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Assessing student perceptions of the clinical teachers' performance during early clinical exposure

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ABSTRACT

***Background**: The clinical teachers' attributes can be grouped into physician competencies, teacher competencies, and personal characteristics. Global performance is considered the clinical teacher's capacity to facilitate an active and stimulating learning process for medical students and a warm, supportive, and pleasant environment.* ***Aim**: To determine which attributes of the clinical teacher influence their global performance from the students' point of view.* ***Material and Methods**: The Role Model Apperception Tool questionnaire (RoMAT) was answered by 133 second-year medical students at the University of Chile during 2018.* ***Results:** The students assessed 37 clinical teachers. Teaching competencies had the higher influence in global performance. Personal characteristics also had a significant influence. Physician competencies had an indirect influence on teaching competencies. The model obtained 88% of the explained variance of the teacher's global performance.* ***Conclusions:** This study showed that teacher competencies, personal characteristics, and physician competencies are qualities that influence the perception of the global performance of clinical teachers.*

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***Key words:** Education, Medical; Education, Medical, Undergraduate; Mentors; Students, Medical; Teaching.*

Evaluación de la percepción de los estudiantes acerca de los atributos de sus tutores en los primeros cursos clínicos

***Antecedentes**: Los atributos de un tutor clínico pueden agruparse en competencias clínicas, competencias docentes y características personales. En el desempeño global del tutor se considera su capacidad de facilitar un proceso de aprendizaje activo y estimulante y generar un ambiente cálido y de soporte.* ***Objetivo**: Determinar qué atributos del tutor clínico, evaluados por los estudiantes, influyen sobre su desempeño global.* ***Material y Métodos**: La escala "Role Model Apperception Tool" fue contestada por 133 estudiantes de segundo año de medicina en la Universidad de Chile durante el 2018.* ***Resultados:** Los estudiantes evaluaron 37 tutores clínicos. Las competencias docentes tuvieron la mayor influencia sobre el desempeño global. Las características personales*

también mostraron influencia significativa. Las competencias clínicas influyeron indirectamente a través de las competencias docentes. El modelo logró explicar 88% de la varianza del desempeño global del tutor clínico. ***Conclusiones****: El estudio muestra que las competencias docentes, características personales y competencias clínicas influyen sobre la evaluación de los estudiantes sobre el desempeño global del tutor.*

Palabras clave: *Educación Médica; Estudiantes de Medicina; Mentor; Enseñanza, educación médica de pregrado.*

Learning clinical skills from clinical teachers is a cornerstone of medical education at any level, making outstanding clinical teachers a key element in achieving this goal[1]. A clinical teacher in medicine is a physician who supervises trainees in their clinical practice[2]. A warm, encouraging, and challenging environment for student-teacher interaction is an essential prerequisite for optimal learning[3,4]. Furthermore, students develop professional values guided by their teachers' precepts and example, acting as role models[2,5-11].

Attributes of the clinical teacher

The characteristics that should be present in an outstanding clinical teacher have been a subject of considerable discussion. These attributes can be grouped into three main categories: *physician competencies*, *teacher competencies*, and *personal characteristics*[3,12-14]. Physician competencies correspond to the clinical teacher's knowledge, skills, and attitudes directly related to clinical practice, including clinical and technical skills, clinical reasoning, an effective doctor-patient relationship, adequate communication with the patients' relatives, and a positive relationship with the health team[3,11,15-17]. In clinical teachers, these skills have been associated with teaching effectiveness[18].

Teacher competencies refer to the abilities and attitudes that are developed and displayed exclusively in the pedagogical context. These competencies primarily involve methods used to facilitate the learning process, planning lessons, management practices, and attitude towards teaching[18,19]. The attributes expected from a clinical teacher are diverse, including but not limited to understanding the students' learning needs[6,10,20,21], having a positive attitude towards them, and being easily accessible for consulting[4,6,12].

Personal characteristics involve personal attributes such as relationship skills, some positive personal characteristics, and positive emotional states[3]. Features such as communication skills, role modeling, showing enthusiasm, and being supportive are highly valued[4,12].

Global performance in clinical teachers is a complex concept to define, considering the diversity of attributes that have been explored as relevant. The performance of teachers has been evaluated through the concept of *teaching effectiveness*[22]. For this research, global performance is considered the teacher's capacity to facilitate an active and stimulating learning process for medical students and a warm and supportive environment when working with them. Given the above, the clinical teacher must be aware of their position as a role model[23].

This study aims to determine what attributes of the clinical teacher influence their overall performance, assessed from the students' perceptions, in the context of early clinical exposure (ECE). A secondary aim was to explore the relationships between the tutor's attributes. The study was designed to test the following research hypotheses, using structural equation modeling (SEM) to meet the objectives set. This model contains four constructs: *physician competencies*, *teacher competencies*, *personal characteristics*, and *global performance* (Figure 1).

Hypotheses

- H1: Teacher competencies have a direct effect on global performance.
- H2: Personal characteristics have a direct effect on global performance.
- H3: Physician competencies have a direct effect on global performance.
- H4: Teacher competencies mediate the relationship between personal characteristics and global performance.
- H5: Teacher competencies mediate the relationship between physician competencies and global performance.

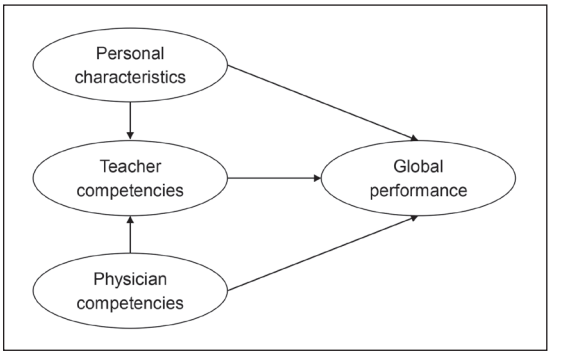

Figure 1. Proposed model.

Methods

Study design

The study design is non-experimental analytical using an SEM statistical tool. SEM is a family of statistical techniques used to analyze multivariate data[24]. It provides a flexible framework for developing and analyzing complex relationships among multiple variables, allowing researchers to test the theory's validity using empirical models[24,25]. The SEM adopted is the partial least square structural equation modeling (PLS-SEM). This approach is appropriate for predicting the model's constructs by maximizing the explained variance, and their main advantages are that it allows exploring possible relationships between constructs, does not require normal distribution, and can be used in small samples[25-27].

Survey development

The Role Model Apperception Tool questionnaire (RoMAT) is a validated scale that assesses the students' perception of their clinical teachers, using a 5-point Likert scale for rating 17 items[2]. It was selected as an instrument since it had prior validation and adequacy to capture domains of the students' perception of interest in this study. The instrument was translated using a modified version of a method for validating translated instruments. The original source-language version is formally compared with the back-translated source-language version[28]. Regarding comparability of language and similarity of interpretation[28], each item was ranked by five raters fluent in the English language. A pilot was applied to 20 students to assess its comprehensibility and application time.

The rationales for the measures tested are explained hereunder. In the case of the physician competencies construct, four statements from the RoMAT were selected. Following the literature review, the statements capture clinical reasoning, empathy present in the doctor-patient relationship, the health team's relationship, and the attitudinal variable of whether they show enthusiasm for their work[2,29,30,31]. For the teacher competencies construct, four statements were included. These statements capture how the clinical teacher uses their teaching skills and understands the students' needs. They also evaluate the quality of the relationship with the students[2,20,21,32]. Two of the statements address the influence of the attitude towards teaching. Although the instrument does not include direct questions about didactic competencies, they are indirectly measured by how students perceive their competencies[2]. In the personal characteristics construct, three observable variables were considered relevant when exploring the impact on global performance. They include professional integrity, patience, and self-confidence[33]. Regarding evaluating global performance, the authors of this study proposed three statements, which reflect the capacity to stimulate medical students' learning process and create a warm, supportive, and pleasant working environment[32]. Moreover, the awareness of their position as role models was assessed as a vital component of global performance[34,35]. The constructs and measurements in the theoretical model are outlined in Table 1.

Furthermore, a questionnaire was applied to the clinical teachers to assess their sociodemographic characteristics and educational background.

Study setting

The study was conducted at the University of Chile School of Medicine in 2018. According to the curriculum, clinical practices begin in the second year to favor ECE, that has been associated with a powerful influence on learning[29,30]. Semiology, the first clinical course, focuses on developing clinical skills such as medical history taking, physical examination, and communication skills. It includes clinical conferences, clinical cases analysis, and bedside tutorial clinical practice in a hospital setting.

In the University of Chile, 214 students' class is divided into five public, university-affiliated,

Table 1. Constructs and measurements in the theoretical model

Constructs	Variables	Description of statements
Physician competencies	Q1	Has excellent clinical reasoning skills
	Q2	Conveys empathy for patients
	Q7	Demonstrates enthusiasm for his/her work
	Q9	Has a positive interaction with other care workers
Teacher competencies	Q4	Understands learners' needs and is committed to the growth of learners
	Q5	Establishes rapport with learners
	Q6	Has a positive attitude towards learners
	Q12	Is available for learners
Personal characteristics	Q8	Is patient
	Q11	Has self-confidence
	Q13	Is honest and has integrity
Global performance	Q10	Makes learning exciting and stimulating
	Q15	Is aware of his/her role model status
	Q16	Is nice and easy to work with
Questions that were not included in any construct*	Q3	Communicates well with patients and relatives
	Q14	Has leadership qualities
	Q17	Is professionally competent in difficult clinical situations

*These questions were excluded from the model as they were not statistically significant in the measurement model's adjustments.

tertiary care hospitals. Clinical activities are performed in small groups of 6 students supervised by the same clinical teacher during the semester, with a frequency of 2-morning sessions per week.

Participants

The instrument was distributed amongst second-year medical students who completed the semiology course from the University of Chile in 2018. Data was collected via paper-based surveys at the course finalization so that students could give an informed opinion about their clinical teachers. The students who agreed to participate in the study were invited to complete the survey. A sample of 133 students was obtained who evaluated their clinical teachers.

The clinical teachers included in this study supervised the students' clinical practice in the semiology course, and their functions were the direct supervision of students, providing feedback, and carrying out workshops and clinical cases discussions. Clinical teachers were asked to complete an online questionnaire.

Ethical considerations

Informed consent was obtained from each participant, either in a digital or physical format. When the survey was applied, it was possible to present completed projects to the Ethics Committee of the Faculty of Medicine. However, since 2020, a review before the initiation of the project has been required. Thus, the approbation of the University of Chile Medical School for the use of survey data was obtained. Subsequently, the study was presented to the Ethics Committee of the Faculty of Engineering and Sciences of Diego Portales University, which approved the data's statistical analysis and interpretation.

Data analysis

A descriptive analysis of the data obtained from clinical teachers was performed. The variables included gender, age, and education.

The PLS-SEM technique was then applied to identify significant relationships between constructs and which have a greater effect on the students' perception of global performance. The *t* value of the relationship between constructs is studied to determine whether there is a statistically significant relationship. For this purpose, an equivalent of the *t*-Student statistic is estimated using a resampling approach based on the bootstrapping technique[31]. The *t* values of the regression coefficients between constructs are statistically

significant at the 95% confidence level, i.e., an absolute value larger than 1.96. The PLS-SEM analysis is presented in the three steps (Figure 2) considered in this methodology: the measurement model's adjustments[26,27,32], the structural model's results[31,33,34], and total effect results from[26,27,32].

Results

One hundred thirty three out of 214 medical students (response rate of 62.1%), and 30 out of 37 clinical teachers responded to their respective survey (response rate of 81.0%). There was no missing data.

The Spanish translation of RoMAT (Table 2) was considered highly comparable to the original version, based on ratings of comparability of language and similarity of interpretation. All items received a score of one; therefore, they needed no further revision of the translation.

Profile of clinical teachers

Of the 30 respondents, 63.3% were male. Concerning their educational background, 66.6% were alumni of the University of Chile, 33.3% attended or were going through medical education training, and 15.1% had undergone or were undergoing postgraduate training. The rest of the clinical teachers did not receive formal training in medical education but were trained in their role and objectives of the semiology course. Table 3 shows the characteristics of clinical teachers.

Results from the PLS-SEM approach

Results of measurement model assessment

The measurement model generated by the data describes how the observable variables explain each construct. The results presented in Figure 3 show excellent psychometric properties, implying that the constructs' estimation and the validity and reliability conditions were satisfied.

Individual reliability (λ) of the observable variables, composed reliability (CR), and convergent validity corresponding to the average variance extracted (AVE) were all verified (Table 4). Only three questions of RoMAT did not meet these criteria and were excluded from the resulting model (Q3, Q12, and Q17).

Results of structural model assessment

To achieve appropriate interpretation and to draw conclusions from the model, it was necessary to determine the path coefficients (β), the explained variance, the predictive relevance, and the total effect on the endogenous constructs[32]. The bootstrapping technique results show that

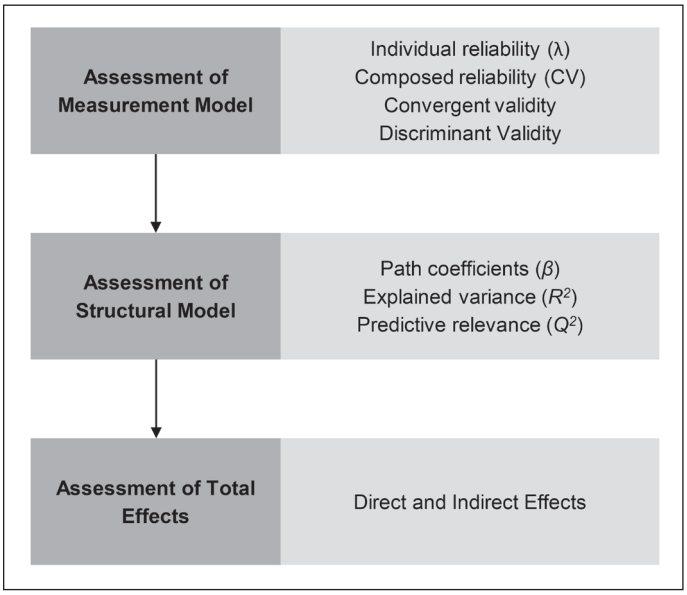

Figure 2. Summary of the process for the PLS-SEM. The first step assessed the measurement model using PLS algorithm, the second step assessed the structural model using PLS Bootstrapping, and the third step assessed de total effects.

Table 2. Spanish translation of RoMAT

Mi tutor clínico...	Muy en desacuerdo	En desacuerdo	Neutral	De acuerdo	Muy de acuerdo
1. Tiene excelentes habilidades de razonamiento clínico	1	2	3	4	5
2. Demuestra empatía con los pacientes	1	2	3	4	5
3. Se comunica bien con pacientes y sus familiares	1	2	3	4	5
4. Entiende cuales son las necesidades de los estudiantes y está comprometido/a con su formación	1	2	3	4	5
5. Establece una buena relación con los estudiantes	1	2	3	4	5
6. Tiene una actitud positiva con los estudiantes	1	2	3	4	5
7. Demuestra entusiasmo por su trabajo	1	2	3	4	5
8. Tiene paciencia	1	2	3	4	5
9. Se relaciona bien con el resto del equipo de salud	1	2	3	4	5
10. Hace el aprendizaje entretenido y estimulante	1	2	3	4	5
11. Tiene confianza en sí mismo/a	1	2	3	4	5
12. Está disponible para los alumnos/as	1	2	3	4	5
13. Es honesto y tiene integridad profesional	1	2	3	4	5
14. Tiene liderazgo	1	2	3	4	5
15. Está consciente de su rol como modelo de conducta	1	2	3	4	5
16. Es simpático/a y es agradable trabajar con él/ella	1	2	3	4	5
17. Es profesionalmente competente en situaciones clínicas difíciles y sabe cómo enfrentar la adversidad	1	2	3	4	5

Table 3. Characteristics of clinical teachers (n = 30)

Characteristics		n (% or SD)
Age	25 - 29-year-old	23 (76.6)
	30 - 34-year-old	4 (13.3)
	35 - 40-year-old	3 (10.0)
Sex	Male	19 (63.3)
	Female	11 (36.6)
Education	University of Chile M.D.	20 (66.6)
	Medical education training	10 (33.3)
	Postgraduate training	5 (15.1)
Self-reported motivation scale of 1 to 10	Mean	9 (1.05)
	≤ 8 points	10 (33.3)
	> 8 points	20 (66.6)

SD: Standard deviation.

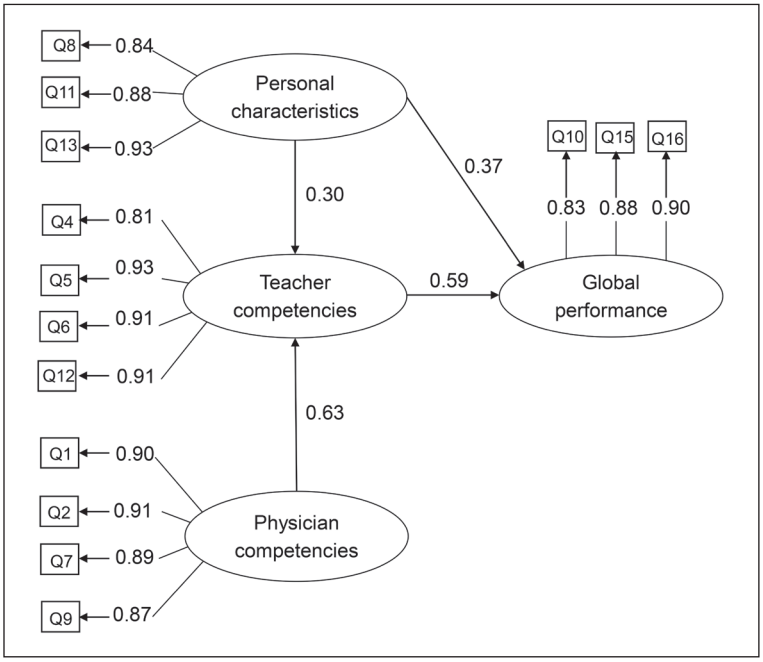

Figure 3. Measurement model of the relationships among teacher competencies, physician competencies, personal characteristics, and global performance.

Table 4. Composed reliability and average variance extracted indicators of the measurement model

Construct	Indicator	λ	CR	AVE
Physician Competencies	Q1 Q2 Q7 Q9	0.909 0.911 0.898 0.872	0.943	0.806
Teacher Competencies	Q4 Q5 Q6 Q12	0.814 0.935 0.918 0.914	0.943	0.806
Personal Characteristics	Q8 Q11 Q13	0.842 0.880 0.932	0.916	0.784
Global Performance	Q10 Q15 Q16	0.831 0.885 0.904	0.906	0.764

AVE: Average variance extracted; CR: Composed reliability; Q: Question; Individual reliability.

the *t*-values of the regression coefficients between the constructs were highly significant at a 95% confidence level (Table 5). The value refers to the size of the variance in a variable, which is explained by the dependent constructs[33]. The results imply that the model's predictive relevance was satisfied (Table 6). The model overall explains

Table 5. Predictive relevance and explained variance by the model

Construct	Q^2	R^2
Global performance	0.624	0.880
Teacher competencies	0.632	0.848

Q^2: predictive relevance; R^2: explained variance.

Table 6. Path coefficients (β) and bootstrapping results

Relationship between constructs		Standardized values	t statistic
Personal characteristics	Teacher competencies	0.305	2.360
Physician competencies	Teacher competencies	0.631	5.129
Personal characteristics	Global performance	0.374	3.520
Teacher characteristics	Global performance	0.590	5.616

Table 7. Total effects

Construct	Total effect on the construct teacher competencies	Total effect on the construct global performance
Physician competencies	0.631	0.372
Teacher competencies	–	0.590
Personal characteristics	0.305	0.553

88% of global performance and 84% of teacher competencies.

The structural model shows statistically significant relationships, verifying the hypotheses H1, H2, H4, and H5 proposed in the conceptual model. Only hypothesis H3 –physician competencies have a direct effect on global performance– was rejected.

Total effects

The total effects reflect the influence on the target construct through direct and indirect effects. They are calculated from the sum of the direct and indirect effects on the target construct. Indirect effects are calculated from the multiplication of the impact that fills or links the studied construct with the objective construct[26,27,32]. Table 7 shows the total effect of each construct. Teacher competencies is the construct with the most significant effect.

Discussion

Summary of findings

To our knowledge, this study is the first that employs PLS-SEM, which is a very robust, rigorous statistical tool, to explore which factors influence students' perception of the clinical teacher's global performance and how these factors are interrelated. The exposed model achieves a high explained variance (88%) through the studied constructs.

Among the expected results, the three categories are qualities that affect the global performance of clinical teachers. The construct with the most substantial influence on global performance is teacher competencies, showing the highest total effect. Personal characteristics show the second most significant effect. Previous studies have reported that an excellent clinical teacher depends less on acquiring cognitive skills such as medical knowledge, and more on inherent non-cognitive, relationship-based attributes. Furthermore, when considering an ideal role model, students value teaching competencies over clinical expertise and ability[15,35,36]. Our findings are consistent with these results[3,6,10,12,14,15].

As an unexpected result, physician competencies were the construct with the lowest positive impact on global performance, with indirect influence through teacher competencies. One possible explanation for these results is that students expect clinical teachers to have a minimum level of knowledge to perform as tutors. As the study was conducted amongst second-year medical students, their medical knowledge has not been fully developed, so they may not question the physician competencies. Instead, they focus on their teaching competencies and personal characteristics.

Practical implications

Accessible and effective faculty development to expand clinician teaching expertise is critical[37]. Other experiences have warned that clinical tea-

chers may lack training in teaching and that it is possible to improve them[38]. In this case, 1/3 of the teachers had no formal training. The results of this study indicate that teaching competencies are the most important when evaluating the teacher's overall performance. Therefore, the prioritization of the development of teacher competencies over personal characteristics or professional competencies in the context of a faculty development program could be considered. Additionally, this study provides a model that can be used in the evaluation of such a faculty development program.

Limitations and future research

Our study has several limitations. Firstly, the study focuses on students' evaluations, not outcomes of students' performance in clinical practice. Secondly, the instrument used in this study did not include direct indicators of pedagogical strategies. It would be relevant to incorporate this information to evaluate more fully the teaching effectiveness of clinical teachers. In this sense, it has been discussed that student evaluations have not been linked to teaching effectiveness[39]. Additionally, although the study response rate is considered adequate to be interpreted, there may be a non-response bias[40]. Finally, many clinical professors correspond to recently graduated physicians; thus, external validity could be compromised in teaching teams with a predominance of senior physicians. Future research should assess whether differences exist between the attributes valued in clinical teachers' performance in different stages of medical training or medical specialties.

Conclusions

The present study developed a model to explain the factors influencing clinical teachers' global performance in ECE. According to our model, teacher competencies, personal characteristics, and physician competencies affect the global performance of clinical teachers. Teacher competencies and personal characteristics had the most significant and direct effect. Continuous evaluation of teacher competencies is required to guide clinical academic training and ensure high-quality teaching in ECE. In this respect, this model exposes which clinical teacher attributes have a more significant influence on their performance and guides clinical teachers' training and continuous improvement.

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