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PERCEPTION OF MEDICINE ACADEMICS IN THE ACTIVE METHODOLOGY ON THE USE OF BIOLOGICAL MATERIALS IN SURGICAL PRACTICE AND THEIR APPLICATION IN HOSPITALITY: AN OBSERVATIONAL AND CROSS-SECTIONAL STUDY

PERCEPÇÃO DOS ACADÊMICOS DE MEDICINA EM METODOLOGIA ATIVA SOBRE O USO DE MATERIAIS BIOLÓGICOS NA PRÁTICA CIRÚRGICA E SUA APLICAÇÃO NO INTERNADO: UM ESTUDO OBSERVACIONAL E TRANSVERSAL

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ABSTRACT

Introduction: During the medical internship, the last phase of the medical degree, the student is exposed to internships in the medical field of general surgery in health services, where he receives intensive training to start developing his skills and practical surgical notions, in this way, for the student to be introduced early to the surgical scenario, the use of biological parts during practical classes in medical education becomes a tool for the improvement of the teaching-learning process.

Objective: To evaluate the perception of medical students in active methodology on the use of biological parts in the teaching of Surgical Skills and their contributions to the medical internship.

Methods: A descriptive cross-sectional study was conducted online where 106 boarding students (ninth, tenth, and eleventh semesters) of the medical course of a college in the interior of São Paulo were interviewed through a questionnaire using the Google Forms™ tool.

Results: 106 students were included in the study, 65 (61.3%) were female and the median age was 26 years. 30.5% intend to follow surgery as a medical specialty, and

the majority (45.3%) consider the use of the surgery course and performance in the surgery internship very satisfactory. 89.6% and 92.5% stated that the use of biological parts improved skills for the internship and is important for practical classes, respectively. The most relevant procedures addressed in the Surgical Skills discipline were ATLS (79.2%), hemostasis (76%), and cricotomy (56.6%). Skills in the development of surgical procedures (51.9%), instrumentation skills (45.3%), and safety in carrying out activities were the main contributions of surgery classes to internship activities identified by medical students. And this important is the acquisition of anatomical knowledge acquired during classes (68.9%). Most participants (56.6%) identified cricotomy as the main activity enhanced by the use of biological parts. The main contents not covered in the surgical skills were: urological (26.4%) and vascular (21.7%) surgery procedures. There was no relationship between the achievement of the college's surgery course and the student's performance in the surgery internship (p=0.10).

Conclusion: According to the perception of medical students in active methodology, the biological model for teaching medical skills has shown promise in favoring students' understanding and helping them to perform the necessary surgical procedures during their internship.

Keywords: Internship; Surgical skills; Biological parts; Practice; Active method.

RESUMO

Introdução: *Durante o internato médico, última fase do curso de medicina, o aluno é exposto a estágios na área médica de cirurgia geral em serviços de saúde, onde recebe formação intensiva para começar a desenvolver as suas competências e noções práticas cirúrgicas, desta forma, para que o aluno seja introduzido precocemente no cenário cirúrgico, o uso de peças biológicas durante as aulas práticas na educação médica torna-se uma ferramenta para a melhoria do processo ensino-aprendizagem.*

Objetivo: *Avaliar a percepção de estudantes de medicina em metodologia ativa sobre o uso de peças biológicas no ensino de Habilidades Cirúrgicas e suas contribuições para o internato médico.*

Métodos: *Foi realizado um estudo transversal descritivo online, onde foram entrevistados 106 alunos internos (nono, décimo e décimo primeiro semestre) do curso de medicina de uma faculdade do interior de São Paulo, por meio de questionário utilizando a ferramenta Google Forms™.*

Resultados: *106 alunos foram incluídos no estudo, 65 (61,3%) eram do sexo feminino e a idade mediana foi de 26 anos. 30,5% pretendem seguir a cirurgia como especialidade médica, e a maioria (45,3%) considera muito satisfatório o aproveitamento do curso de cirurgia e o desempenho no estágio de cirurgia. 89,6% e 92,5% afirmaram que o uso de peças biológicas melhorou as habilidades para o*

estágio e é importante para as aulas práticas, respectivamente. Os procedimentos mais relevantes abordados na disciplina Técnicas Cirúrgicas foram ATLS (79,2%), hemostasia (76%) e cricotomia (56,6%). Habilidades no desenvolvimento de procedimentos cirúrgicos (51,9%), habilidades de instrumentação (45,3%) e segurança na realização das atividades foram as principais contribuições das aulas de cirurgia para as atividades de estágio identificadas pelos estudantes de medicina. E este importante é a aquisição de conhecimentos anatômicos adquiridos durante as aulas (68,9%). A maioria dos participantes (56,6%) identificou a cricotomia como a principal atividade potencializada pelo uso de peças biológicas. Os principais conteúdos não contemplados nas habilidades cirúrgicas foram: procedimentos cirúrgicos urológicos (26,4%) e vasculares (21,7%). Não houve relação entre o aproveitamento do curso de cirurgia da faculdade e o desempenho do aluno no estágio de cirurgia (p=0,10).

Conclusão: *De acordo com a percepção dos estudantes de medicina na metodologia ativa, o modelo biológico para o ensino de habilidades médicas mostrou-se promissor em favorecer a compreensão dos estudantes e auxiliá-los na realização dos procedimentos cirúrgicos necessários durante o estágio.*

Palavras-chave: *Estágio; Habilidades cirúrgicas; Partes biológicas; Prática; Método ativo.*

1 INTRODUCTION

The faculties of medicine that use active methodologies in the course have as their main characteristic problem-based learning, where the student is the central figure in their training and the professor acts as a mediator of this process [1,2]. In these courses, unlike those that use the traditional methodology, the teaching model has shown promise in relating theory to the practice of the contents covered [3-6], which is an important pedagogical strategy, especially for the axis of surgical skills, requires from the student a greater approach of practical classes to carry out the procedures studied [4].

During the medical internship, the last phase of the medical degree, the student is exposed to internships in the medical field of general surgery in the health services, where he receives intensive training to start developing his skills and practical surgical notions, whether in an outpatient setting, making sutures or assisting in the operating room, to sediment and deepen their knowledge [7-9].

Thus, surgery is not a science that is based only on theory, it takes a lot of

effort and training for the student to be able to perform outpatient and urgent and emergency care. Therefore, the earlier the student is exposed to situations and the teaching of surgical skills, the more he will feel confident and able to perform better and improve his techniques during the internship [7].

Thus, for the student to be inserted early in the surgical scenario, the use of biological parts during practical classes in medical education becomes indispensable. In this teaching strategy, students perform the procedures on ethically obtained post-mortem animal parts, most of which are purchased from slaughterhouses. Students can understand the various anatomical aspects and thus train, concretely and objectively, the studied surgical intervention [10].

Although previous studies have shown that the use of alternative modalities in the teaching of subjects that require practical classes, such as resin parts and 3D anatomical models,

facilitate student learning [11,12], the use of biological parts in the approaches to these disciplines is still crucial for the teaching-learning process, especially for academics in the health area [13-15].

Because of the above, this study was prepared with the objective of evaluating how the practice of surgical techniques in biological parts of animals during the medical course helps students to better develop the understanding of the technique described in the literature that will help in surgical practices during medicine internship, so that it is possible to recognize and adjust the deficiencies in teaching to prepare the student for the adequate performance of basic operative procedures in the professional scope.

2 METHODS

Study Design

A descriptive and cross-sectional study was conducted online (STROBE guidelines were followed).

Study population and sample size

Undergraduate students aged 18 years or older, enrolled in the ninth, tenth, and eleventh semesters of the medical course at a college in the interior of the state

of São Paulo, who consented to participate in the study. The sample size was calculated considering the proportion that maximizes the required sample size through a larger variance [variance of p = p(1-p)] and proportion of p=0.50. Expected frequency = 50%, acceptable margin of error = 5% and 95% confidence interval. Therefore, the study population consisted of a total of 156 Brazilian medical students.

Data Collect

A questionnaire was proposed for students who are in a medical internship, and students in the ninth, tenth and eleventh period of medicine at a college in the interior of São Paulo. A

total of 12 items were elaborated using Google Forms (Google LLC, California, United States of America) where questions about the surgical skills developed during the course were addressed to identify the students' perception of the use of biological materials in practice surgery as well as other variable aspects in the research. The researchers invited eligible students to the survey through a Google Forms™ link through the main electronic means of communication to obtain a greater number of responses.

Data Analysis

Exploratory data analysis included mean, median, standard deviation, and range for continuous variables and number and proportion for categorical variables. The Normal distribution of continuous variables was analyzed by asymmetry, kurtosis, and the Kolmogorov-Smirnov test. A comparison of ordinal variables between three groups was performed using the Kruskal-Wallis test. Statistical analysis was performed using the IBM SPSS Statistics software version 24 (IBM Corporation, NY, USA). The test was two-tailed and $p<0.05$ was considered significant.

Ethical Approval

The study was carried out following the Brazilian National Health Council, Resolution No. 466/212, and approved by the Research Ethics Committee of the Ceres College– FACERES (No. 2.506.811). All participants who agreed to participate voluntarily provided their electronic consent before participation.

3 RESULTS

In total, 106 students were included in the study, 65 (61.3%) were female and the median age was 26 years (20 to 41 years). The intention to pursue a medical career in the area of surgery was reported by 30.5% of the study participants. It was observed that 45.3% of the participants considered the use of the surgery course and performance in the surgery internship very satisfactory. The most relevant procedures covered in the Surgical Skills course were advanced trauma life support (ATLS) (79.2%), hemostasis (76%), and cricotomy (56.6%) (**Table 1**). The question “How did the surgery classes contribute to your performance at the internship?” highlighted the answers related to the skills to perform the procedures, safety, and tranquility as described in **Table 1**.

Table 1. Student responses to quiz questions (N=106).

Description of questions and their answers	N (%)
Surgical career intention	
No	56 (52.8)
Yes	32 (30.5)
I didn't decide	17 (16.0)
Use of the surgery course and performance in the surgery internship	
Bad	1 (0.9)
Regular	9 (8.5)
Good	32 (30.2)
Very satisfactory	48 (45.3)
Beyond expectations	16 (15.1)
Most relevant procedures according to the participants' perception	
ATLS	84 (79.2)
Hemostasis	79/104 (76.0)
Crichotomy	60 (56.6)
Anesthesia	50 (47.2)
Abdominal procedures	34 (32.1)
Chest	30 (28.3)
Amputation	22 (20.8)
Anastomosis	20 (18.9)
Digestive procedures	19 (17.9)
Vascular procedures	9 (8.5)
Urological procedures	7 (6.6)

How did the surgery classes contribute to your performance during the internship	
Ability	55 (51.9)
Instrumentation	48 (45.3)
Safety	41 (38.7)
Fitness	39 (36.8)
Confidence	36 (34.3)
Dexterity	30 (28.3)
Tranquility	29 (27.4)
Anatomy	28 (26.4)

*Categorical variables are described in number (percentage).

When asked if they had previously studied the subject of practical surgery classes, 58 (54.7%) students answered yes, 18 (17%) answered no, and 30 (28.3%) answered “superficially”. Regarding the role of the pieces in student learning, it was identified that 89.6% (95) consider that they helped to improve the performance of surgical techniques, is considered important for the teaching-learning process, contributing, according to the perception of 68.9% (73), for the acquisition of anatomical knowledge and, mainly, for the improvement of cricotomy (56.6%) as described in **Table 2**. Only 20.8% of the participants had no difficulties during the internship to perform trained surgical techniques and surgical procedures related to urology (26.4%) and vascular (21.7%) were identified as possible flaws in the content of practical classes.

Table 2. Role of biological parts in student learning.

Description of questions and their answers	N (%)
Did the use of biological parts help you to improve the performance of surgical techniques?	
Yes	95(89.6)
No	8 (7.5)
Irrelevant	3 (2.8)
Do you consider important the use of biological parts during the practices of surgery classes?	
Yes	98 (92.5)
No	7 (6.6)
Superficially	1 (0.9)
Did you find that the biological pieces helped in the anatomical perception of the procedure?	
Yes	73 (68.9)
No	11 (10.4)

Superficially	22 (20.8)
From the options below for using biological parts. What was essential for the realization of your learning?	
Crichotomy	46 (56.6)
Chest	46 (43.4)
Abdominal	31 (29.2)
Anastomosis	32 (30.2)
Digestive	19(17.90)
Urological	7 (6.6)
Vascular	11 (10.4)
Amputation	19 (17.9)
At boarding school. Did you have any difficulties during any procedure studied in practical classes before?	
Suture	2 (1.9)
Vascular	1 (0.9)
Sites	1 (0.9)
Mini	1 (0.9)
Inguinal	1 (0.9)
Repetition	1 (0.9)
Thoracentesis	1 (0.9)
Technical difficulty	1 (0.9)
Superficially	11(10.4)
No	22(20.8)
During your internship experience. What did you identify that was not addressed in the surgical skills and that ended up causing difficulties in your activities?	
Biosecurity	13(12.3)
Amputation	15(14.2)
Vascular	23(21.7)
Urological	28(26.4)
Digestive	8 (7.5)
Anastomosis	15(14.2)
Abdominal	8 (7.5)
Materials	8 (7.5)
Atire	3 (2.8)
Chest	12(11.3)
Crichotomy	3 (2.8)
Biopsy	8 (7.5)
ATLS	14(13.2)
Anesthesia	25(23.6)
Synthesis	8 (7.5)

*Categorical variables are described in number (percentage).

Finally, the analysis of the answer to question 10 (relationship between the success of the surgery course at the college and the student's performance in the surgery internship) was carried out, concerning students with or without the intention of pursuing a surgical career. There was no statistical difference between the groups (**Table 3**).

Table 3. Analysis of the relationship between the achievement of the college's surgery course and the student's performance in the surgery internship according to surgical career intention.

	Likert Scale Score	p-value*
Do you intend to pursue a surgical career?		
No	3 (1 – 4)	
Yes	3 (1 – 4)	0.10
I didn't decide	2 (0 – 4)	

*Ordinal variables are described as median (range). *Kruskal-Wallis test.

4 DISCUSSION

This study identified the perception of medical students about the effectiveness of medical education in the area of surgery of the use of biological parts, which are learning tools that contribute to the acquisition of technical skills and greater safety in performing the procedure. In the scientific literature, studies propose different perspectives on teaching surgical techniques, such as the use of alternative models for training students and discussions about animal handling in practical classes [11-15]. The present study, however, emphasizes the students' perception of active methodology related to the use of the content of practical classes in surgery and its application in the internship, and its relationship with the main surgical techniques in medical education.

In the search for scientific references on the use of biological parts in teaching, studies were found that show the advantages of these tools, since they allow the dynamic and concrete study of the various aspects and systems of the human body, in addition to reporting that an adequate alternative model is still not available [16-20]. For the control and inspection of this practice, the studies propose the need for a rigid regulation of the use of animals in teaching and research and the availability of training in institutions, so that the use of this method is ethical and respectful [21]. On the other hand, research was also found that demonstrated that the use of alternative models to the use of animals can be satisfactory in teaching, since there are technologies that make this possible, requiring interest on the part of institutions to implement these

methods and encourage the creation of more models [19-21].

The use of animals in research and teaching has provided a great leap in scientific knowledge, having contributed to the production of drugs and vaccines as well as to the development of surgical techniques. However, previous studies have shown that questions about the use of animals in classes involve a broad debate that includes ethical and pedagogical principles [16]. The principle of the 3R's (Reduction, Refinement, Replacement) created in the United Kingdom by zoologist William Russell, was developed to promote the use of animals in science more ethically and safely, using alternative models whenever possible [17,18].

Reinforcing the use of biological parts, some studies show that despite the wide use of technology in the development of alternative teaching models, such as the use of resin parts and 3D representations. Such tools contribute to the learning process but are not yet able to completely replace organic materials in this process, as they do not provide the student with the development of their skills and greater anatomical perception in the conduct performed [11,13,15], also failing to acquire knowledge. security and tranquility in the execution of the procedures. Our study shows the benefits of using biological tissues in the discipline of surgical skills, as the students in the internship found that this teaching model helped them to have a greater perspective of the procedures studied and thus better understand the techniques performed, such as the procedure of cricotomy, in which most students noted that the use of these pieces to materialize their knowledge is of fundamental importance.

In the current scientific literature, no tools were found to evaluate the performance of students in surgery based on the use of biological parts during classes. In the present research, therefore, we proposed a questionnaire in which it was possible to identify the main aspects related to the perspective of students in active teaching methodologies on the use of biological materials in the discipline of surgical skills and to determine whether the use of this instrument helped students in a medical internship.

In this sense, the learning model through active methodologies stands out, an innovative instrument in health education that proved to be favorable in the acquisition of medical skills by students during the medical course [2], offering them greater competencies, especially in the context of practical disciplines, like surgery. In this way,

the present study showed that medical students in active methodologies that use biological parts in their practical classes had benefits such as improvement of surgical procedures and the safety to develop them for application in an internship. This proves the result of previous research, showing the integration of theory and practice in these courses, and especially the appreciation of surgical techniques training activities [6].

The present study also corroborates other studies carried out previously [22], showing that there are some deficiencies to be corrected in the teaching of surgical skills, such as urological surgeries, which, when not addressed in the discipline classes, were identified as the content in which students had more experience and difficulties during an internship. In addition, the preference for the area of surgery does not interfere with the effectiveness of the teaching tool, which favors its evaluation by its users. In this way, it is possible to outline goals and strategies to correct these gaps.

This study has some limitations. Some questions remain unanswered: What is the medical student's perception of the influence of the methodological approach to teaching in the process of learning and acquiring surgical techniques? How do develop and implement an assessment instrument that is capable of measuring the effectiveness of tools that can favor the teaching-learning process? In addition, the questionnaire developed by the study allowed participants to different response categories, making data analysis difficult and it is an instrument that has not been validated in terms of its psychometric properties.

5 CONCLUSION

The acquisition of surgical skills involves the development of teaching and learning techniques and tools that can be facilitated by the use of biological parts in the classes of medicine courses in active methodology. This teaching tool, in addition to improving technical skills, offers greater security to the academy during the internship. It is important to highlight the need to develop instruments for the evaluation and implementation of educational tools in the health area.

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Not applicable.

ETHICAL APPROVAL

The study was carried out following the Brazilian National Health Council, Resolution No. 466/212, and approved by the Research Ethics Committee of the Ceres College – FACERES (No. 2.506.811). All participants who agreed to participate voluntarily provided their electronic consent before participation.

INFORMED CONSENT

All participants who agreed to participate voluntarily provided their consent before participation.

DATA SHARING STATEMENT

No additional data are available.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SIMILARITY CHECK

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