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Anatomy and clinical reasoning

Abstract

Recent years have seen significant advances in the field of anatomical pedagogy. Among these major advances, the introduction of clinical reasoning in the early years of the medical curriculum has modified and modernized the approach to teaching anatomy. At the Faculty of Medicine of the Gaston Berger University of Saint-Louis, conventional high-school teaching has been enriched by this new teaching method.

Clinical reasoning is the foundation of medical practice, it brings together processes of thought and decision making that allow the clinician to take the most appropriate actions in a specific context of problem solving. However, learning and teaching clinical reasoning are particularly demanding, especially in a discipline such as anatomy, and during first years of the medical curriculum. Apart from the basic knowledge of anatomy, clinical reasoning also requires cognitive abilities from students. Despite these difficulties, the teaching of anatomy can be an interesting basis for learning and practicing clinical reasoning.

Our experience shows that even at the beginning of their curriculum, medical students may be confronted with clinical situations. In anatomy, this scenario improves the motivation and understanding of students. Moreover, it represents an exercise in which students feel valued because they are playing their future role in the care team.

Keywords: clinical reasoning, anatomy, teaching methods, cognitive abilities

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Introduction

Many innovative and effective teaching techniques are used to improve the teaching of anatomy. These techniques, which include clinical reasoning, promote the teaching of anatomy by their interactive and stimulating nature. In recent years it has been recognized that methods used to teach and evaluate anatomical knowledge in medical schools should positively influence students' approach for this learning.[1]

Learning through lectures in an amphitheater is a passive experience in which everything happens between the ears (listening) and fingers (writing). Important advocacy has been made by many faculties of medicine to enrich this magisterial teaching.[2,3] With this in mind, efforts have been made to promote the introduction of new learning methods. Despite the introduction of these stimulating methods, their impact has been limited. In particular, the introduction of new interactive methods into the teaching of fundamentals like anatomy has been very slow.[4]

In the Faculty of Medicine of Gaston Berger University in Saint-Louis, Senegal, for the last few years, our first and second year students in anatomy have begun to become familiar with clinical reasoning. Our experience shows that the introduction of clinical reasoning into the teaching of anatomy can be an effective method for stimulating the interest of medical students.

Introducing clinical reasoning into the teaching of anatomy

Clinical reasoning is the process of thinking and decision-making that allows the clinician to take the most appropriate actions in a specific health problem-solving context.[5,6] Clinical reasoning can be thought of as the intellectual activity by which the clinician synthesizes the information obtained in a clinical situation, integrates it with previous knowledge and experiences, and uses it to make diagnosis and management decisions.[7] Clinical reasoning is at the heart of the competence of health professionals. Its learning and teaching are particularly demanding. It remains difficult for students to acquire the finesse and master all the complexity that is attached to efficient clinical reasoning, and it is equally difficult for teachers to promote its development. This difficulty is more important for fundamental teaching such as anatomy.

Audetat et al.[8] showed that teachers quickly identify students with clinical reasoning deficiencies. However, this detection is intuitive and global. And it is not followed by remedial actions because teachers feel not equipped to diagnose the specific deficit. Therefore, they cannot set up targeted and effective educational measures. Researchers conducted in different clinical environments[9] confirmed that this feeling of pedagogical helplessness is widespread. One of the main tasks of the clinical teacher is to help students sort through patient data and make an accurate diagnosis, with the ultimate goal of appropriate treatment. Over the past 30years, there has been much debate about which model best describes mental processes used by expert clinicians to make diagnostic decisions. For some authors, the ability to use non-analytic databases to make clinical decisions increases with experience and, therefore, the use of pattern recognition processes should not be teached to students, because of "serious potential consequences".[10] Our experience shows that even at the beginning of their curriculum, medical students are able to be confronted with clinical situations. In anatomy, this scenario improves the motivation and understanding of students. It represents an exercise in which students feel valued because they are playing their future role in the care team.

Clinical teachers need to recognize that the traditional two-step programs, which date back to Flexner,[11] where students first appropriate the basic sciences before being exposed to clinical problems, are about to be outdated. Research in medical education

suggests that understanding basic mechanisms can help the clinician to generate accurate diagnostic hypotheses and therefore must continue to be part of the training program.[12,13] This explains why the clinician always uses his anatomy to solve a clinical problem. This approach is also valid for medical students at the beginning of the curriculum, especially when they do not yet benefit from the experience of a seasoned clinician. However, it is important to recognize that this strategy is only one way of reaching the right diagnosis, not the only way. Several processes can be used. When teachers are asked to report on these processes, they typically experience a virtual impossibility to make them explicit, to "de-automate" them and to trace their stages.[14] In this way, it is difficult for students to grasp different dimensions, nuances and subtleties, and for teachers to provide students with the necessary assistance.

Despite all the efforts made to offer a uniform training program to all, not all students have the same experiences. Different students in clinical trainees see different patients, take into account different aspects of each case seen and draw different lessons from their reflections. Each of these differences will have an effect on how each student will approach a given case (i.e, specific circumstantial elements will influence the adopted "reasoning strategy"). For anatomy students in a clinical reasoning situation, this difference between students is less important because they do not yet benefit from clinical experience and the necessary hindsight. This circumstantial conception of the clinic is undoubtedly the fundamental reason for wanting to offer students multiple strategies that will enable them to solve a clinical problem. These processes of thought and decision-making are at the heart of professional practice. They are a complex phenomenon. And in this case, the perspective is resolutely referring to cognitive psychology.

Various research studies conducted on this subject have revealed the existence of several processes of clinical reasoning. Several studies[15–17] have shown that clinicians do not all follow the same path in their progression towards the solution. They do not always collect the same data and we cannot determine a common path that would characterize the expertise. The effective clinician does not generate more hypotheses, does not maintain himself more in his working memory and does not collect more clinical information than novices. In fact, he is distinguished by the generation of better quality hypotheses, the ability to collect crucial data and a better interpretation of the data to test his hypotheses.[4]

In the traditional model of medical education, students are expected to learn clinical reasoning through reading reference books, listening to clinical case conferences, observing experienced clinicians, and discovering the process of effective clinical reasoning through trial and error. Each of these different approaches have their legitimacy and they are very complementary, provided they are articulated with each other.[4] The reading of reference texts does not explain how to generate relevant diagnostic hypotheses, how to walk efficiently within a wide constellation of signs in a patient or how to elucidate a diagnostic problem that presents itself in an atypical way. For a student who has acquired a basis in anatomy, only a clinical situation can encourage a process of clinical reasoning. However, clinical case presentation conferences also have substantial limitations on learning. Because the diagnostic process has been reordered by the presenter and the logic of the investigation is often implicit and imperceptible by medical students.

The observation of clinicians experienced in action also has many limitations if they do not make explicit both their reasoning processes and the knowledge they rely on to develop them. This means that clinical reasoning is not learned in abstract terms. It is acquired through problem-solving activities related to particular clinical cases. The knowledge of anatomy required for good clinical practice is changing rapidly today. This is particularly the case in the field of minimally invasive surgery. Indeed, in this specific area, diagnostic and therapeutic innovations have changed clinicians' perceptions of the anatomy of the human body. Moreover, teaching programs on the use of laparoscopy in the cadaver are developed in addition to the basic teaching of anatomy.[18] It would be desirable for this complementarily to become the norm in the teaching of anatomy.

The establishment of a clinical reasoning process must be evaluated continuously. In medical education, assessment is essential to improve skills and test the quality of teaching.[1,19] The methods used in an anatomy assessment program are therefore essential for determining learning outcomes. In anatomy, practical teaching is evaluated through clinical elements, by the identification of organs on cadavers or on models, or through the interpretation of radiological images. This evaluation sometimes involves the correlation of an organ and its physiological function. Thus for the evaluation of anatomical knowledge, in recent years have seen the integration of evaluation methods sometimes based on the clinic, with great success.

These methods are interesting because they offer the opportunity to directly evaluate the clinical application of anatomical knowledge acquired in first and second years of the medical curriculum. These methods make it possible to early assess the student's skills using instruments and clinical models. They focus on pathologies whose therapeutic decision is based on a good understanding of anatomy. The use of these assessment methods in the curriculum of medical education has promoted an integrated approach to learning anatomy. Several studies showed that this integrated approach improves student participation and understanding.[20,21]

Our analysis may have some limitations. Indeed, it reflects only reflections on the faculty of medicine of Saint-Louis. Saint-Louis Faculty of Medicine is young, and only exists since 2011. The anatomy enjoys significant hourly volumes during the 1st and 2nd years of medical studies. For some years now we have been encouraging our students in logic of clinical reasoning from the first year of the medical course. The preliminary observations show us a better adherence of students in this type of interactive teaching. In particular, the understanding of the course and the participation of the students are improved by the exploitation of clinical cases during the teaching of anatomy. The difficulty of teaching to medical students clinical reasoning stems from the fact that it is an instinctive practice. However, the teaching of anatomy can be an interesting basis for this learning when certain objectives relate to it. As a result, it is not too early to put first- or second-year medical students in a clinical situation. The exercise that involves the student using his anatomical knowledge to solve a clinical problem must be encouraged from the beginning of the medical course.

In spite of these observations, it would be desirable to evaluate by an anonymous and objective questionnaire the perception of the students on the real or supposed benefits of clinical reasoning during the teaching of anatomy in Saint-Louis of Senegal.

Conclusion

At the Faculty of Medicine of Saint-Louis (Senegal), we gradually

introduced clinical reasoning into the teaching of anatomy in the early years of the medical curriculum. Although this introduction was made after a slight reorganization of theoretical and practical anatomy teaching, experience shows us a strong adherence of medical students.

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Conflict of interest

The authors declare that there is no conflict of interest.

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