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KNOWLEDGE, SKILLS, AND ATTITUDES NECESSARY FOR THE PERFORMANCE OF A CYTOPATHOLOGY TECHNICIAN: PERSPECTIVES OF BRAZILIAN LABORATORIES

CONOCIMIENTOS, HALIBIDADES Y ACTITUDES NECESARIAS PARA EL TRABAJO DE TÉCNICOS EM CITOPATOLOGÍA: PERCEPCIÓN DE LOS LABORATÓRIOS BRASILEÑOS

CONHECIMENTOS, HABILIDADES E ATITUDES NECESSÁRIAS PARA A ATUAÇÃO DO TÉCNICO EM CITOPATOLOGIA: PERCEPÇÃO DE LABORATÓRIOS BRASILEIROS

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Abstract
The training process for cytopathology technicians was marked by both the lack of standardization of courses and in-service training. Understanding the work performed by cytopathology technicians in their professional practice is one way to understand which skills are necessary for their training. This article aimed to understand the perception of eight cytopathology laboratory professionals about what knowledge, skills, and attitudes they consider necessary for the performance of a cytopathology technician. To achieve this objective, a qualitative study was conducted with an exploratory approach and intramethod triangulation, through the application of a questionnaire and interviews to laboratory supervisors from October 2023 to April 2024. Gynecological reading cytology slides was the most sought-after knowledge among professionals who supervise cytopathology technicians. Preparing histological slides was considered a very important skill for half of the Respondents. Being attentive. and ethical during professional practice was considered by all participants as very important during the execution of laboratory activities. The role of cytopathology technicians has been discussed in light of changes in cervical cancer screening policy in the SUS. Understanding the skills that laboratories look for when hiring this professional contributes to the construction of a standardized curriculum that meets the demands of this area .

Keywords: Cytology; Professional Education; Technical education.

Resumen
El proceso de formación de técnicos em citopatología estuvo marcado tanto por la falta de estandarización de los cursos como por la falta de capacitación em el servicio. Conocer el trabajo que desempeñan los técnicos em citopatología em su ejercicio profesional es una de las formas de entender qué competências son necesarias para su formación. Este artículo tuvo como objetivo comprender La percepción de ocho profesionales de laboratorios de citopatología respecto de qué

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conocimientos, habilidades y actitudes consideran necesarios para el desempeño de um profesional técnico em citopatología. Para lograr el objetivo se realizo un estúdio cualitativo, con enfoque exploratório com triangulación intramétodo, mediante La aplicación de um cuestionario y entrevistas a supervisores de laboratorio desde octubre de 2023 hasta abril de 2024. La lectura de preparaciones de citología ginecológica fue el conocimiento más buscado entre los profesionales. que supervisan a los técnicos de citopatología. La preparación de porta objetos histológicos se consideró una habilidad muy importante para La mitad de los encuestados. La atención y la ética em elejercicio profesional fue considerada por todos los participantes como muy importante durante La ejecución de lãs actividades de laboratorio. El papel del técnico em citopatología ha sido discutido a la luz de los câmbios en la política de pesquisa Del cáncer de cuello uterino em el SUS. Conocerlas habilidades que buscan los laboratorios al contratar a este profesional contribuy en la construcción de un currículo estandarizado que atienda lãs exigencias de esta área.

Palabras clave: Citología; Educación profesional; Educación técnica.

Resumo

O processo de formação de técnicos em citopatologia foi marcado tanto pela falta de padronização de cursos quanto pela formação em serviço. Conhecer o trabalho desenvolvido pelos técnicos em citopatologia na sua prática profissional é um dos caminhos para compreender quais competências são necessárias para a sua formação. Esse artigo se propôs a conhecer a percepção de oito profissionais de laboratórios de citopatologia sobre quais conhecimentos, habilidades e atitudes eles consideram necessárias para a atuação de um profissional técnico em citopatologia. Para concretizar o objetivo foi realizado um estudo qualitativo, de enfoque exploratório com triangulação intramétodo, através da aplicação de questionário e entrevista a supervisores de laboratórios no período de outubro de 2023 a abril de 2024. Nesse sentido, a leitura de lâminas de citologia ginecológica foi o conhecimento mais buscado entre os profissionais que supervisionam técnicos em citopatologia. A preparação de lâminas histológicas foi considerada uma habilidade muito importante para metade dos respondentes. Ter atenção e ética durante a prática profissional foi reconhecido por todos os participantes como muito importante durante a execução das atividades laboratoriais. Assim, a atuação do técnico em citopatologia tem sido discutida diante das mudanças na política de rastreamento do câncer do colo do útero no SUS. Portanto, conhecer as competências que os laboratórios buscam ao contratar esse profissional contribui para a construção de um currículo padronizado que atenda as demandas dessa área.

Palavras-Chave: Citologia; Educação profissional; Ensino técnico.

Introduction

The training of cytopathology technicians (also called cytotechnicians) began in Brazil in the 1960s, during the first cervical cancer screening campaigns using cytopathological examination (Cruz; Salvador, 2024).

Cervical cancer is the third most common type of cancer among Brazilian women, excluding non-melanoma skin cancers. The Pap smear (Papanicolaou test) was introduced into cervical cancer screening campaigns because it is capable of detecting pre -neoplastic cellular changes early, which precede the onset of this cancer (Instituto Nacional do Câncer - Inca, 2022).

In this context, the training of cytopathology technicians was necessary to have professionals who could perform the initial microscopic reading of slides, referring cases considered doubtful or atypical for evaluation by a higher-level professional qualified to determine the cytological diagnosis (Santana et al., 2023).

The training process for these professionals was marked by a lack of standardization in courses and on-the-job training (Medrado; Evaristo; Lopes, 2019). And currently, there are still discrepancies in the literature regarding the content that should be offered to this professional category (Santana et al., 2023).

In 2011, the Ministry of Health (MS) published guidelines and orientations for the training of cytopathology technicians, reinforcing the training of mid-level technicians to work in anatomical pathology laboratories according to the specificities of cytology and histology from the perspective of health promotion, disease prevention, and treatment (Brasil, 2011). However, the Ministry of Education (MEC), when presenting the skills of cytopathology technicians in the National Catalog of Technical Courses (CNCT), in its four editions, mentions the receipt and preparation of samples for cytopathological analysis, but does not include histological samples (Brasil, 2020).

Furthermore, in recent years there have been advances in diagnostic technologies, which has led to the work of cytopathology technicians encompassing the analysis of non-gynecological samples and incorporating liquid-based cytology techniques and biomolecular analyses, representing new possibilities and challenges for workers in the field (Medrado; Lopes, 2023).

In 2021, the World Health Organization (WHO) began recommending the use of human papillomavirus deoxyribonucleic acid (HPV-DNA) testing as a primary screening method for cervical cancer, instead of cytological examination (World Health Organization , 2021). In Brazil, It was only in 2024 that Ordinance SECTICS/MS nº 3 was published, incorporating the recommendation to use HPV-DNA testing for cervical cancer screening within the scope of the Unified Health System (SUS) (Brasil, 2024a). Using this new screening method, a decrease in cytological examinations is expected in the country, which is one of the main activities performed by cytopathology technicians.

Given so many changes, this article aimed to understand the perception of human resource management professionals in laboratories regarding the knowledge, skills, and attitudes necessary for the performance of a cytopathology technician.

- Knowledge, skills and attitudes

Understanding the work carried out by cytopathology technicians in laboratories is one way to comprehend what skills are necessary for their performance.

Professional competence is a multifaceted concept and can be defined from various theoretical approaches in different areas of activity (Martins; Martins; Oliveira, 2020). In this study, we will use the concept of dialogical competence, where the construction of meaning presupposes the transfer of learning based on content to learning based on the integration of theory and practice (Lima, 2005).

Regarding the dialogical approach, Lima et al. (2014, p.4) states that:

> the dialogical approach considers that the definition of a professional profile is an open-ended process, described by the knowledge of a given era and society, woven into the tensions and noise produced by the dispute and complementary interaction of different values present in a Society.

In this way, we will seek to highlight, through current professional practice, a set of actions that define the scope of work for cytopathology technicians.

Professional competence is composed of three elements: skills, attitudes, and knowledge. According to Saupe et al. (2006), skills correspond to the set of practices acquired mainly through demonstration, repetition, and critical re-elaboration that provide know-how; attitudes comprise a set of behaviors that give the professional the ethical and affective mastery of knowing how to be and how to live together, in addition to the ability to make decisions and solve problems in their area of expertise; and knowledge is associated with the set of contents that enable the professional to have cognitive mastery of knowledge, which allows them to make decisions and solve issues in their field of activity.

Pietropaolo and Silva (2021) state that there is a consensus regarding the organization of a competency-based curriculum when dealing with professional training, as it is difficult to defend the idea of a training process consisting solely of theoretical knowledge. The authors further emphasize that the conception of a competency-based

curriculum should be based on situations close to professional reality and present the skills necessary to solve them, indicating required knowledge areas, rather than a traditional body of disciplinary content.

Methodology

- Study Design

This is a qualitative research study with an exploratory focus. This type of study aims to understand the phenomenon as it presents itself or occurs within its context, allowing for a better understanding of human behavior and the social context (Lösch ; Rambo; Ferreira, 2023).

- Population

The study included eight professionals working in human resource management, specifically supervising cytopathology technicians in cytology and/or anatomical pathology laboratories. The respondents were physicians, biomedical scientists, pharmacists, and biologists. Six participants work in the Southeast region of Brazil, one in the South, and one in the Northeast. Among the participants, two professionals are affiliated with public laboratories (both located in the Southeast region) and the others are from private institutions.

Among the laboratories that participated in this study, the majority (six) are small, having a maximum of five cytopathology technicians on their staff. Only two laboratories had more than five cytopathology technicians working in the same service, one public and one private, both located in the Southeast region.

The inclusion criteria were: Possessing a higher education degree and working in the cytology sector in a cytology and/or anatomical pathology laboratory supervising cytopathology technicians. Professionals who were not working in the cytology sector during the research period and who did not hold a position compatible with the supervision of cytopathology technicians were excluded from the study.

- Data collection

In this study, intramethod triangulation was used employing the following techniques: an electronic questionnaire and a semi-structured interview conducted in both face-to-face and *online formats,* according to geographical distance. Suto et al. (2021) argue that triangulation, in a qualitative study, can enable dialogue between different data collection and analysis techniques, sources from the literature, illuminating obscure points and establishing new knowledge.

The online questionnaire was administered via *Google* Forms between October 2023 and April 2024. The interviews were conducted between March and April 2024.

- Data analysis

The professionals responsible for supervising cytopathology technicians were invited, via email, to answer a questionnaire and subsequently participate in a structured interview.

The questionnaire administered to this audience consisted of 30 closed-ended, scaled questions (*Likert scale*) and was divided into four parts: (1) identification, (2) knowledge, (3) skills, and (4) attitudes. Attitude scales such as *Likert* are widely used, especially in questions of preferences, tastes, and perceptions (Feijó; Vicente; Petri, 2020). The data were grouped and organized into tables detailing the absolute and percentage frequencies. For the analysis of the electronic questionnaire data, databases were created and processed using *Microsoft Office Excel* 97-2003, and statistical treatment was performed by calculating the data distribution (absolute and relative frequency).

The structured interview was conducted using pre-formulated questions whose wording remained unchanged for all respondents. Participants answered five questions related to expectations regarding the training of cytopathology technicians (Table 1). The interview method was chosen because it allows for the introduction of new and/or unexpected information, which is crucial in exploring topics with which the researcher is not yet sufficiently familiar or where there is a lack of prior investigation. It also has the advantage of being quick and allowing for statistical analysis of the data, since the answers

obtained will come from standardized questions (Batista et al., 2021). Two interviews were conducted in person, using a sound recorder for recording. The remaining interviews were conducted online, due to geographical distance, with recording done via the *Google Meet platform*.

Table 1 - Structured Interview.

Items	Variables
1	Do you think that a professional with technical training in cytopathology should have knowledge of and work in the technical area of histology?
2	Do you think that a professional with technical training in cytopathology should have knowledge of and work in the technical area of molecular biology?
3	Do you think that a professional with technical training in cytopathology should have knowledge of and be able to perform macroscopic examinations of biopsies?
4	In 2021, the WHO published a new guideline for screening and treatment of precancerous lesions of cervical cancer, recommending the use of HPV DNA testing to replace Pap smear testing. This recommendation reinforces discussions about the reduction of Pap smear tests in the future. How do you see the role of cytopathology technicians in hospitals and laboratories in this scenario?
5	In your opinion, are there any thematic areas that should be improved in cytopathology technical training courses to broaden and/or improve the quality of this professional's work?

Source: The authors, 2024.

The information collected in the interviews was analyzed according to the thematization proposed by Helena Amaral da Fontoura (2011, p.62), which aims to "provide a possible way of analyzing data, without seeking a universal truth." This process is divided into seven steps: the first step was to transcribe all the material collected orally; the second was the careful reading of all the material; the third was to demarcate what is considered relevant to the *corpus* of the analysis; the fourth step was to group data, identifying themes; the fifth was to define units of context and units of meaning, considering the number of times and the emphasis given to the theme; the sixth was the clarification of the data treatment; and the seventh and final step was the interpretation, the analysis itself, in light of theoretical frameworks that anchor the themes worked on in the research (Fontoura, 2011).

- Ethical aspects

For the development of this study, the project was submitted through the Plataforma Brasil to the Research Ethics Committee with Human Beings of the Oswaldo Cruz Institute (CEP Fiocruz/IOC) and approved by the Substantiated Opinion number

1,134,954, dated March 28, 2023 (CAAE: 64177222.1.0000.5248). The research participants signed the Informed Consent Form (TCLE) and the Sound and Image Authorization Form as stipulated by Resolution No. 466/2012 of the National Health Council.

Results and Discussion

Table 2 presents the professional category of the respondents representing the laboratories participating in the survey.

Table 2 - Category The respondent 's professional profile.

Variables	Absolute number (n)	Percentage number (%)
Doctors	3	37,5
Biomedical scientists	3	37,5
Pharmacists	1	12,5
Biologist	1	12,5

Source: The authors, 2024.

The respondents in this survey were represented by physicians (37.5%), biomedical scientists (37.5%), pharmacists (12.5%), and biologists (12.5%). These categories represent professionals with higher education qualifications to perform cytological diagnosis and who, therefore, are qualified to supervise the activities of cytopathology technicians.

Table 3 presents the knowledge that cytopathology technician supervisors expect cytopathology technicians to possess in order to perform laboratory tasks.

Table 3 - Knowledge sought put supervisors for the technician position in cytopathology.

Variables	(n)	(%)
Perform preliminary screening of conventional gynecological cytology slides.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	0	0,0
Very important	8	100,0
Perform preliminary screening of liquid-based gynecological cytology slides.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	0	0,0
Very important	8	100,0
Perform preliminary screening of non-gynecological cytology slides.		
Unimportant	0	0,0
Of little importance	3	37,5
Important	3	37,5
Very important	2	25,0

Perform pre -screening of cellblock slides.		
Unimportant	1	12,5
Of little importance	3	37,5
Important	2	25,0
Very important	2	25,0
Perform preliminary screening of histological slides.		
Unimportant	2	25,0
Of little importance	5	62,5
Important	1	12,5
Very important	0	0,0
Perform preliminary screening of immunohistochemistry slides.		
Unimportant	3	37,5
Of little importance	4	50,0
Important	1	12,5
Very important	0	0,0
Perform rapid on-site *assessment (ROSE)*		
Unimportant	0	0,0
Of little importance	4	50,0
Important	4	50,0
Very important	0	0,0

Source: The authors, 2024.

Reading gynecological cytology slides, both using conventional and liquid-based techniques, was the most sought-after knowledge among professionals who supervise cytopathology technicians (100% of respondents). Non-gynecological cytology was considered important or very important by the majority of respondents (75%). According to the guidelines and orientations of the Ministry of Health for the training of cytopathology technicians, "performing actions and procedures pertinent to cytological examinations" is included among the necessary competencies for the training of this professional (Brasil, 2011).

The participation of cytopathology technicians in complementary diagnostic techniques (cytochemistry, immunocytochemistry, flow cytometry, molecular analysis, etc.) was described in the "Competency Profile for Cytothechnology Training"published by the Permanent Working Group on Telemedicine and Telehealth of the Community of Portuguese Speaking Countries (*Perfil de Competências para a Formação em Citopatologia*, 2022). In this research, knowledge to perform pre -screening of immunohistochemistry slides and rapid on - *site evaluation* (ROSE) was categorized as "not very important" (50%) among professionals who supervise cytopathology technicians.

According to Teixeira et al. (2012), the ideal curriculum for training cytopathology technicians requires knowledge of pathological anatomy (cytology and histology), physiopathology, microbiology, biosafety, and planning of the work process in clinical

laboratories, microscopy techniques, in order to develop the necessary skills and abilities for cytomorphological analysis , which includes: identifying patterns of cell normality and their variations, reactive, proliferative, degenerative, reparative alterations, iatrogenic modifications, pre -neoplastic and neoplastic alterations .

Table 4 shows the skills sought by supervisors for the cytopathology technician position.

Table 4 - Skills sought put supervisors for the technician position in cytopathology.

Variables	(n)	(%)
To be able to prepare gynecological cytology slides.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	0	0,0
Very important	8	100,0
To be able to prepare non-gynecological cytology slides.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	2	25,0
Very important	6	75,0
Be able to prepare *cellblock*.		
Unimportant	0	0,0
Of little importance	2	25,0
Important	1	12,5
Very important	5	62,5
Being able to prepare histological slides.		
Unimportant	1	12,5
Of little importance	2	25,0
Important	1	12,5
Very important	4	50,0
To be able to prepare liquid base samples.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	1	12,5
Very important	7	87,5
To be able to prepare dyes.		
Unimportant	0	0,0
Of little importance	1	12,5
Important	0	0,0
Very important	7	87,5
Being able to process material for special colorations.		
Unimportant	1	12,5
Of little importance	1	12,5
Important	2	25,0
Very important	4	50,0
To be able to perform macroscopic examination and cleavage of surgical specimens.		
Unimportant	2	25,0
Of little importance	1	12,5
Important	3	37,5
Very important	2	25,0

To be able to prepare immunohistochemistry material.		
Unimportant	2	25,0
Of little importance	1	12,5
Important	2	25,0
Very important	3	37,5
To be able to perform molecular biology analysis.		
Unimportant	1	12,5
Of little importance	2	25,0
Important	3	37,5
Very important	2	25,0
To be able to transcribe technical reports.		
Unimportant	1	12,5
Of little importance	0	0,0
Important	4	50,0
Very important	3	37,5
Be able to code technical reports.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	3	37,5
Very important	5	62,5
Being able to scan slides for digital pathology.		
Unimportant	0	0,0
Of little importance	1	12,5
Important	2	25,0
Very important	5	62,5

Source: The authors, 2024.

Complying with biosafety standards was considered very important by all respondents (100%). The CNCT, from the MEC, affirms the duty of this professional to work in accordance with biosafety and quality standards, and to apply appropriate techniques in the disposal of healthcare waste, protecting individuals and the environment (Brasil, 2020). Santana et al. (2023) state that in recent years there has been an increase in biosafety content in public service examinations for the position of cytopathology technician due to its importance in the work processes developed in the healthcare field.

Cell block preparation was considered very important by 62.5% of them. Using techniques for receiving and pre-treating material submitted for examination, applying methods of fixation, embedding, sectioning, staining, and slide mounting, and operating equipment used in the execution of histological techniques are skills included in the guidelines and recommendations of the Ministry of Health for the training of cytopathology technicians (Brasil , 2011).

Being able to prepare stains was considered "very important" by the majority of respondents (87.5%). Papanicolaou staining is universally applied in cytopathology laboratories; through it, it is possible to highlight variations in morphology, degrees of

maturity, and metabolic activity of the cell (Araujo-Junior et al., 2016). The CNCT (National Cytopathology Technical Code) of the MEC (Ministry of Education) states that cytopathology technicians are qualified to receive and prepare samples for cytopathological analysis (Brasil , 2020).

Being able to transcribe technical reports was considered an important task by 50% of respondents and unimportant by 12.5%. According to Medrado, Evaristo and Lopes (2019), there is no equivalence between a technical report and a cytopathological diagnosis, but rather a need to hold the cytopathology technician more directly responsible for the results they produce. If the cytopathology technician irresponsibly analyzes the samples they receive and releases false-negative reports that are not reviewed by the technical supervisor, the only professional who can be punished is the technical supervisor, leaving the negligent cytopathology technician out of any question.

Being able to perform molecular biology analysis was considered an important skill by 37.5% of participants and unimportant by 12.5%. The preparation of immunohistochemical material was considered very important by 37.5% of respondents and unimportant by 25%. Among the competencies listed in the competency profile for training in cytotechnology is the preparation of samples for current and future analyses using procedures in accordance with existing guidelines (sample processing, immunocytochemistry, molecular biology, flow cytometry, etc.) (*Perfil de Competências para a Formação em Citopatologia*, 2022).

In February 2024, the Ministry of Health published Recommendation Report No. 878, entitled "Molecular Testing for HPV Detection and Cervical Cancer Screening." This document reiterates that improving strategic actions for cervical cancer prevention in Brazil should include increasing HPV vaccination coverage and potentially changing the screening method to incorporate molecular testing for HPV detection into the SUS (Brazilian Unified Health System) (Brasil, 2024b). On March 7, 2024, SECTICS/MS Ordinance No. 3 made public the Ministry of Health's decision to incorporate molecular tests for the detection of oncogenic HPV into the SUS (Brasil, 2024a). Therefore, cytopathological examination will no longer be used as the primary screening test. With this change, a decrease in the number of gynecological cytology examinations, which is the main activity performed by cytopathology technicians, is expected. Therefore, we reinforce the importance of discussions on expanding the training of these professionals.

Table 5 describes the attitudes supervisors look for in the cytopathology technician position.

Table 5 - Attitudes sought put supervisors for the technician position in cytopathology.

Variables	(n)	(%)
Pay attention during your professional practice.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	0	0,0
Very important	8	100,0
To be agile during your professional practice.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	2	25,0
Very important	6	75,0
Be dedicated during your professional practice.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	1	12,5
Very important	7	87,5
Knowing how to work in a team during your professional practice.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	1	12,5
Very important	7	87,5
Be proactive in your professional practice.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	1	12,5
Very important	7	87,5
Be ethical during your professional practice.		
Unimportant	0	0,0
Of little importance	0	0,0
Important	0	0,0
Very important	8	100,0

Source: The authors, 2024.

Paying attention during professional practice was considered by all supervisors (100%) to be very important during the execution of laboratory activities. According to the *Manual de Gestão da Qualidade para Laboratório de Citopatologia* (2016), one of the main diagnostic errors corresponds to screening error, which occurs when neoplastic cells are present in the smear but are not identified or recognized by the examiner. Factors leading to this type of error include lack of attention and concentration, insufficient time to analyze the smear, mental fatigue, work overload, and the professional's lack of experience. Therefore, attention is an essential attitude for this specialist.

Having professional ethics was considered a very important factor for the execution of the work activities of cytopathology technicians by all participants (100%). On April 14, 1989, Opinion 353/89, edited by the Ministry of Education, was published, establishing the minimum professional curriculum for technical courses in cytopathology. This curriculum, with a workload of 1,590 hours, included the subjects of anatomy, histology, physiology and general pathology, organization and methods, cytopathology, public health, professional ethics, and supervised internship. Among the professional ethics content discussed since that period, we have: the role of the cytopathology technician as a health professional; principles of ethics; professional confidentiality; and relationship and integration with other health professionals and with professional bodies (Brasil, 1989). The Guidelines and Orientation for the Training of Cytopathology Technicians, in relation to professional ethics, state that:

> the current level of development and the diversification of knowledge and technologies in the field of cytotechnology, in addition to no longer allowing the inclusion of unqualified workers, require that technical training includes skills that allow for a response with scientific accuracy and ethical, political and social responsibility to the demands and needs of the population. (Brasil, 2011, p. 14)

Knowing how to work in a team was reported as very important by most respondents (87.5%). Teamwork, cooperation, and the articulation of one's own work with the health needs and demands of individuals and the community are attitudes reported by the Ministry of Health as transversal to all the knowledge and skills necessary for the exercise of the profession (Brasil, 2011).

Being proactive was also considered by the majority of respondents as a highly relevant attitude during the execution of laboratory activities (87.5%). According to the Competency Profile for Cytotechnology Training, the professional must have critical thinking skills and know how to use problem-solving strategies to ensure best laboratory practices, promoting the principles of continuous quality improvement, using personal initiative to improve laboratory practices and the safety of patients, colleagues, themselves, and the environment (*Perfil de Competências para a Formação em Citopatologia*, 2022).

In the next stage, a structured interview was conducted with the professionals who supervise cytopathology technicians from five laboratories. Three participants from the first stage did not respond to the invitation for the second stage.

Among the interview participants, four were professionals from laboratories located in the Southeast region and one in the South region. Laboratory 1 is a public institution, and the others are private.

Most interviewees reported that it is common to hire cytopathology technicians who lack knowledge in the field of histology. The representative from laboratory 3 stated that "...it would be important for professionals to arrive with knowledge in both areas, but normally they only have knowledge of cytology." One reason for this may be that guidance on introducing knowledge related to actions and procedures intrinsic to histological techniques only began in 2011, with the publication of guidelines and orientation for the training of cytopathology technicians by the Ministry of Health (Brasil, 2011). The National Cytology and Cytology Training Code (CNCT) does not directly mention histological techniques in the description of its qualifications (Brasil, 2020). The latest publication of the course plan for the "Technical Professional Education Course at the Secondary Level with Qualification in Cytopathology" from INCA in partnership with the Joaquim Venâncio Polytechnic School of Health (EPSJV) in 2023 also does not include a description of technical procedures for histological samples, only content related to the preparation of samples for cytopathological examinations (Brasil, 2023).

In the interviews, some laboratories mentioned that training is provided so that cytopathology technicians can work more broadly in the service, receiving knowledge regarding laboratory technical procedures (receiving and preparing samples). The supervisor of laboratory 2 states that:

> [...] I believe that a cytopathology technician should have knowledge of histology and all other aspects related to pathological anatomy, as it is an area with a very high shortage of professionals. We are having difficulty finding experienced professionals and are already pursuing a strategy of hiring and providing training in our own laboratory. (Laboratory 2)

According to Medrado (2010), from a historical perspective, professional education in the field of anatomical pathology has been significantly based on on-the-job training, with little or no structuring of the content taught, and relying on the repetition of procedures as the basis for worker "qualification." We reaffirm the importance of discussing the training of cytopathology technicians in this context of transformation in the field and the integration of new technologies, so that we do not return to the on-the-job training model without standardized curricula.

Regarding the inclusion of molecular biology knowledge in technical training courses in cytopathology, the representative from laboratory 1 states that:

> [...] there's no going back, in fact the entire field of anatomical pathology has been enhanced by knowledge in oncology, and oncology today can no longer function without molecular pathology. When a patient undergoes a biopsy, for example, I'm already aware of whether the collected material is sufficient for molecular studies that can aid in their treatment. This isn't the future, it's the present. (Laboratory 1)

On March 7, 2024, SECTICS/MS Ordinance No. 3 was published, which

> It makes public the decision to incorporate, within the scope of the SUS (Brazilian Public Health System), molecular tests for the detection of oncogenic HPV, using nucleic acid amplification techniques based on PCR, with partial or extended genotyping, validated analytically and clinically according to international criteria for cervical cancer screening in standard-risk populations and in accordance with the Guidelines of the Ministry of Health.

The supervisor of laboratory 2 states that "after the publication of the ordinance, I believe that the path to be followed for the cytopathology technician is to have the knowledge to work in the area of molecular biology."

The other laboratories interviewed (laboratories 3, 4, and 5) do not perform molecular tests; this service is outsourced to support laboratories. Therefore, they believe that it is not necessary for the cytopathology technician to have knowledge of molecular biology to work in the laboratory. The person in charge of laboratory 3 states that:

> [...] immunohistochemistry, biopsies, and molecular biology tests are performed in support laboratories; however, we have a professional who collects the material in hospitals and, therefore, needs to have technical knowledge about sample preparation to ensure the material is fixed and stored correctly. They also need to know how to transport the samples to avoid damaging them. They are trained in the laboratory itself, receiving little knowledge about this in training courses. (Laboratory 3)

Regarding having knowledge and working with macroscopic biopsies, the head of Laboratory 4 states that "it is important for a cytopathology technician to have knowledge of macroscopic procedures because the market needs this professional." The representative from Laboratory 1, however, believes that this task can be performed by a laboratory technician, who does not have such specific training as a cytopathology technician.

> [...] I think that the cytopathology technician is a professional who has already acquired knowledge that can be better utilized in a laboratory setting, since performing macroscopic biopsies does not require such in-depth knowledge, and is an activity that underestimates the capabilities of the cytopathology technician. (Laboratory 1)

Regarding the use of the HPV DNA test as a replacement for the Pap smear, which reinforces discussions about the reduction of Pap smear tests in the future, the National Commission for the Incorporation of Technologies in the SUS (Conitec)[3] reports that:

> the decision is a gain for women, since in addition to being an effective technology for early detection and diagnosis, it offers the advantage of increasing the interval between examinations. While the current screening method, through the Papanicolaou test, should be performed every three years and, in case of detection of any lesion, annually, testing is recommended every five years. This change allows for better adherence and facilitates access to the examination. (Conitec[1], 2024)

From this perspective of a decrease in Pap smear tests in the future, the impact this will have on the work of cytopathology technicians was discussed, since this is the activity most frequently performed by these professionals currently. Laboratories 1 and 2 believe that this decrease in Pap smear tests will happen soon. Laboratory 1 states that:

> [...] the cytopathology technician has sufficient skills to participate in the HPV-DNA process, possessing the intellectual capacity to operate a PCR machine effectively, analyze results, identify patients who need to undergo cytopathological examination, and perform microscopic analysis. (Laboratory 1)

Laboratories 3, 4, and 5 believe it will take a long time for the Pap smear to be replaced by the HPV DNA test. Laboratory 3 expresses concern about this issue:

> we, from small laboratories, will shrink, having a reduction in the number of these tests. I don't know how this situation will turn out, but I am very concerned about the result of all this in a country as heterogeneous as ours, with patients with different financial realities and diverse access to healthcare. This could leave many gaps in diagnosis, potentially impacting the reduction in cervical cancer that has already been achieved with the cytopathological examination. (Laboratory 3)

The representative from laboratory 4 states that:

[3] Published on March 11, 2024. Available at: https://www.gov.br/conitec/pt-br/assuntos/noticias/2024/marco/prevencao-de-cancer-de-colo-de-utero-ministerio-da-saude-incorpora-teste-inovador-para-deteccao-do-hpv-em-mulheres Accessed on: June 20, 2024.

> i see that it will take some time for this to happen because the health system cannot expand basic testing, and implementing a new technique is costly. I am not in favor of this technique because it will require many probes with various HPV subtypes to efficiently detect the virus. Furthermore, it will be essential to have professionals trained in the reading of cytological slides. (Laboratory 4)

Laboratory 5 believes that, in practice, there will be no decrease in the number of Pap smear tests.

> this will not happen because we know that the problem is how the screening is done and not a problem with the cytology or molecular biology technique. I believe that using only molecular biology for cervical cancer screening will end up having a negative impact on women's lives. (Laboratory 5)

According to SECTICS/MS Ordinance No. 3 of March 7, 2024, the technical areas will have a maximum period of 180 (one hundred and eighty) days to implement the offer of the HPV DNA test in the SUS, after the publication of the Conitec recommendation report on this technology (Brasil, 2024a).

The final question asked during the interviews corresponds to the thematic area that should be improved in technical training courses in cytopathology, according to the respondents, to allow for the expansion and/or improvement of the quality of this professional's performance in the service.

Laboratory 5 responded that: “In the training, I don't feel any content is lacking; I feel there should be more practical classes to arrive at the laboratory with more experience. There could be an increase in the hours dedicated to slide reading, both in conventional cytology and liquid-based cytology.” All laboratories agreed that there should be more practical classes in liquid-based cytology in the training courses.

Laboratories 1 and 2 state that it will be necessary to expand/include knowledge in molecular biology. According to laboratory 1:

> molecular biology is the present; we have to accept that we are now migrating to HPV DNA testing, there's no way around it. Molecular biology and liquid-based cytology are the guiding principles for the eradication of cervical cancer. (Laboratory 1)

Changes in cervical cancer screening practices should directly impact the role of cytopathology technicians. This study, based on both questionnaire and interview data, observed that respondents working in large laboratories with more than five cytopathology technicians on staff and equipped to perform molecular tests favored

molecular biology training for these technicians. Conversely, participants working in smaller laboratories with fewer than five cytopathology technicians and who do not perform molecular biology tests in their own laboratories believe that molecular biology training is not necessary for these technicians.

Given this scenario, it is increasingly important to discuss the skills necessary for the training of this professional, seeking to better understand the academic profile and performance in the job market for this professional category. In this way, it will be possible to find ways to have a standardized curriculum that meets the health needs of society in this field.

Conclusion

The most sought-after knowledge among professionals who supervise cytopathology technicians is the ability to perform microscopic reading of gynecological cytology slides. The preparation of histological and non-gynecological cytology slides was considered by most respondents as an important skill for a cytopathology technician. Ethics and attentiveness during the tasks performed are the most sought-after attitudes during the selection of these professionals.

An approach to the skills required for training cytopathology technicians can contribute to the development of a standardized curriculum for training cytopathology technicians, by aligning the training of these professionals with the realities sought by cytopathology laboratories.

The sample size used in this research was a limiting factor, since generalizations require knowledge of the perceptions of a larger number of laboratories. The lack of previous research on the topic also makes comparisons in the literature difficult. Studies showing other perspectives on the training of these professionals are essential to broaden the discussions on the subject.

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