virtual patients and EHRs. For a real-life setting, reflected in EHRs, identifiers are crucial, and the language used should support doctors in their reasoning processes, while the technology should be optimized to facilitate the time needed for documentation. In simulation settings, such as virtual patient, all identifiers need to be removed, and the language should preferably be expressive and colorful, instead of “overly medical” and specialized, in order to enhance the simulation experience, for example, by describing symptoms the way the patient would present them.
The technological aspects of a simulation should be optimized for didactic scenarios such as questions, discussions, and quick references to learning materials.

The virtual patients imbedded in a simulation can to some extent provide an illusion of real-life settings as a source of information and/or as an additional opportunity for training. For example, an endoscopist in training needs to directly shadow and later be shadowed by an experienced colleague before examining patients independently. At all stages of training and particularly in earlier ones, virtual endoscopic patients with rare pathologic findings can boost the learning efforts.27,28

Discussion

We took a detailed look at the important changes in how patients and citizens and medical communities inform themselves about medical issues. The way we communicate within the expanding social spaces and the way we learn is inspired and at the same time affected by the extremely fast and continuous developments of IT. All social groups and individuals are subject to ongoing changes. The virtualization of patients’ problems or data has already—sometimes without awareness and/or control—trickled into almost everyone’s private life, for example, by means of smartphones and smartwatches. Despite all changes and potential benefits of virtualization, it should be remembered that electronic data processing still has rules and regulations.

The communication between all persons involved remains essential in the field of medicine and all other human affairs. The use of the two different types of virtual patients described in this paper—the one fostering communication among doctors and the other helping to bring the clinic to the classroom—share the same principles, which support this communication. They allow others to observe patients and their doctors, and also allow students to interact and communicate to boost their learning process. In designing virtual patients for educational purposes, the traditional learning materials, such as articles, books, films, and slide presentations, and more currently established tools, such as...
Figure 4. Creating a virtual patient—four steps.

webinars and online discussions, can be interlinked easily and effectively.

Educators will create virtual patients as individual actors using material given to them by patients seen in their own medical practice or clinic with limited editorial resources. Technological progress will allow educators, especially those with high IT skills, to produce virtual patients of increasing quality featuring complex designs. Institutions and medical communities do have the resources to develop highly organized case discussions, virtual case collections, and programs. This will lead to progress in the near future.

Several decades ago, the OESO developed their concept putting the focus on one organ to initiate not only interdisciplinary exchange, but also to stimulate pan-disciplinary communication. This innovative approach of uniting various disciplines by focusing on just one single organ was pioneering. Through the OESO, almost 30 different scientific disciplines engage in scientific exchange. Since 2009, “the clinical case discussions” were featured in OESO meetings, books, courses, and other educational endeavors, and many other medical associations have had success with virtual patients (e.g., www.esgar.org, www.myessd.org).

Conclusion

We conclude that to use patient cases for educational purposes, the society and institutions on all levels as well as individuals have to work together closely. Only close cooperation will make it possible to develop systematically structured virtual patient-case collections, which contribute to the development of good clinical reasoning skills in medical students and health professionals. Despite all the potential positive effects of using virtual patients for the education of health professionals, one should keep in mind that a simulated situation can never replace the experience made in real-life situations. When it comes to training students for optimal patient care, there is more than just the clinical reasoning process that should be taken into consideration and trained. Caring for patients also includes communicating with the patient, understanding and negotiating with her or him. The nonverbal communication that can only occur when two individuals—the patient and the doctor—meet in person is unlikely to be replaced by even the best virtual patient environment.

What we should strive for is to use patient cases and IT to enhance and support health professionals in improving their clinical reasoning skills in
order to enable them to treat their patients safely and improve patient outcome.

Competing interests
The authors declare no competing interests.

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