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Clinical Competence of Family Medicine Residents with Patients Attending Prenatal Care in a Medical Unit in Southern Mexico

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Abstract

The development of competency-based thinking is transforming medical education by preparing professionals for the new challenges of the 21st century. Its strategies are key to the development of clinical competence and to improving critical thinking. **Objective:** This paper aims to evaluate the level of clinical competence of family medicine residents treating patients attending prenatal care in a medical unit in southern Mexico. **Materials and Methods:** In 2023, a cross-sectional, retrospective, and analytical study with an educational focus was conducted in two phases. The creation and validation of a clinical competence instrument based on five real real-world problem-based clinical cases of prenatal care patients, with indicators related to clinical aptitude. Three rounds of experts were used to validate the instrument following the Delphi method, with a concordance threshold of 80% or higher (Kappa index > 0.80). The Kuder-Richardson formula was used to calculate internal consistency, yielding a value of 0.87. The evaluation instrument was administered to 40 newly admitted medical residents in the second phase in Villahermosa, Tabasco. A descriptive analysis was performed, and the levels of competence were compared using the Chi-square test. **Results:** Internal consistency was 0.87. Among the residents, 32.5% demonstrated low knowledge levels (know-what), 37.5% showed intermediate skills levels (know-how), and 67.5% exhibited adequate performance in attitudes (know-be). **Conclusions:** Inclusive strategies are necessary to improve clinical competence levels in prenatal care.

Keywords

Clinical Competence, Resident Physicians, Prenatal Care, Instrument, Family Medicine

1. Introduction

In recent decades, the easy access to vast amounts of information and changes in educational training have created a need for educational strategies and learning models that foster deeper reflection. This has led to the combination of skills, dispositions, and knowledge encapsulated in the concept of competencies [1]. The term "competence", derived from the Latin competeré, encompasses both the notion of competitiveness and the ability or authority in a specific field [2]. According to Chomsky (1963), competence refers to the actual ability to achieve objectives and outcomes in specific contexts [3].

The three most common interpretations of the term competence are: the ability to apply acquired knowledge, competitiveness related to being the most efficient in society, and incumbency, which refers to individual functions and emotions [4]. Competency-Based Learning (CBL), implemented since the 1990s, has been consolidated as a flexible, interdisciplinary model focused on developing the competencies necessary to address complex needs, encompassing knowledge, skills, and attitudes summarized as "knowing", "knowing how to do", and "wanting to do" [5]-[7].

Throughout history, various educational theories have been key to understanding learning and improving pedagogical approaches. The behaviorist model, proposed by John B. Watson and developed by B.F. Skinner, views learning as an observable change in behavior influenced by interaction with the environment. It emphasizes classical and operant conditioning, highlighting repetition and positive reinforcement for effective learning.

Jean Piaget's theory of knowledge elaboration emphasizes the active role of students in constructing knowledge. Piaget argued that cognitive development depends on biological maturation, social/physical experience, and the balance between mental structures and external reality. According to this theory, learners not only absorb information but also interpret and adapt it to their understanding of the world [8] [9].

Lev Semyonovich Vygotsky's social constructivist theory highlights the importance of social and cultural interaction in cognitive development. Vygotsky argued that learning occurs first at the social level and then becomes internalized. A key concept is the Zone of Proximal Development (ZPD), which defines the gap between what a student can do independently and what they can achieve with assistance. He also emphasized the role of language as a mediator in cognitive development.

David Ausubel contributed with his theory of meaningful learning, which

optimizes learning by allowing students to integrate new information with their prior knowledge, unlike rote learning, which is superficial and short-lived. Meaningful learning provides deeper, longer-lasting understanding, enhancing retention and enabling knowledge application to new problems, and promoting greater knowledge transfer [10].

Despite its age, constructivism, with its epistemological approach, continues to influence various educational fields, including medical training, by promoting deeper, context-based learning in medical knowledge. Muñoz Cano emphasizes the importance of education that not only instructs but also fosters continuous and participatory learning, emphasizing the teaching capacity, student competitiveness, and educational innovation from a constructivist perspective [11] [12].

Constructivism and the competency-based approach have influenced medical education, training healthcare professionals to face 21st-century challenges. It is essential to consider educational strategies that develop clinical competencies and stimulate critical thinking in students, with particular emphasis on prenatal care—a crucial topic that must be addressed effectively.

Family Medicine, as one of the primary medical specialties and a cornerstone of primary prenatal care, offers comprehensive, continuous, and coordinated care to protect both mother and child [13]. Physicians in this field must remain up-to-date and, through their experience, contribute to the advancement of the discipline by analyzing each case individually [14].

The World Health Organization describes prenatal care as a key opportunity for healthcare personnel to provide care, information, and support to pregnant women, promoting a healthy lifestyle and preventing diseases [15]. Adequate prenatal care is essential to ensure maternal and fetal health [16].

Rodríguez-Martínez and García-López (2020) conducted a qualitative study in Mexico City to evaluate the competencies of 15 nursing students in obstetrics and gynecology through guided observations and expert-validated interviews. The variables considered in this study were clinical experiences, identification of learning needs, and the proposal of an educational model. The study found a low level of competence in key areas and the need for a more humanistic approach to training. An educational intervention model was suggested to improve comprehensive maternal health care [17].

Hernández-Gómez (2021) evaluated the clinical aptitude of 90 family physicians in managing patients with arterial hypertension. The results showed that 45% of physicians had a low global aptitude, with scores below 25 on a 100-point scale. Additionally, 35% of physicians were classified as having very low aptitude, with scores between 25 and 45 points. This study highlights the need for ongoing training in managing prevalent chronic diseases to improve clinical aptitude in primary care [18].

The purpose of this study was to determine the level of clinical competence of family medicine residents beginning their medical specialty training treating patients attending prenatal care in a medical unit in southern Mexico, using an evaluation instrument to assess clinical competencies in three areas of knowledge:

know-what, know-how, and know-be.

2. Materials and Methods

A cross-sectional, retrospective, and analytical study with an educational focus was conducted, divided into two phases:

Phase I:

1) The instrument was designed based on five real-life clinical cases involving clinical indicators (recognition of risk factors, identification of clinical signs, diagnostic integration, recognition of prognosis and/or severity, use of therapeutic resources, implementation of preventive measures and referrals, and selection of diagnostic tests), with theoretical and clinical aspects supported by clinical practice guidelines (CPG).

2) The validation of the instrument underwent three rounds of expert evaluation, with the participation of two specialists in gynecology and obstetrics from outpatient clinics, two family physicians, and a doctor in sciences specializing in Family Medicine. This expert group validated the instrument based on theoretical foundation, clinical utility, and methodological aspects. The Delphi method was used to assess concordance, with a Kappa index of 0.80 or higher.

3) To integrate the instrument, clinical competencies were evaluated in three domains of knowledge: know-what, know-how, and know-be. To assess the know-what domain, a structured questionnaire was used with three response options: true, false, and "I don't know". For the second and third components, know-how and know-be, a Likert scale was used (always, almost always, sometimes, almost never, and never). A rigorous and strict analysis of the domains of each evaluation was required.

4) A pilot test was conducted, involving a group of 10 physicians outside the study but with the same academic level. To calculate internal consistency, the Kuder-Richardson formula was used, and a test-retest approach was applied for item analysis, employing the Delphi method. The calculation of possible responses was performed by chance using the Pérez Padilla and Viniegra formula [19].

Phase II:

5. For the competency diagnosis, a previously validated instrument was applied to a natural group admitted in 2023, based in Villahermosa, Tabasco. The sample consisted of 40 medical residents with clinical experience from their medical training but who were newly admitted to the medical specialty program. It is important to note that the evaluation was conducted for diagnostic purposes to plan their academic training, while those who declined to participate in the study were excluded. The levels of clinical competence across the three knowledge domains were evaluated, with the results subjected to descriptive statistics, and competency levels compared using the Chi-square formula in SPSS software, version 25 for Windows.

3. Results

The instrument was structured of 165 items and was distributed as follows: know-

what area: 140 items; know-how: 15 items; and know-be: 5 items. For the know-what area, the evaluation of responses was calculated using the random effect formula developed by Pérez-Padilla and Viniegra, with a result of 18 items or fewer. The results were ordinally distributed into five categories: very high (140-111), high (110-87), medium (86-64), low (63-41), and very low (40-19). The know-how domain was scored as high, medium, or low performance. The know-be domain was classified as adequate or inadequate performance.

In Table 1, the descriptive statistics of the sociodemographic variables can be observed: Women: 65%, marital status single: 70%, urban geographic location: 77%, university of origin: DACS: 47.5%, DAMC: 17.5%, UAG: 12.5%, Olmeca: 10%, UVM: 12.5%. Additionally, 85% of the medical residents have graduated from their bachelor's degree within the past 3 years or less.

The analysis of the sociodemographic variable "age" produced the following results: measures of central tendency: mean: 28.15, median: 28.00, mode: 25; and measures of dispersion: standard deviation: 3.431, variance: 11.772, range: 17, minimum: 24, and maximum: 41.

In the assessment of the know-what domain, the following results were found: medium 5 (12.5%), low 13 (32.5%), very low 18 (45.0%), and random 4 (10.0%) (Table 2).

In the comprehensive analysis of the sociodemographic variables and years since graduation from the medical degree, when contrasted with the levels of the knowledge sphere (know-knowledge), no significant differences are found (Table 3).

In the assessment of the know-how domain, the following results were obtained regarding performance: high 12 (30%), medium 15 (37.5%), and low 13 (32.5%) (Table 4). In the know-be domain, the following results were observed in terms of performance: adequate 27 (67.5%) and inadequate 13 (32.5%) (Table 5).

Table 1. Global distribution of variables considered in the study.

Characteristics	N= 40	%
Gender		
Female	14	35.0%
Male	26	65.0%
Marital status		
Single	28	70.0%
Married	8	20.0%
Cohabiting	2	5.0%
Divorced	2	5.0%
Geographical location		
Urban	31	77.5%

Continued

Suburban	2	5.0%
Rural	7	17.5%
University of origin		
DACS	19	47.5%
DAMC	7	17.5%
UAG	5	12.5%
Olmeca	4	10.0%
UVM	5	12.5%
Years since graduation		
0 - 3 years	33	85.0%
4 - 7 years	5	12.5%
>7 years	1	2.5%
Years practicing in health area		
0 - 3 years	34	85.0%
4 - 7 years	5	12.5%
>7 years	1	2.5%

Source: Clinical competence level database of family medicine resident physicians attending prenatal care patients at Family Medicine Unit 43.

Table 2. Level of competence of resident physicians in the three domains of knowledge evaluated.

Variable	N= 40	%
Know-what (cognitive)		
Very high	0	0
High	0	0
Medium	5	12.5%
Low	13	32.5%
Very low	18	45.0%
Random	4	10.0%
Know-how (performance)		
High performance	12	30.0%
Medium performance	15	37.5%
Low performance	12	32.5%
Know-be (effective)		
Adequate performance	27	67.5%
Inadequate performance	13	32.5%

Source: Clinical competence level database of family medicine resident physicians attending prenatal care patients at Family Medicine Unit 43.

Table 3. Competence level in the know-what variable.

Variables	Level of competence in know-what						Statistical values		
	Very high	High	Medium	Low	Very low	Random	X^2	df	p
Gender									
Male	0	0	0	5	7	2	3.276	1	0.351
Female	0	0	5	8	11	2			
Marital status									
Single	0	0	4	9	15	0	14.445	1	0.107
Married	0	0	1	2	3	2			
Cohabiting	0	0	0	1	0	1			
Divorced	0	0	0	1	0	1			
Geographical location									
Urban	0	0	0	1	1	0	7.604	1	0.269
Suburban	0	0	4	7	16	4			
Rural	0	0	1	5	1	0			
University of origin									
DACS	0	0	5	5	7	2	9.029	1	0.700
DAMC	0	0	0	3	3	1			
UAG	0	0	0	2	3	0			
Olmeca	0	0	0	2	2	1			
UVM	0	0	0	1	3	0			
Years since graduation									
0 - 3 years	0	0	4	11	15	3	4.390	1	0.624
4 - 7 years	0	0	0	2	2	1			
More than 7 years	0	0	1	0	1	0			
Years of practice (medicine)									
0 - 3 years	0	0	4	10	16	4	4.058	1	0.669
4 - 7 years	0	0	1	3	1	0			
More than 7 years	0	0	0	0	1	0			

Source: Clinical competence level database of family medicine resident physicians attending prenatal care patients at Family Medicine Unit 43.

Table 4. Competence level in the know-how variable.

Variables	Level of competence in know-how			Statistical values		
	High	Medium	Low	X^2	df	p
Gender						
Male	6	5	3	2.017	1	0.365
Female	6	10	10			

Continued

Marital status						
Single	10	7	11	8.541	1	0.201
Married	1	6	1			
Cohabiting	1	1	0			
Divorced	0	1	1			
Geographical location						
Urban	1	1	0	5.639	1	0.228
Suburban	8	10	13			
Rural	3	4	0			
University of origin						
DACS	5	7	7	14.758	1	0.005
DAMC	1	5	1			
UAG	4	0	1			
Olmeca	1	0	3			
UVM	1	3	1			
Years since graduation						
0 - 3 years	9	11	13	4.184	1	0.382
4 - 7 years	2	3	0			
More than 7 years	1	1	0			
Years of practice (medicine)						
0 - 3 years	10	12	12	3.545	1	0.471
4 - 7 years	1	3	1			
More than 7 years	1	0	0			

Source: Clinical competence level database of family medicine resident physicians attending prenatal care patients at Family Medicine Unit 43.

Table 5. Competence level in the know-be variable.

Variables	Level of competence in know-be		Statistical values		
	Adequate performance	Inadequate performance	X^2	df	p
Gender					
Male	10	4	1.52	1	0.697
Female	17	9			
Marital status					
Single	19	9	1.335	1	0.721
Married	5	3			
Cohabiting	2	0			
Divorced	1	1			

Continued

Geographical location					
Urban	2	0			
Suburban	20	11	1.138	1	0.566
Rural	5	2			
University of origin					
DACS	11	8			
DAMC	6	1			
UAG	3	2	4.952	1	0.292
Olmeca	2	2			
UVM	5	0			
Years since graduation					
0 - 3 years	21	12			
4 - 7 years	4	1	1.544	1	0.462
More than 7 years	2	0			
Years of practice (medicine)					
0 - 3 years	22	12			
4 - 7 years	4	1	0.959	1	0.619
More than 7 years	1	0			

Source: Clinical competence level database of family medicine resident physicians attending prenatal care patients at Family Medicine Unit 43.

4. Discussion

The average age of the participants was 28.15 years. In the comparative analysis of clinical competence levels, no significant difference was found in relation to age; similar results were obtained by Veloz-Martínez J., who found that age is not always a reliable predictor of the level of competence achieved [20]. It is evident that an educational strategy that promotes knowledge generation is essential, regardless of the time spent in classrooms.

Regarding the results of the variable "marital status", most participants were single (70%), and a smaller proportion were married (20%). No significant statistical difference was found concerning competencies—results comparable to those of Hopmans C., who found no evidence that marital status directly affects the competencies acquired during residency. These findings suggest that family responsibilities may be an important factor, but they do not necessarily impact the clinical competencies of physicians in training [21].

The analysis of the variable "university of origin" indicates no significant difference in the know-what and know-be domains among the training personnel. This suggests that the origin of the educational institutions evaluated is not a determining factor in their competence performance. However, a significant difference was observed in the know-how competence, indicating that practical skills

may be influenced by other factors such as the quality of training and supervision, it is important to consider that this significant difference results from the imitation of the daily practices of instructors rather than from a reflective process. Similar studies by Sánchez C. reported that the university of origin does not significantly influence acquired competencies, emphasizing the importance of meeting operational and academic program requirements, as well as supervised practice, as key factors in competency development [22].

When presented with the opportunity to travel abroad for benchmarking, it is essential to recognize that host universities should focus their educational interventions on fostering critical thinking. Authors such as Zain S. indicate that academic programs offering opportunities to study abroad and access financial support have shown that residents in these programs demonstrated greater confidence in communication skills, cultural sensitivity, and ability to handle emergent situations compared to residents who did not participate in the exchange program, although both groups exhibited similar levels of confidence in other areas of family medicine. These findings suggest that the exchange program effectively provided opportunities for residents to engage in and immerse themselves in valuable global experiences, underscoring the importance of global health education programs in residency training, as evidenced by other institutions [23].

The results obtained for the variables of years since graduation and years of medical practice showed no significant difference in clinical competence levels in this study, similar to the findings of González-López, who reported that neither the time since graduation nor accumulated experience necessarily predict clinical competencies, particularly in the domain of knowledge [24].

An important background factor is that the residents are newly admitted physicians who have not previously undergone intervention by the health institution conducting the evaluation. This assessment is diagnostic, and the results are highly significant for initiating knowledge planning and management. It is important to consider that educational interventions are an essential tool for elevating competency levels through the development of strategies that promote knowledge generation and the deliberate pursuit of enhanced skills in the three domains of knowledge.

5. Conclusions

The female gender represented a higher percentage of the study participants, with a total of 26 participants, accounting for 65% of the total sample.

The "single" variable had a higher percentage compared to the other marital status variables. Furthermore, the group of graduates with 0 - 3 years since graduation and years of experience represented 85% of the study sample.

One of the local universities had the highest number of subjects studied, with 47.5% of participants coming from this institution. However, no significant differences were found among the universities included in the study across the three domains of knowledge considered.

In the know-what domain, less than 50% of participants scored very low, while 32.5% were classified as low. Additionally, the know-how domain achieved its highest percentage at a medium level, with 37.5%. It is important to note that the know-be competence showed a partially acceptable performance in 67.5% of participants.

No statistically significant differences were found among the know-what, know-how, and know-be competencies in relation to gender, marital status, geographical situation, university of origin, years since graduation, or years practicing medicine.

6. Recommendations

- Implement educational strategies to foster critical thinking in various residency modalities and include simulations to improve theoretical knowledge in clinical contexts, using the development of critical thinking as a guideline.
- Conduct periodic diagnostics to identify areas for improvement in the know-what domain, adjusting curricula based on the results obtained.
- Implement advanced clinical simulations supported by critical thinking development to refine the know-how domain and strengthen practical skills.
- Use highly reliable evaluation instruments tailored to educational needs, applying them periodically to obtain diagnoses that are close to clinical reality.
- Validate strategies through scientific research designs, comparing the theories that generate the highest level of knowledge.
- Develop inclusive strategies to improve the know-be domain by promoting effective communication, emotional control, and conflict resolution in clinical settings.
- Evaluate the long-term impact of educational interventions on the know-be domain and update training programs according to the needs of the health system.
- Utilize current technological strategies guided by critical thinking principles—such as interactive educational platforms and care simulators—enhance learning by incorporating real, problem-based cases and exercises that foster critical thinking development. These inclusive educational strategies prioritize understanding over rote memorization, using memory solely as a background for information.

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Conflicts of Interest

The authors declare that there are no conflicts of interest related to the publication of this paper.

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