Barriers to knowledge mobilization in learning to take evidenced-based clinical decisions: a descriptive longitudinal research

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RESUMEN

Introducción: El objetivo de esta investigación fue describir el proceso educativo centrado en resolver situaciones de la vida real con base en evidencia científica.

Metodos: Participantes 58 estudiantes en el curso Fisiopatología en una Escuela de Medicina del Sureste de México. El curriculum está basado fundamentalmente en el esquema de lectura-memorización. El curso se estructuró hacia la resolución de problemas en situaciones de la vida real apoyado por una plataforma en línea.

Resultados: Se identificaron barreras para el desarrollo del curso: persistencia de nociones previas, deficiencias en la selección de información en línea, hábito de copiar y pegar en los reports. Se observaron deficiencias en la percepción que el proceso enfermedad-salud es dinámico y que los pacientes requieren de atención más integral.

Conclusiones: El curso contribuyó a la formación de lectura crítica que apoya fuertemente una práctica clínica de calidad.

Palabras clave: Pensamiento crítico y complejo; profesionalismo; atención centrada en el paciente; educación médica.

ABSTRACT

Background: The objective of this research was to describe educational processes addressed at solving real life situations based on scientific evidence.

Method: Participants were 58 students coursing Physiopathology in a Medical School in Southeast Mexico, where the medical curriculum is based fundamentally on the memory-lecture scheme. The course was structured toward problem-solving situations and was supported by an on-line educational platform.

Results: During the development of the course, we identified barriers in: attitudes and persistence of previous notions, selection of information sources, copy-and-paste habits in reports. Likewise, we encountered failures in their perception that the health-disease process is dynamic and that patients require an integrated management.

Conclutions: The course contributed to construct critical reading that might give support to a well-qualified clinical practice.

Key words: Critical and complex thinking; professionalism; patient-centered care; medical education.

BACKGROUND

The medical practice is based on two fundamental axes: empathy with patients complemented with the possibility of making sense of the clinical data presented by the patients. With the traditional way of medical practice and, consequently, of the medical education processes, many of the physician's action are supported by the non-critical reproduction of the actions performed every day; hence, it is of utter relevance to incorporate the search of evidences to support medical performance in the educational process

The search for the best available information involves an important ethical component (Carter et al., 2011). It bases the medical practice on taking decisions that can resolve in the best probable way the problems of the patients and avoids, as far as possible, the delays and

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undue use of tests and drugs. The search of information for specific medical problems is a competence (Perrenaud, 2009), and according to the mission, vision, and objectives of the School of Medicine of the Universidad, in Southeast Mexico, students must be "capable of learning permanently and autonomously" for which they must "develop competences for their education and permanent professional up-dating of their knowledge" (UJAT, 2010). Despite of this, the preponderant activities, like in most other universities of the American continent, consist of lectures and test-type examinations, according to the traditional text books.

For this research, academic activities were performed based on five lines of thought: 1) Teaching of the subjects known as basic subjects, as blocks before clinical subjects, does not help to identify conceptual needs in taking clinical decisions. 2) Limits among subjects avoid mobilization of knowledge. 3)Decisions are taken in a context of uncertainty and chaos. 4) Taking decisions should have as support the search of evidence, mainly on line. 5) The systematic search of new evidence leads to reconsidering the previously elaborated hypotheses.

Learning to mobilize knowledge

The traditional way of diagnosing is based on the heuristic method (Marewski and Gigerenzer, 2012). The main limitation of this method is its subjectivity, which limits taking into account possible alternatives (Sánchez et al., 1997). Among the main mistakes of this method are the "distortion of the disease 'model' in the personal experience of the physician" and the "use of 'clues' and poorly specific signs to venture the diagnosis" (Hidalgo, 2012). Although, specific criteria are still lacking to determine the risk levels for the classification of patients, these might not yet be sensitive enough (Mitchell, 2015). From this approach, the actions of the physician, as well as those of the consulting patients, depend on pre-conceptions, prejudices, which are constructed as ideology by the dominant structures, and are interiorized as part of the social habits and theories.

The new practice is sustained on values, which are re-defined from the rationalization of the physician's doing, who far from assuming an authoritarian attitude must consider the ethics code that establishes "all patients have the right to a medical care of human and scientific quality" (CGCOM, 2011). Therefore, in the process of medical education, one must, among other aspects: 1) learn to negotiate diagnostic and treatment methods with the patients; 2) reach a commitment of continuous improvement; 3) challenge health consumerism; 4) promote a healthy life style (Gómez et al., 2007).

These aspects inherently involve scientific, philosophical, ethic concepts, as well as reconfiguring the educational processes so that the student can develop the competence in managing information and mobilizing knowledge (Perrenoud, 2009).

The practice of evidence-based medicine entails an argumentative method that must be sustained on the best evidence available. In this model, a hypothesis is constructed that must be sustained by scientific information, be it clinical, epidemiological, or experimental. Only when the hypothesis cannot be sustained, another must be considered that has already been elaborated as less probable alternative than the first one. "Especially with experience, many hypotheses arise from the recognition of a pattern that generates multiple possibilities, instead of a single one with a very high probability" (Sackett, Haynes and Tugweel, 1989).

OBJECTIVE

The research was aimed at describing the barriers the students possess for the management of Internet resources with which they could resolve problems related to decisions taking in the interpretation of the diverse clinical symptoms and signs.

MATERIAL AND METHODS

A descriptive, longitudinal research was performed.

Design of the course

The course was based on the need of knowledge about the physiopathological processes to interpret and apply the results of scientific research on the clinical decision taking (Moller, 2005; EBMWG, 1992). The course was centered on the classification of information for the elaboration of clinical diagnoses. For this, the Kieffer and Sanchez (2004) method was followed; this method poses four basic elements of a relevant clinical question: 1) patient or problem of interest referred to a group of

similar patients, 2) intervention or exposure, being either a doubtful treatment or diagnostic process, 3) comparison, which confronts a standard against a proposal, 4) relevant clinical result, regarding applications of treatment effects or diagnostic methods that are an alternative to standard procedures.

Participants

Fifty-eight students of the School of Medicine of the Universidad, in Southeast Mexico, were monitored in this research. Students were enrolled in the Physiopathology course; the study was performed from January to May 2015.

Instruments used to evaluate activities

Guided anamnesis, physical exploration, and the use of laboratory and imaging tests are needed to construct a hypothesis for the resolution of "problem situations" (Campanario and Otero, 2000). This competence must overcome the learner's attitudes, which are "the personal psychological attitudes that imply the assessment, positive or negative, of an object through explicit or implicit responses" (Manassero et al., 2004).

Based on this premise, the core of the course was the analysis of diverse signs and symptoms and their resolution by searching the scientific information in which the cause of the symptomatology could be sustained on a dynamic process. For this, students were guided in the search of primary articles, systematic reviews, meta-analyses, and clinical guides. To provide feedback to the students, an evaluation matrix was used. Categories of this matrix were: 1) identification of the problem, 2) integration of conceptual contents, 3) elaboration of conclusions based on premises, 4) quality of the cited sources, 5) spelling and grammar. The course was complemented with a virtual platform were students received feedback for their reports.

Ethical considerations

For the report of results, each student was assigned a code to preserve anonymity, an S followed by a number. The study was approved by the Ethics Commission of the UJAT.

RESULTS

Students were free to leave the course. Therefore, in the first semester of 2015, only 35 (60%) ended the course. At the end of the course it was observed that although, the students could overcome the barriers for some problem situations, in the next course, these barriers recurred.

Analyses of the reports by the students revealed four barriers: 1) Their response based on attitudes "about" medicine. 2) Lack of discrimination regarding the information sources. 3) Constraining their report to information obtained predominantly from a single source, either a book, a guideline, or a standard. 4) Inability of providing integrated management of patients.

Attitude barriers

Students were asked to express their opinions in reference to the problem situations that were presented to them. Exploration of their attitudes allowed analyzing, in each situation, the previous ideas that the students had about the health problems of the patients, despite having coursed already several semesters, according to the logic of the traditional curriculum organized in blocks, they should have overcome through the learning of the basic subjects. Hence, at the problem: "diarrhea in a 65-year-old man with diabetes" some responses were: "what is the color of feces? (S56); "if of secretory (type) would you use antibiotics" (S4 and S43); "I would use metamizole and butylhyoscine" (S41).

For "repeated diarrhea in a 25-year-old woman that presents with pain" the students responded "what did she eat"? (S61); "would we use loperamide and tetracyclin" (S31). To "4-year old child with diarrhea" they responded "in a diarrea of secretory type there is malabsorption of nutrients (S3); "how was he infected" S16); "let us check if the child has bathed and has personal cleanliness" (S34). As much as possible, each response was analyzed to construct the conceptual contents, for example, identification of the types of diarrhea according to characteristics that would allow for a diagnosis with a higher reasoning level. As it was clear that the responses were not evidenced-based, sources were indicated to compare the validity of the responses for the construction of concepts.

Barriers in selecting sources

A next step in response to the preconceived ideas of the students, "what they know", about the problems of patients, was to attempt a solution with the aid of sources available on the web. Students responded by transcribing sentences or paragraphs that they localized in their usual search engines. For example, the responses to the problem "of a 40-year-old woman with low back pain of 1 day of evolution". "Many patients do not exhibit symptomatology and many of them do not know that they suffer this condition (spondylolisthesis)", which appears in the web site of a clinic in Ohio, USA (S13). "Based on the continuous pain of our patient (male), which increases when performing movements or intensifies with effort" (S22); although when presenting the data of the patient's problem nothing was said about the information given by the student. The response was based mainly on the information for patients that is given on the web site of a clinic in Barcelona, Spain, and one from Chile. These responses are not the result of a process of identification, selection, and comparison to elaborate conclusions based on several information sources; much less of a search addressed according to the guidelines provided beforehand.

Barrier of copy-and-paste

As the course advanced, there were more attempts to elaborate responses according to the provided information. Despite that the need to analyze the texts had been discussed and that they could not present as their own the information corresponding to published papers or other materials, as this is not ethical, it remained to be a common practice. For example, as response to the problem "a 65-year-old man with dizziness, which appeared while watching a tennis match" a response, in which the source is not given, was: "the nystagmus of vestibular or peripheral origin increases its intensity when the subject looks to the side contrary to batting" (S40). Although it is also a transcription, the following response is handled differently, starting with the identification of the source: "According to the Guide of Clinical Practice, the non-pharmacological treatment consists of repositioning maneuvers. One of the maneuvers that solve 80% of the cases is that of Epley. The Epley maneuver is more efficacious, hence, it is not necessary to use flunarizine" (S34).

Barrier to the integrated management of patients

One of the problem situations was the analysis of the reasons of those that admitted a "7-year-old girl with wheezing" (a problem taken from the Medscape site) to reach a diagnosis of "obstructive bronchitis", independently that 3 months later, by means of X rays, the presence of a foreign body in an esophageal diverticulum was revealed. Despite that they were able to identify one of the criteria for the diagnosis of bronchial asthma, "it is diagnosed by the sudden appearance of symptoms like episodic wheezing, as well as difficulties to breath, thoracic constriction sensation, and coughing" (S24), where the key words are "sudden" and "episodic", paradoxically the students maintained the admittance diagnosis of "obstructive bronchitis".

Only, after the course had advanced further, did they analyze the validity of their diagnosis and were able to review other sources, such as the Child Mortality tables in Mexico provided by the National Institute of Statistics, Geography and Informatics of Mexico (INEGI, for its initials in Spanish). For example, one student was able to construct in his/her report: "The patient is 7 years old, which discards causes 1 and 2 (perinatal). She could not have had pneumonia, where fever and coughing are common, and the patient did not present any of them. Regarding intestinal infections she did not present any digestive symptom or sign. Hence, it leads us to think that it might have been an accident" (S18).

DISCUSSION

The first obstacle was the traditional design of the subject, which is considered a theoretical one, although the program mentions as learning tools, field practices, and clinical and laboratory practices.

Another obstacle was that the student considered the activity as one where the professor "did not impose order": no list of absentees, partial or departmental written examinations, assignments to present themes, review of the report. The idea was not for the students to repeat an isolated subject in a reductionist manner, but to respond to a "problem situation" (Abela, 2009) based on dispersed concepts in diverse texts.

There were also difficulties in constructing abilities for complex and systemic thinking, mainly because many of

the Mexican students that reach university levels have difficulties in reading comprehension (González, 2014). Accomplishing the type of activity required for this course requires the development of literacy, like consultations in virtual libraries, identification of relevant concepts, comparison of information, and construction of conclusions (Muñoz and Maldonado, 2013). This type of learning "requires a more personal involvement with knowledge and dismisses those attitudes prevailing in the traditional learning systems, related to the feeling of wellbeing of the students, an attitude that allows them to become distant or absent-minded, without really understanding" (Perrenoud, 2009), and explains the 40% desertion rate.

Barriers of attitudes

The initial questions were elaborated for the re-thinking about the notions and pre-conceptions, for example "when is fever present?" which is to be responded according to the measurement by a thermometer in a specific anatomical site, according to the Clinical Practice Guide. The concepts like "feverish" which is non-existent in medicine, or the confusion between fever and hyperthermia, surfaced constantly. But if we want to take students further ahead, attitudes must be explored, since "all new learning has as starting point the previous knowledge and experience" (Díaz, 2010). Therefore, it is of utter importance to identify the attitudes if the aim is to foster learning in students and not just memorization of concepts for the final tests, which are promptly forgotten. But instead of changing the emphasis, the school, or the teachers, it is insisted in improving memory, "achievements" (Fortoul et al., 2012).

The attitude, i.e., ingenious or previous ideas, is that it corresponds to what the students "know". These ideas constructed within the families and pursued in the social environment determine many of the perceptions of the students. Their identification is relevant not just as a pure academic exercise, because, as shown by analyzing the responses given by the students, these ideas permeate the vision held by the students on how people get sick and the physician's actions. Actually, they influence more powerfully the behaviors of acting physicians, than the educational processes from memorization and traditional repetition. In this way, they mentioned the use of lope-

ramide (S33, S11, S22, S17) despite being a dangerous drug, simply because they have seen it advertised in TV commercials; as well as the use of antibiotics (S11, S22), in spite of the recommendations of the Mexican Clinical Practice Guide, according to the assessment of evidence.

Barriers in selecting information sources

Because the Project was produced within the context of the academic programs that follow their own logic and not that of a "true work of theoretical practice", activities were centered as much as possible on the analysis of how the organism functions under disease conditions, understood from the mobilization of knowledge. Therefore, normative documents, clinical practice guidelines, concepts of basic sciences, were reviewed when available.

Barrier of copy-and-paste

This barrier consists in the transcription of information predominantly from one source, be it a book, a guide, or a norm. In this type of response predominates definitions and paragraphs of printed texts or from online information, because that is what they have been taught in their class assignments in the traditional processes, where they are responsible for the lectures (Baños and Farré, 2011; García et al., 2012), and they prepare their "assignments", compilations, as requested by some teachers as a means to credit a course, a still popular practice.

In opposition, to resolve the problems of patients, one must mobilize the dispersed data in diverse sources, in contrast to the non-critical memorization which is the concern of the teachers of "basic" science. To improve the working environment, several didactic supports were offered, since teachers "must place themselves in the shoes of the student", recalling that they were also students once, and if teachers do not understand concepts "it is not due to lack of willingness but because the expert sees as evident that which is complicated and arbitrary to the students" (Perrenoud, 2004); abilities for autonomous and permanent learning are required (Sáiz et al., 2012).

Barrier to the integrated management of the patient

Feedback work is necessary for the students to consider more deeply the problems posed. For the problem of the 7-year-old girl with wheezing, the example of conclusions elaborated by the teacher and placed on

the platform was: "There was a deficient management of the patient, since no attempt was made to identify the problem behind the difficulty in breathing of sudden onset. Had the protocols of asthma been followed, more tests and examinations should have been made for the early identification of the foreign body without the risk of diminishing the function of the bronchial-tracheal cilia and the aggregated pneumonia 3 months after the accident. There is a window of variable uncertainty in each case in performing diagnoses; therefore, an attentive and expectant attitude is needed in each occasion to maintain the integrity of each patient"

Other barriers in the first month

The lack of establishing "clear rules", which the students perceived as uncertainty, explains why, unfortunately, half of the students abandoned the course, despite that the best possible answer was not requested according to the evaluation matrix, but rather their input was provided with positive feedback. This response might have been because students are not taught to fail in school as a means of "restructuring their understanding of the world": mistakes are also "instruments of teaching" (Muñoz, 2012).

If instead of emphasizing on the correct responses in the examinations as the primary mechanism to credit a course, one would rather work in the classroom on a formative evaluation process, students would learn more from their mistakes, because incorrect answers would be discussed in class, this does not occur in the memorization exercises whose results are often not accessible to students. In contrast, in school situations where the learning of meta-cognitive strategies is fostered as well as the processing of information, a better level of success is achieved even in traditional curricula (Watmough, Sullivan and Taylor, 2009).

At the end of the course, students were able to structure better their thoughts as they managed a greater amount and diversity of information. They recognized that to face the social practice of medicine, as well as for any other discipline, "knowledge is needed, but knowledge is not pertinent if not available and movable with full awareness and at the time needed" (Perrenoud, 2009). For example, students mentioned that they had forgotten the memorized concepts learned in canonical subjects like anatomy and biochemistry, as they lose relevance as isolated subjects once they get immersed in the clinical subjects (Watmough, Sullivan and Taylor, 2009). This contradicts the idea that concepts are serial and that emphasis must be given to their use (Fortoul et al., 2012) when out of context or that descriptive anatomy is the core of the learning of medicine (Sándor, Birkás and Győrffy, 2015).

Despite all the obstacles (the strengths of the study), 35 (60%) students finished the course and demonstrated to their classmates and to themselves the ability to develop critical complex thinking when faced to ambiguous and demanding tasks as occurs in everyday life. Unfortunately this does not mean that, in the next courses, this ability will be reinforced to turn them into mature, autonomous students, and competent professionals.

CONCLUSIONS AND IMPLICATIONS

Students started the course with severe limitations to integrate contents, which is part of the failure of the educational system as a whole to form students with comprehensive reading abilities, and pursued by the type of academic activities at the higher level, poorly fostering critical reading that might give support to a well-qualified clinical practice.

Although students had access to the Internet from their personal computers, it was evident that the main difficulties were of methodological order, as they lacked searching plans, critical reading abilities, and identification of the necessary statistical aspects for decision taking.

Students were able to analyze clinical signs and symptoms in a similar context to real life. This does not mean that they learned the strategy to apply the scientific knowledge that might respond the questions regarding specific conditions of the patients. To practice a more personalized medicine requires scientific evidence.

To work with projects or problems like complex pedagogical constructions requires mobilization of conceptual resources that have not been analyzed previously, or has been done disorderly and futilely; hence, the relevance of the competence to mobilize knowledge regarding the problems encountered in medicine. It is important to perform further research to evaluate whether the development of the ability to decide based on scientific

information increases the empathy of students for patients and, at the same time, diminishes their levels of anxiety.

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