



ORIGINAL ARTICLE

Satisfaction with the use of information and communication technologies among family medicine residents

Miguel Angel Amaró-Garrido¹✉, Jim Alex González-Consuegra², Eliecer González-Valdéz³, Carlos Lázaro Jiménez-Puerto⁴, Tatiana Hernández-González¹

¹University of Medical Sciences of Sancti Spíritus. Faculty of Medical Sciences Faustino Pérez Hernández. University Polyclinic Juana Naranjo León. Sancti Spíritus, Cuba.

²University of Medical Sciences of Sancti Spíritus. General Health Directorate of Fomento. Sancti Spíritus, Cuba.

³University of Medical Sciences of Sancti Spíritus. Faculty of Medical Sciences Faustino Pérez Hernández. Provincial General Hospital "Camilo Cienfuegos". Sancti Spíritus, Cuba.

⁴University of Sancti Spíritus "José Martí Pérez". Faculty of Technical and Economic Sciences. Sancti Spíritus, Cuba.

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ABSTRACT

Introduction: information and communication technologies (ICTs) transform education by improving access to information and fostering collaborative learning, but challenges remain in their proper integration and in medical training.

Objective: to assess the level of satisfaction and the factors associated with the use of information and communication technologies among Family Medicine residents at the University Polyclinic "Juana Naranjo León," during the second semester of the 2024–2025 academic year.

Methods: quantitative, descriptive, cross-sectional study with census sampling (n=25 residents). A validated questionnaire ($\alpha=0,85$) with a 5-point Likert scale was applied to assess overall satisfaction, perceived usefulness, accessibility, ease of use, and technical support. The analysis included nonparametric tests and multiple linear regression.

Results: the median overall satisfaction was 3,0 (IQR: 2,0–4,0). Perceived usefulness showed the highest score (3,2; IQR: 2,8–4,0), while ease of use (2,5; IQR: 2,0–3,0) and technical support (2,8; IQR: 2,0–3,5) were the most critical. No significant differences were found by gender ($p=0,72$) or year of residency ($p=0,13$), but a moderate correlation was observed between perceived usefulness and satisfaction ($p=0,52$; $p=0,007$). The regression model explained 34 % of the variance ($R^2=0,34$; $p=0,02$), with perceived usefulness ($\beta=0,48$; $p=0,01$) and ease of use ($\beta=0,32$; $p=0,04$) as key predictors.

Conclusions: satisfaction with information and communication technologies is moderate, influenced by perceived usefulness and ease of use. It is recommended to strengthen technical support and optimize tool usability.

Keywords: Information Technology; Education, Medical; Satisfaction; Family Practice.

INTRODUCTION

Nowadays, Information and Communication Technologies (ICTs) have revolutionized the global educational landscape by providing new opportunities for learning and teaching. This scenario demonstrates that their integration into learning processes not only improves access to information but also promotes independent and collaborative learning, both of which are key elements in contemporary education.^(1,2) According to reports from the United Nations Educational, Scientific and Cultural Organization (UNESCO), the use of digital tools is a key indicator of educational development, as it improves teaching quality and provides students with the necessary skills required by today's society.^(3,4)

However, despite technological advances and the growing investment in educational infrastructure, challenges persist in effectively integrating these tools into academic disciplines worldwide.⁽⁵⁾ In the health sector, and particularly in the specialty of Family Medicine, residents require a teaching process that combines theoretical knowledge with practical skills and appropriately integrates ICTs.⁽⁶⁾ Lack of training and inadequate use of these tools in the classroom generate dissatisfaction, which affects the motivation and academic performance of future professionals.^(7,8)

In the context of Sancti Spíritus, Cuba, although attempts have been made to modernize education and facilitate access to ICTs, deficiencies in resident training as well as limitations in the availability and proper use of virtual platforms have been identified.^(8,9)

Therefore, the objective of this study is to diagnose the state of satisfaction of Family Medicine residents at the University Polyclinic "Juana Naranjo León" regarding the use of ICTs in academic training.

METHODS

During March 2025, a quantitative, descriptive, cross-sectional study was conducted, based on the Technology Acceptance Model (TAM), in which the satisfaction status of Family Medicine residents at the University Hospital "Juana Naranjo León" in Sancti Spíritus was assessed regarding the use of ICTs in academic training.

The study group consisted of 25 residents in the specialty of Family Medicine. Sampling was considered census-based, since all available cases were included.

Inclusion Criteria:

- Enrolled in the specialty during the study period.
- Use of ICTs in academic activities during the current semester (second semester of the 2024–2025 academic year, which began in September 2024).

Exclusion Criteria:

- Residents in their first semester, as their experience with ICTs in the program could be limited.
- Residents who expressed unwillingness to participate in the study.

The study focused on two central variables:

- **Independent Variable:** Use of ICTs in Academic Training. This variable was operationalized as the frequency and types of technological tools used by residents during the training process.
- **Dependent Variable:** Satisfaction with the Use of ICTs. This variable was defined as the degree of residents' agreement with the experience of using ICTs, encompassing dimensions such as perceived usefulness, ease of use, accessibility, and technical support.
- **Control Variables:** Age, gender, year of residency (R1, R2, R3).

For data collection, a structured questionnaire was used, based on a five-point Likert scale (Table 1). This instrument was adapted from validated items in previous studies on TAM and underwent a validation process by experts in medical education, statistics, and health-related ICTs.

Additionally, relevant demographic data were collected, such as age, gender, and year of residency, considering that these variables could have influenced perceptions regarding ICTs.

Table 1. Variables and Operational Definitions Related to Satisfaction and Use of ICTs in Residents.

Variable	Operational Definition	Scale/Type	Indicators/Examples
Satisfaction with ICTs	Degree of resident agreement with the experience of ICT use during academic training. Reflects overall perception of usefulness, ease of use, accessibility, and technical support.	5-point Likert (1 = Very dissatisfied, 5 = Very satisfied)	• Accessibility: "I have access to computers with internet in the lab." • Perceived usefulness: "ICTs improve my learning." • Ease of use: "The software I use is intuitive." • Technical support: "I receive help when I encounter problems."
Use of ICTs	Frequency and types of technological tools used by residents in the training process.	Ratio scale (hours/week) and nominal scale (types of ICTs)	• Hours per week dedicated to ICT use for academic activities. • Types of ICTs used: PACS software, simulators, virtual platforms (Moodle), bibliographic databases.
Demographic Characteristics	Relevant participant characteristics that may influence the level of satisfaction with ICT use.	Numerical scale (age), nominal scale (gender), ordinal scale (year of residency)	• Age (in years). • Gender (Male/Female). • Year of residency (R1, R2, R3).

The questionnaire used in this study underwent a rigorous validation process to ensure reliability and validity. The process involved review by five experts in medical education and ICTs, each with extensive experience in the field, averaging 20 years of medical training and 15 years in the use of information and communication technologies.

The Content Validity Index (CVI) was calculated using Lawshe's formula, which quantifies the degree of agreement among experts on the relevance of each questionnaire item. Each expert evaluated the questions and assigned scores according to their relevance and clarity. The instrument demonstrated an acceptable CVI when scores exceeded 0,80 for all evaluated items.

In addition, a pilot test was conducted with 10 advanced residents with high academic performance, who were excluded from the final study to avoid repetition bias. This pilot demonstrated that the instrument showed high internal consistency ($\alpha = 0,85$ for the full scale and between 0,78 and 0,88 per dimension), thereby validating measurement reliability.

The statistical analysis of the study used descriptive methods along with inferential procedures appropriate to the characteristics of the information provided. The statistical analysis determined medians with Interquartile Range (IQR) for ordinal variables (Likert scales), while nominal variables (gender and types of ICTs) were summarized using frequencies and percentages.

Nonparametric statistical analysis used the Mann-Whitney U test to compare satisfaction by gender, the Kruskal-Wallis test to evaluate differences among residency years, and Spearman's correlation to explore relationships between variables. Additionally, a multiple linear regression model was built to investigate how perceived usefulness and ease of use (dimensions of the TAM model) affect overall satisfaction. Statistical analysis was performed using SPSS v.28 and Jamovi due to their capabilities for small-sample analysis.

In particular, the relatively small sample size may have limited the generalizability of the results to other populations of Family Medicine residents. Likewise, the cross-sectional nature of the study prevented establishing causal relationships between ICT use and satisfaction. Despite these limitations, this research was expected to provide valuable information for informed decision-making regarding the integration of ICTs in Family Medicine training.

This study adhered to the ethical principles established in the Declaration of Helsinki. In this regard, informed consent was obtained from all participants, ensuring their understanding of the study objectives, the right to confidentiality, and the freedom to withdraw at any time. Furthermore, anonymity of data was guaranteed through information coding and the elimination of any elements that could allow participant identification.

RESULTS

The 25 Family Medicine residents included in the study represented 100 % of the target population that met the inclusion criteria. Gender distribution showed a predominance of women (64 %, $n=16$) compared to men (36 %, $n=9$). The median age of participants was 27 years, with an interquartile range (IQR) of 25–29 years. Regarding residency year, 28 % ($n=7$) were in their first year (R1, second semester), 24 % ($n=6$) in the second year (R2), and 48 % ($n=12$) in the third year (R3).

Overall satisfaction with ICTs showed a median of 3,0 on the Likert scale (IQR: 2,0-4,0), indicating a moderate perception. When disaggregated by dimensions, perceived usefulness obtained the highest score (Median=3,2; IQR: 2,8-4,0), followed by accessibility (Median=3,0; IQR: 2,5-3,5). In contrast, ease of use (Median=2,5; IQR: 2,0-3,0) and technical support (Median=2,8; IQR: 2,0-3,5) reflected the lowest levels of satisfaction (Table 2).

Table 2. Satisfaction with ICTs by Dimensions (n=25).

Dimension	Median	Interquartile Range (IQR)
Overall Satisfaction	3,0	2,0-4,0
Perceived Usefulness	3,2	2,8-4,0
Accessibility	3,0	2,5-3,5
Ease of Use	2,5	2,0-3,0
Technical Support	2,8	2,0-3,5

No significant differences were identified in overall satisfaction according to gender (Mann-Whitney U=68,5; p=0,72) or residency year (Kruskal-Wallis=4,12; p=0,13). However, in the accessibility dimension, a trend toward higher scores was observed among advanced-year residents (R3: Median=3,3; IQR: 3,0-3,5 vs. R1: Median=2,8; IQR: 2,0-3,0), with a marginally significant effect (p=0,05; without adjustment for multiple comparisons) (Tables 3 and 4).

Table 3. Satisfaction by Gender (Mann-Whitney U Test).

Dimension	Men (Median + IQR)	Women (Median + IQR)	p-value
Overall Satisfaction	3,1 (2,4-4,0)	2,9 (2,0-3,8)	0,72

Table 4. Satisfaction by Residency Year (Kruskal-Wallis Test).

Dimension	R1 (Median + IQR)	R2 (Median + IQR)	R3 (Median + IQR)	p-value
Accessibility	2,8 (2,0-3,0)	3,0 (2,5-3,5)	3,3 (3,0-3,5)	0,05

The frequency of ICT use showed a weak positive correlation with overall satisfaction (Spearman's $\rho=0,18$; $p=0,38$). However, when analyzing the TAM dimensions, perceived usefulness presented a moderate and statistically significant correlation with satisfaction ($\rho=0,52$; $p=0,007$). A multiple regression model confirmed that both perceived usefulness ($\beta=0,48$; $p=0,01$) and ease of use ($\beta=0,32$; $p=0,04$) explained 34 % of the variance in overall satisfaction ($R^2=0,34$; $p=0,02$), with no evidence of multicollinearity (VIF=1,2 for usefulness; VIF=1,1 for ease) (Tables 5 and 6).

Table 5. Correlations with Overall Satisfaction (Spearman).

Variable	ρ Coefficient	p-value
ICT Use Frequency	0,18	0,38
Perceived Usefulness	0,52	0,007**
Ease of Use	0,28	0,17
Technical Support	0,15	0,47

Table 6. Multiple Linear Regression Model (Predictors of Overall Satisfaction).

Predictor	β Coefficient	p-value	Variance Inflation Factor (VIF)
Perceived Usefulness	0.48	0.01	1.2
Ease of Use	0.32	0.04	1.1

Model: $R^2 = 0.34$, $p = 0.02^*$

DISCUSSION

This research demonstrates that Family Medicine residents have different attitudes toward the integration of information and communication technologies in academic training programs. The study results show that residents particularly value accessibility and ease of use but report a less positive experience with the latter and with technical support, which, according to TAM, are essential conditions for the adoption of digital tools. These findings are consistent with the results of Rojas and Placencia,⁽¹⁰⁾ who also found that accessibility influences ICT acceptance in medical education.

The different evaluation scores indicate that residents perceive the theoretical benefits of ICTs positively but encounter real barriers to their use, such as complex interface design and insufficient institutional support. The presence of these barriers affects individuals' perceptions and risks diminishing the educational benefits that these technologies can provide over time. Similarly, Perendones M, et al.,⁽¹¹⁾ also found that medical students perceive ICTs as valuable tools for learning but face similar challenges and the need for adequate support to facilitate their effective use in academic training.

Levels of satisfaction by gender, as well as by residency year, remained similar across all demographic categories. The results demonstrate equal opportunities for access to ICTs during the program under study according to this interpretation. Because the sample was small, consisting only of students from a single university center, the results should be interpreted with caution. Third-year residents (R3) tended to rate accessibility characteristics more favorably, as they had better knowledge of institutional resources acquired during training.

In line with this, authors Espinoza and Grefa,⁽¹²⁾ as well as Montes M and Ramírez-Santana M,⁽¹³⁾ obtained results in similar settings and also noted that students with greater training experience tend to show a more positive perception of available technological resources, suggesting that familiarity with the educational environment can influence satisfaction and the effective use of ICTs.

A particular finding was the lack of a statistical relationship between frequent use of ICTs and satisfaction scores ($p = 0,18$; $p = 0,38$). The data collected contradict the widespread belief that greater exposure to technological tools automatically leads to satisfactory results. Multiple regression analysis found that key TAM elements, such as integrated usefulness ($\beta = 0,48$; $p = 0,01$) and ease of use ($\beta = 0,32$; $p = 0,04$), served as significant predictors of satisfaction, explaining 34 % of the explanatory power.

The study results demonstrate that the extent to which ICT pedagogy supports learning activities and the ease of use of the interface are more important than current availability or frequency of use. This outcome corresponds with the studies of Rojas et al.,⁽¹⁴⁾ who found that pedagogical design and usability are fundamental for the effectiveness of distance education. On the other hand, research conducted by Bory et al.,⁽¹⁵⁾ and Del Castillo,⁽¹⁶⁾ also emphasized the importance of interface design in user satisfaction with educational technologies. Similarly, Cuéllar Díaz et al.,⁽¹⁷⁾ indicated that the quality of technical support and training in ICT use influences the perceived effectiveness of technological tools in medical education.

Despite its methodological soundness, this study had limitations, such as its cross-sectional design, which prevented the identification of causal links, and the small sample size, which reduced the ability to identify potential problems. Additionally, despite anonymity, participants may have downplayed criticism due to social desirability bias.

The authors believe that the information obtained provides valuable guidance for improving medical training through information and communication technologies. Residents need training that focuses on mastering the use of tools during the initial residency period, in line with the currently low level of satisfaction with ease of use.

They also highlight the need for institutional actions to provide rapid solutions to technological problems so that medical work remains uninterrupted. ICTs must be strategically connected with clinical competencies and medical practice scenarios within educational programs, since perceived usefulness is the essential component.

CONCLUSION

The results show that the improvement in the training of Family Medicine residents derived from ICT depends on continuous institutional support combined with appropriate learning opportunities and system ease of use. Although TAM proved effective in explaining these phenomena, researchers should conduct studies using broader timeframes with more diverse teams of participants to reveal how environmental factors affect ICT adoption patterns.

Conflict of interest

The authors declare no conflicts of interest.

Authors' contribution

MAAG: Conceptualization, Data curation, Formal analysis, Project administration, Project management, Investigation, Methodology, Resources, Supervision, Validation, Visualization, Drafting of the original manuscript, Writing, review, and editing.

JAGC: Data curation, Formal analysis, Project administration, Investigation, Methodology, Visualization, Drafting of the original manuscript, Writing, review, and editing.

CLJP: Data curation, Formal analysis, Project administration, Investigation, Methodology, Supervision, Drafting of the original manuscript, Writing, review, and editing.

EGV: Formal analysis, Project administration, Investigation, Methodology, Drafting of the original manuscript, Writing,

BIBLIOGRAPHIC REFERENCES

1. Barrientos Oradini N, Yáñez Jara V, Pennanen-Arias C, Aparicio Puentes C. Análisis sobre la educación virtual, impactos en el proceso formativo y principales tendencias. REV CIENC SOC- VENEZ [Internet]. 2022 [acceso 11/01/2025]; 28(4): 496-11. Disponible en: <https://produccioncientificaluz.org/index.php/rcs/article/view/39144>
2. Guerra Hernández I, Benítez Vargas B. Uso de las TIC en educación media superior. prepa3 [Internet]. 2024 [acceso 10/03/2025]; 11(22): 48-3. Disponible en: <https://repository.uaeh.edu.mx/revistas/index.php/prepa3/article/view/12720>
3. UNESCO. Qué necesita saber acerca del aprendizaje digital y la transformación de la educación [Internet]; 2024 [acceso 05/02/2025]. Disponible en: <https://www.unesco.org/es/digital-education/need-know>
4. UNESCO. Informe GEM 2023: Tecnología en la educación. ¿Una herramienta en los términos de quién? [Internet]; 2023 [acceso 09/03/2025]. Disponible en: https://www.unesco.org/gem-report/sites/default/files/medias/fichiers/2023/07/2023reportflyer_SP.pdf
5. Díaz-López MM, Gómez Restrepo LA, Martínez Lozano JC. Reimaginar la educación médica: uso de la tecnología e inteligencia artificial para educar, innovar y participar. Educ Méd Sup [Internet]. 2025 [acceso 13/03/2025]; 39. Disponible en: <https://ems.sld.cu/index.php/ems/article/view/4309>
6. Cervantes-López MJ, Peña-Maldonado AA, Ramos-Sánchez A. Uso de las tecnologías de la información y comunicación como herramienta de apoyo en el aprendizaje de los estudiantes de medicina. CienciaUAT [Internet]. 2020 [acceso 20/01/2025]; 15(1): 162-71. Disponible en: <https://doi.org/10.29059/cienciauat.v15i1.1380>
7. Zamora Castro JC, Garay Núñez JR, Jiménez Barraza VG, Santos Quintero MI, Beltrán Montenegro MD. Vivencias en el uso de las tecnologías de la información y comunicación como apoyo al aprendizaje en estudiantes de medicina en tiempos de pandemia COVID-19. Dilemas Contemp [Internet]. 2023 [acceso 19/01/2025]; X(2). Disponible en: <https://doi.org/10.46377/dilemas.v2i10.3504>
8. Martínez Morales Y, Padilla García O, Concepción Rodríguez M, Gómez Fernández M, Crespo Garriga S, López Rodríguez SR. Modo de actuación creativo del docente universitario, singularidades para la educación a distancia. Gac méd espirit [Internet]. 2024 [acceso 22/01/2025]; 26. Disponible en: <https://revgmespirituana.sld.cu/index.php/gme/article/view/2617>
9. Estrada Jiménez LE, Compte Ruiz HM, Solenzal Hernández K. Estrategia de superación profesional para potenciar la cultura informacional del docente universitario con el uso de herramientas infotecnológicas. Gac méd espirit [Internet]. 2023 [acceso 13/03/2025]; 25 (1). Disponible en: <https://revgmespirituana.sld.cu/index.php/gme/article/view/2540>
10. Rojas H, Placencia Medina M. Uso docente de las tecnologías de la información y comunicación como material didáctico en Medicina Humana. RIEM [Internet]. 2018 [acceso 12/02/2025]; 7(26): 54-2. Disponible en: <https://riem.facmed.unam.mx/index.php/riem/article/view/173>

11. A, Perendones M, Roca F, Goñi M. Enseñanza de la medicina clínica en la virtualidad. Satisfacción de los estudiantes y desafíos pendientes. InterCambios. [Internet]. 2022 [acceso 15/03/2025]; 9(1). Disponible en: <https://doi.org/10.29156/inter.9.1.9>
12. Espinoza-Criollo E, Grefa-Quisahuan P. Herramientas digitales para potenciar la enseñanza de docentes de posgrado de odontología en la especialización de radiología maxilofacial. 593 Digit Publ CEIT [Internet]. 2024 [acceso 05/03/2025];9(3): 954-62. Disponible en: <https://doi.org/10.33386/593dp.2024.3.2426>
13. Montes M, Ramírez-Santana M. Experiencia de enseñanza usando metodologías activas, y tecnologías de información y comunicación en estudiantes de medicina del ciclo clínico. Form Univ [Internet]. 2020 [acceso 05/03/2025];13(3): 65-76. Disponible en: <https://doi.org/10.4067/s0718-50062020000300065>
14. Rojas Carrillo E, Benites Godinez V, Velasco González LE, Ramírez Corona AG, López Morán JA, Parrao Alcántara IJ, et al. Factores asociados al uso de tecnologías en información y comunicación en residentes de Medicina Familiar. Rev Esp Edu Med [Internet]. 2021 [acceso 25/01/2025]; 2(2). Disponible en: <https://revistas.um.es/edumed/article/view/485371>
15. Bory Ed, Barrios Herrero L, Vázquez Naranjo O, Arencibia Flores L, Lastayo Bourbon L, Pérez Yero C. Percepción estudiantil sobre una innovación evaluativa utilizando la plataforma Moodle. Edumecentro [Internet]. 2020 [acceso 04/03/2025]; 12(2). Disponible en: <https://revedumecentro.sld.cu/index.php/edumc/article/view/1469>
16. Del Castillo Saiz GD, Sanjuan Gómez G, Gómez Martínez M. Tecnologías de la Información y las Comunicaciones: desafío que enfrenta la universidad de ciencias médicas. Edumecentro [Internet]. 2018 [acceso 04/03/2025]; 10(1). Disponible en: <https://revedumecentro.sld.cu/index.php/edumc/article/view/908>
17. Cuellar F, Castro Gutiérrez E, Torres Cancino I, Castro Alonso M, González Flores G. Diagnóstico del uso de las TIC's como recurso de aprendizaje de los estudiantes de Pregrado en la Facultad de Ciencias Médicas de Matanzas. Rev Méd Electrón [Internet]. 2020 [acceso 05/03/2025]; 42(5): 1-14. Disponible en: <https://revmedicaelectronica.sld.cu/index.php/rme/article/view/3698>