Application for teaching medical bioethics in physiatry

Application for the teaching of medical Bioethics in Physical Medicine and Rehabilitation

Application for the Teaching of Medical Bioethics in Physical medicine

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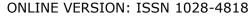
SUMMARY

Bioethics and its principles have become, today, an urgent need in various academic curricula, both undergraduate and postgraduate education, to contribute to the teaching of Medical Bioethics in residents of the specialty of Physical Medicine and Rehabilitation . With the aim of evaluating, through an educational application, the understanding of contents related to bioethics in the specialty of Physical Medicine and Rehabilitation , a

technological development study was carried out in the Physical Medicine and Rehabilitation Service of the Celia Sánchez Manduley Hospital from September 2022 to September 2024. The work methodology was established, in accordance with the scientific foundations and the pertinent aspects for its evaluation, through the *Chanlat Matrix* , which are conceived as expressions of scientific logic. The application carried out allows the physical medicine and rehabilitation professional a computer product that, as a means, favors the integration of bioethical knowledge into the residency program.

Keywords: Educational software; Medical bioethics; Educational application .
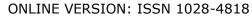
ABSTRACT

Bioethics and its principles have become, today, an urgent necessity in various academic curricula, both undergraduate and postgraduate, to contribute to the teaching of Medical Bioethics to residents in the specialty of Physical Medicine and Rehabilitation. With the aim of evaluating, through an educational application, the understanding of content related to bioethics in the field of Physical Medicine and Rehabilitation, a technological development study was conducted at the Physical Medicine and Rehabilitation Department of Celia Sánchez Manduley Hospital from September 2022 to September 2024. The work methodology was established according to scientific foundations and relevant aspects for evaluation, using the Chanlat Matrix, which is conceived as an expression of scientific logic. The developed application provides physical medicine and rehabilitation professionals with an IT product that serves as a means to promote the integration of bioethical knowledge into the residency program.

Keywords: Educational software; Medical bioethics; Educational application.

SUMMARY

A Bioética e seus beginning tornaram -se, hoje , uma necessity inadiável em several academic curricula , both graduation quanto de pós-graduação , to contribute with I teach

Medical Bioethics to residents of the specialty of Physical Medicine and Rehabilitation . com The objective of supporting , through an educational application, the understanding of two contents related to bioethics in the specialty of Physical Medicine and Rehabilitation , was carried out in a Technological development study at the Physical Medicine and Rehabilitation Service of the Celia Sánchez Manduley Hospital , from September 2022 to September 2024. The working methodology went established according to as the scientific foundations and the pertinent aspects for its validation , by means of the Chanlat Matrix , conceived as an expression of scientific logic. Or developed application offers year physical medicine and rehabilitation professional um computer product that favors, like meio , the integration of bioethical knowledge in the residency program .
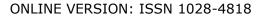
Keywords : Educational software; medical bioethics; Application.

Introduction

Computing is the discipline or field of study that encompasses the body of knowledge, methods, and techniques related to the automatic processing of information, along with its theories and practical applications, for the purpose of storing, processing, and transmitting data and information in digital format using computer systems . [1]

Computer operating systems, known as software, comprise all the programs and applications necessary to run all the computer system's processes. Among the most commonly used are application software, management software, programming software, and systems software. [2]

This scientific and technical activity is designed and implemented to influence human well-being, promote social and economic progress, and impact the environment. The rapid rise and constant progress of Information and Communication Technologies are part of this context. [3]
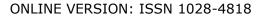
Bioethics and its principles have become, today, an urgent need in various academic curricula, both undergraduate and graduate. In the particular case of the training of health specialists, this urgency is much more immediate and transcendent, since it would complete and deepen their preparation for excellent performance in different work settings. New Information and Communication Technologies, which have experienced a dizzying development, by their very nature, associated with human behaviors of diverse kinds, are a favorable field for the implementation of a bioethical approach that enhances their rational and humanistic use. [4]

The scientific question is: How can we contribute to the teaching of Medical Bioethics to residents of the Physical Medicine and Rehabilitation (PMR) specialty at the Celia Sánchez Manduley Hospital in Manzanillo?

From this analytical perspective, as part of the causal assessment, it is necessary to identify gaps in the training program of this specialty that denote the lack of a comprehensive vision in the contents of Medical Bioethics, which are received in the first year of training of the resident in the Philosophy and Society Course, which consists of 48 hours and only topic 5 called Science and Value, in which three topics are addressed and one of these is: Bioethical reflection as an alternative to the problems of the science-value relationship in the conditions of today's world, which represents 3% of the total content of the course, leaving out transcendental aspects in a specialty that is characterized by a close and direct relationship with the patient, so these deficiencies in the contents of bioethics limit the training of the resident in Physical Medicine and Rehabilitation.

According to this, the training program does not have the objectives that reflect the content. In the opinion of the author of this research, despite the fact that it addresses

ethics as a science, it excludes the bioethics necessary for training and professional settings.

The objective of this research is to evaluate an educational application that contributes to the teaching of bioethics to residents in the Physical Medicine and Rehabilitation specialty.
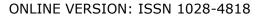
Methods

Type of study: qualitative technological development research. The study considers fact-perceptual aspects linked to the established research problem.

population : made up of the 15 residents who make up the enrollment of the Physical Medicine and Rehabilitation specialty .

The methodological design presented is in line with the requirements of theoretical research and qualitative methodology, based on a bibliographic review , from September 2022 to September 2024 at the Provincial Physical Medicine and Rehabilitation Service of the Celia Sánchez Manduley Hospital.

Study population: made up of first to third year residents in training, specifically taking into account the contents of Module 1: Introduction to the specialty, in the contents of topic 1.3 entitled: The Physical Medicine and Rehabilitation Specialist: Profile and Functions.

Absolute and relative frequency measurements were used, with results presented through N x N contingency tables, which allowed for the demonstration, summary, and presentation of information. This made it possible to organize and classify the indicators acquired during the verification; these indicators revealed the results of a survey conducted with professors from the academic committee and residents as users of the designed application. The work methodology consisted of interviews (with directors of the University of Medical Sciences of Granma), document analysis (exploration of the

specialty's curriculum), as well as characteristics, relevance, objectives, relationships, and trends of the educational desktop application for teaching content related to Bioethics and its principles in the specialty of Physical Medicine and Rehabilitation.

Effectiveness of the application: The *Chanlat Matrix technique was used* with selected specialists based on their computer skills. The instruments were administered to all residents in training, teachers, and managers of the provincial MFR service in groups that were willing to be interviewed and surveyed. To achieve the results, elements of qualitative and quantitative methodology were used in an articulated manner. The research took into account a dialectical perspective, given the established stages for employing the scientific method.

Practical significance: From an academic perspective, the proposal offers faculty and residents a software product that, as a means, promotes the integration of bioethical knowledge into the MFR residency program , and at the same time its implementation in various healthcare settings.

The novelty It consists of the use of technologies and languages used to create software with the application of agile extreme programming methodologies (E *xtreme Programming*) and *Matchware CorelDRAW Graphics X7* , an authoring tool oriented towards multimedia creation, was responsible for satisfying multiple needs from graphic design as a means that enables the introduction of Medical Bioethics available on the institutional FTP site of the Celia Sánchez Manduley hospital as well as in the Library of the Faculty of Medical Sciences of Manzanillo.

Ethical aspects: Written informed consent was obtained from participants after they received an explanation of the characteristics and importance of the research. Ethical principles established in the Declaration of Helsinki, as amended by the 52nd General Assembly of Edinburgh, Scotland, were taken into account. [5]

Results

The following stages of investigative inquiry were taken into account: Factoperceptual Stage for verification of the research problem from the diagnosis of the object and field. Theoretical Elaboration Stage that delimits the title of the application, objective, characterization, information, flowchart, screen design, help, functional requirements, guidelines, evaluation. The usefulness of an educational application as a means to dynamize learning processes is widely used by the international scientific community. Stage of scientific corroboration of results for the evaluation of the educational application submitted to the criteria of specialists, in accordance with the established logic, through the *Chanlat* Matrix construction method . The application of this matrix allowed the feasibility of the results to be evaluated through consultation with specialists.

Table 1. Results of the survey on Bioethics and its principles for faculty members of the MFR residency faculty.

Philosophy topics related to today's bioethical reflection can be complemented with bioethical knowledge that contributes to medical practice.	Yeah		No	
	#	%	#	%
	9	83.3	3	16
Do you consider Bioethics necessary in the training of MFR Residents?	7	66.6	5	33.3
Why is Bioethics necessary in the training of MFR residents?	Yeah		%	
Improve professional performance	6		50	
Improve the doctor-patient relationship	12		83.3	
Better address ethical dilemmas	9		100	
Achieving empathy in dealing with family members	12		83.3	
What content should be added as a complement to teaching Bioethics?				
Medical Bioethics and its principles	9		75	
Fundamentals of Bioethics	6		50	
Informed consent	7		58.3	
Violations in Medical Bioethics	12		100	
Do you know the principles of Bioethics?				
Charity	9		83.3	
Autonomy	12		100	
Non-maleficence	9		83.3	
Social justice	12		100	
Incorporating contents of medical bioethics and its principles would be beneficial in the contexts of the practice of the MFR specialist physician.	Yeah		No	
	#	%	#	%
	7	83.3	5	16.6
Inclusion of other bioethical elements in the Philosophy and Society course	8	66	4	44

taught to residents				
Possibilities offered by an educational application for the incorporation of bioethics content	12	100	-	-

Table 1 offers the results of the survey application that show the teachers' recognition of the need to incorporate topics related to Medical Bioethics into the MFR specialty Resident training program.

Table 2. Results of the interview with Postgraduate directors of the Faculty of Medical Sciences of Manzanillo .

	Yeah		No		I don't know	
Knowledge of Medical Bioethics and its principles	#	%	#	%	#	%
	-	-	4	80	1	20
Need to incorporate medical bioethics content as part of the training program	Yeah			No		
	#	%		#	%	
	5	100		-	-	
Knowledge about the existence of a module for teaching Medical Bioethics in postgraduate studies	-	-		4	80	
Incorporating contents of Medical Bioethics would be beneficial in contexts where the MFR operates.	5	100		-	-	
Possibilities offered by software for incorporating Bioethics content	5	100		-	-	
From the profile of the MFR, it indicates what may be necessary for Bioethics.	Yeah			%		
Offer moral standards of conduct	5			100		
Influence better professional performance	5			100		
Contribute to the solution of ethical problems	5			100		
Improve the quality of human relations	5			100		
Basic aspects of Bioethics						
Care function	3			60		
Scientific information and library science	5			100		
Steering function	5			100		
Teaching function	2			20		
Investigative function	5			100		

In Table 2, the interview reveals the managers' recognition of the need to teach Medical Bioethics as part of the training program content.

Table 3. Survey results for Physical Medicine and Rehabilitation residents.

Do you know what Medical Bioethics is?	Yeah	No

	#	%	#	%
Know situations in your study environment or pre-professional practice where Bioethical conduct is required	2	13.3	13	86.6
	Yeah		**%**	
	#	%	#	%
	11	73.3	4	26.6
Consider it useful to know Bioethics	#	%	#	%
	10	66.6	5	33.3
What is Bioethics useful for?	**Yeah**		**%**	
Improve professional performance	9		60	
Improve the doctor-patient relationship	3		20	
Better addressing ethical dilemmas	8		54	
Empathy in dealing with family members	10		100	
From the profile of the MFR specialist, it indicates where Bioethics may be necessary.	**Yeah**		**%**	
Care function	15		100	
Scientific Information and Library Science	15		100	
Steering function	10		66.6	
Teaching function	8		53.3	
Investigative function	15		100	
What teaching media do you prefer to support your learning?	**Yeah**		**%**	
Books	6		40	
Board	9		60	
Computer (software)	15		100	
Printed materials	5		33.3	
Manuals	3		20	

Table 3 reveals the perceived need for ways to update information on Medical Bioethics. Consequently, the relevance of designing an educational application as a means to foster this need is established, based on the purpose and scope of this research.

From the formula to determine the expected effectiveness of the software (EES), EES = I x F x O / 100, the following ranges are taken into consideration:

- If EES is greater than 8, the proposal is considered strong.

- If EES is between 5 and 7, the proposal is considered medium.

- If EES is less than 5, the proposal is considered weak.

A feasibility assessment is carried out using the Matrix of *Chanlat* , for which it is submitted to a group of specialists, selected for their expertise in computer science. The specialists are asked to analyze the following variables: impact, functionality, and opportunity. The specialists rate the results using a qualitative *Likert scale* , with values between 0 and 10, increasing qualitatively and positively.

Table 4. *Chanlat* matrix to evaluate the effectiveness of the application through consultation with specialists.

Variables	Weighing	Average
Impact		
Contribution to the achievement of objectives	10	
Needs I satisfied	9	
Number of categories involved	10	9.5
Contribution to the organization	9	
Functionality		
Acceptance expected	10	
Availability of resources	10	
Implementation assurances	8	
Process quality	9	9.2
Feasibility	9	
Chance		
Demands of the environment that favor action	9	
Desirability of the proposal	10	
Urgency of the need to apply it	9	9.5
General support expected	10	

From the formula to determine the expected effectiveness of the educational application (EES): EES = 8.303.

In Table 4, the average weighting of the impact and its indicators revealed a significance level of 9.5 , considered a strong aspect of the proposed application. The same is true for the functionality variable , which informants rated at an average weighting of 9.2 .

The results for the third variable, Timeliness , obtained an average weight of 9.5 , considered strong according to the previously identified categorization. Finally, the analysis of the results of the expected effectiveness of the educational application yielded, based on the average weights, a significance level of 8.303 , classifying the proposed educational application as strong. These results enable the theoretical validation of the educational application for teaching Bioethics in the training of residents in Physical Medicine.

Features of the educational application:

Name: Basic Bioethics for ResiFisiat .

Objective: To train the principles of medical bioethics integrated into the Physical Medicine resident program for performance in professional practice.

Characterization: desktop application.

Information: Your software functions as a manager that integrates medical bioethics content from the MFR residency program. (See Figure 1.)

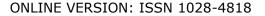**Fig. 1.** Visual design of the application from the praxiological representation .

The wallpaper is white, with a predominance of dividing lines (as per the residents' wishes); the square buttons display text prompts to facilitate navigation for residents and other industry professionals.

Functional requirements from the information display:

1. View information related to the content.

1.2. View information in the book image gallery.

1.3. View information on bioethics personalities and help.

1.4. View external files.

1.5. Execute internal programming of the hyperenvironment .

1.6. Run .exe files.

Non-functional requirements: *Pentium* III, Office 97 and Windows XP with 256MB RAM, Core i5-Windows 11, 4GB RAM.
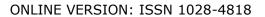
Discussion

The opinions of the academic committee's professors regarding the need to include Medical Bioethics content as part of the MFR resident training program were obtained by administering a survey to 100% of these professionals.

The analysis of the results of the research showed a positive state of opinion of the professors regarding the idea defended in this research, demonstrated in the acceptance of the insufficiency of the contents of Medical Bioethics that are only included in one topic of the Philosophy and Society course [6] and that, despite meeting the objectives set out in the training program for residents of Physical Medicine and Rehabilitation can be enriched with other elements such as bioethical principlism, as it contains the essential theoretical bases of ethical conduct.

These previous ideas coincide with those put forward by Muñoz Fernández, [7] when he recognizes that the most important focuses on health care and its possible complications from a very general way. It is necessary to specify these principles and weigh them according to the specific case of each user, determining which principle, rule, right or duty has more weight in that specific situation. These principles are not absolute; they imply the moral obligation on the part of the health professional to carry out a responsible ethical analysis, which includes their physiotherapist-user relationship, in which medical indications, the physiotherapist's assessment, the user's preferences, the quality of life in terms of the patient's functionality, the real possibilities of recovery and even the user's spirituality are weighed.

The problem of man in philosophy, Marxism and epistemology, and science and value, is addressed in the contents referring to bioethical reflection as an alternative to face the
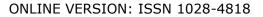
problems. Regarding the science-value relationship in the conditions of today's world, those that are addressed, leave out general theoretical knowledge of Medical Bioethics necessary for all health science professionals, regardless of the professional category they hold. With the knowledge of the general principles of bioethics, they will be able to face the new problems that appear as part of modern life and the computerization of society. An aspect that is recognized by Corrales Reyes who values the role of bioethics in the training and performance of the Cuban health professional. [8]

The above leads to a logical recognition of the need to teach Bioethics as part of the training processes of the student of the MFR specialty, since it would improve the quality of performance in their professional life in the different contexts of action, including teaching as one of the key scenarios, a space that should not be exempt from the emergence of conflicts and dilemmas of an ethical nature in which the knowledge of Bioethics and its principles can contribute to a more accurate solution; in the same way, empathy in the treatment of patients is assumed as one of the aspects that justifies the need to include bioethical aspects in the training of the MFR resident, Alzate , [9] is also in favor of teaching bioethics when he suggests defining competencies to be developed as part of training in medical sciences. García, [10] also considers the particular importance of bioethical training for health professionals.

Knowledge of bioethical principles is recognized and demonstrated as one of the contents that can be included to complement the teaching of medical bioethics, considering the role they play as criteria or standards that propose the greatest good for the person in the areas of life, health, and their use as guides for resolving bioethical dilemmas, an issue with which Ramos de Viesca agrees in the sharing of his experiences. [11]

The ideas presented above are related to the recognition that studying the general code of ethics in the health sector is not sufficient to provide residents with elements of the ethical values and principles that govern this sector and that should characterize its workers.
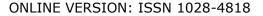
inclusion of other bioethical elements in the Philosophy and Society course taught to residents is required , and these cannot be modified by the faculty. Hence the need to create other alternatives to compensate for such important content as the one proposed in this research.

The teaching of medical bioethics and its principles is assumed to be a necessity for residents of the MFR specialty, allowing them to integrate the contents of bioethics, as it creates the conditions for carrying out a practice that responds to the social demands of this professional who, as part of his mission, offers quality services within the Cuban health system. This activity is not exempt from ethical conflicts, which coincides with studies conducted by Mesa, [12] who assumes that the practice of medicine continually confronts health personnel with ethical dilemmas.

One way to facilitate residents' acquisition of knowledge about Medical Bioethics and its principles is to include it as part of the MFR residency modules, since this content is assessed. This allows instructors to include topics that are not part of the MFR curriculum and may vary depending on educational or territorial needs, or those imposed by scientific and technical developments. The disadvantage is that this residency does not include elective courses to reinforce knowledge. [13]

Accepting the potential offered by an educational application for learning bioethical content is one of the results of this research, an aspect that is confirmed in the opinion offered by the faculty of the MFR academic committee. The educational application, as a computer application with structural and functional characteristics, supports the process of teaching, learning and administration. This coincides with what was proposed by Alfonso , [14] who offers, on the part of the directors, several ways or spaces in which bioethical content can be incorporated, the author suggests including political-ideological preparation, due to the reflexive nature of bioethics and its possibility of addressing the main dilemmas related to medical practice and its related sciences, in the same way as part of the update from the formation in values.

The possibilities to promote and integrate bioethics content and its principles, supported by the access to new technologies that are now guaranteed to medical science residents, are recognized as one of the strategies in the training process of all professionals in the specialties of Medical Sciences. [12]

Several authors such as Machado and collaborators, [15] Salcines and González, [16] have published the use of software in education. Others such as Garay, [17] Morales, [18] Velázquez and collaborators, [19] have used them in Medical Education. In this sense, the software presented in this research enriches the comprehensive training of rehabilitation medical professionals, addressing bioethical aspects, and in line with current Cuban policy, based on advances in information and communication technologies, along with technological development. [15]
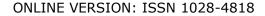
Conclusions

The application provides physical medicine and rehabilitation professionals with a software product that facilitates the integration of bioethical knowledge into their residency program.

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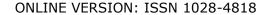
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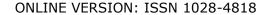
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Conflict of interest

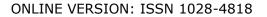The authors declare no conflicts of interest.

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