Revista de Ciencias Médicas de Pinar del Río

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6816

ORIGINAL ARTICLE

Mobile Application for Health Education on Stroke

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Received: June 26, 2025
Accepted: September 24, 2025
Published: September 29, 2025

Citar como: Chacón-Alpí AO, Nogueira-Machín L, Ramírez-Rodríguez M, Gutiérrez-Vera D, Lescalle-Ortiz M de la C. Aplicación móvil sobre la educación para la salud del ictus. Rev Ciencias Médicas [Internet]. 2025 [citado: fecha de acceso]; 29(2025): e6816. Disponible en: http://revcmpinar.sld.cu/index.php/publicaciones/article/view/6816

ABSTRACT

Introduction: stroke is an increasing global health problem, making it essential to establish the best guidelines for prevention and treatment. In Cuba, few digital tools include health education on stroke within Primary Health Care (PHC).
Objective: to design a mobile application for health education on stroke in Primary Health Care.
Methods: a technological innovation study was conducted between March and July 2024 at the Pedro Borrás Astorga University Polyclinic in Pinar del Río. The application was developed using Quasar 2,16 software. Validation was performed through expert assessment—evaluating it as a technological tool—and user criteria.
Results: the mobile application ICTUSPLUS was designed. As a technological tool, 100 % of experts rated the dimensions *applicability* and *originality* as highly satisfactory; 94,12 % rated *generalization potential* as highly satisfactory, and 88,24 % rated *feasibility* and *relevance* as highly satisfactory. Regarding user criteria, 100 % found *design quality*, *usability*, and *functionality* to be highly satisfactory, while 94,12 % rated *interface aesthetics* as highly satisfactory.
Conclusions: an educational application was designed as an option for learning about stroke within Primary Health Care, facilitating knowledge acquisition through a tutorial and developmental approach. The application was validated as *highly satisfactory* according to expert criteria.

Keywords: Mobile App; Primary Health Care; Health Education; Ictus; Mhealth.

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6816

INTRODUCTION

The family physician must provide comprehensive care through effective actions in health promotion, prevention, recovery, and rehabilitation, involving both the family environment and community members, based on the social mandate. These effective actions within Primary Health Care (PHC) are linked to the rise of noncommunicable chronic diseases (NCDs), with stroke being a clear example. Burgaya et al.[1] define stroke as "a clinical syndrome, presumably of vascular origin, characterized by the rapid development of signs of focal neurological impairment lasting more than 24 hours or leading to death."

Stroke is a growing health problem requiring the establishment of optimal prevention and treatment strategies to reduce sequelae. It is the third leading cause of death worldwide and the primary cause of disability among adults.[2,3] According to the World Health Organization (WHO),[4] fifteen million people suffer a stroke every year; of these, 5.5 million die and another five million are left permanently disabled.

Despite variability among epidemiological studies, Soto et al.,[5] estimated stroke incidence in Europe to range from 180 to 200 per 100,000 inhabitants. In Latin America and the Caribbean, this issue is escalating rapidly, reaching epidemic proportions and ranking as the third leading cause of death in the region; according to Cagna and Salcedo,[6] incidence is estimated at 209 per 100,000 inhabitants annually among adults aged 35 years or older.

In Cuba, according to data from the *Statistical Health Yearbook* (2021–2023),[7,8,9] the country reported crude mortality rates of 125.5, 107.6, and 109.6 per 100,000 inhabitants, respectively. In response, a National Program for the Prevention and Control of Cerebrovascular Disease was established in 2000.[10] This program emphasizes strengthening health promotion and stroke prevention actions for educational purposes, patient well-being, greater independence and productivity in recovery, and community reintegration.

Health education (HE) is an essential component of the systematic and continuous development of awareness, knowledge, and individual and collective responsibility toward health and disease. González and Vázquez,[11] define HE as a process aimed at changing or reinforcing thoughts, attitudes, values, or behaviors to achieve and maintain health at individual, group, or community levels.

An important component of health education is the use of information and communication technologies (ICTs), which have become key facilitators in nearly all human endeavors. The health sector is one of the fields most rapidly transformed by technology. The proliferation of the Internet and increasingly advanced devices—particularly smartphones—has created new possibilities for disease promotion, prevention, recovery, and rehabilitation.[12]

Currently, eHealth (electronic health) and mHealth (mobile health) approaches enable a unique connection between physician and patient. Mobile health applications can adapt to different audiences and specific needs in diverse contexts, complementing advanced healthcare technologies.[13]

According to statistics from Quintiles and IMS Health, Inc. (IQVIA),[14] more than 350,000 health-related applications were registered worldwide in 2021 across major digital distribution platforms. Rodríguez and Cano,[15] reported approximately 136 applications focused on stroke, addressing symptom recognition, transportation, emergency assessment, clinical decision-making, and rehabilitation.

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6816

In Cuba, the development of applications has paralleled the growth of the Internet. Notable health-related apps include *Formulario Nacional de Medicamentos* (National Drug Formulary) and *Pesquisador Virtual* (Virtual Screening) developed during the pandemic, as well as *COVID-19*, *Cubadata*, and *Plantas Medicinales* (Medicinal Plants).[16] These examples show that Cuba is moving in the right direction toward improving health through digital applications, though significant progress remains to be made. Digital transformation in healthcare extends beyond infrastructure, influencing roles, processes, legislation, and the culture of both providers and patients. Given this context, the objective of this study was to design a mobile application for health education on stroke in Primary Health Care.

METHODS

A technological innovation study was conducted between March and July 2024 at the Pedro Borrás Astorga University Teaching Polyclinic in Pinar del Río. The research was structured into two phases: development and validation. The mobile application was assessed by expert judgment to theoretically evaluate its effectiveness. Different software programs were used for the multimedia development process. Image processing was performed using Adobe Illustrator CS6 from *Adobe Master Collection CS6*. Text processing was carried out in Microsoft Word (Office). The programming language employed was TypeScript, and the application was developed using Quasar 2.16.

Application Development Phase

To develop the application, the work was divided into several stages, following the methodology proposed by Filippi et al.[17]

- First stage. The appropriate environment for application development was selected. After evaluating several platforms, Quasar 2.16 was chosen because it is an open-source software framework. A general design of the application's potential structure was created, outlining preliminary ideas.
- Second stage. Data sources were selected. Free repositories provided by Google, PubMed, SciELO, and Infomed were used. During this stage, a literature review was conducted to systematize current knowledge on stroke.
- Third stage. Analysis, design, and programming process. The visual components of the application—including screens and menus—were designed. A mock-up of the program layout was created. The program's code was written and tested, initiating the debugging process. The source code was then compiled, resulting in the executable file ICTUSPLUS.apk.

Application Validation Phase

For validation, the expert judgment method was employed. The expert panel consisted of 17 professionals: six professors from the Health Information Systems Program at the *Provincial Medical Sciences Information Center (CPICM)*, four professors from the Department of Medical Informatics, and seven specialists in Family Medicine.

Experts completed a questionnaire previously designed and validated in the study by Vitón et al.,[18] The evaluation considered two main aspects: technological tool and user criteria.
As a technological tool, the following dimensions were assessed: Feasibility: actual possibility of use considering the required technological infrastructure. Applicability: real possibility of implementation based on content. Generalization potential: likelihood of widespread use considering feasibility and applicability. Relevance: social value and degree to which it meets a real need. Originality: level of innovation and novelty of the creation.

ISSN: 1561-3194 **RNPS:** 1877
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According to user criteria, the following dimensions were assessed:

- Design quality
- Interface aesthetics
- Ease of use (simplicity of handling)
- Functionality (ability to meet users' needs)
- Product content (quality and currency of information).

Each dimension was rated using a three-point scale: *highly satisfactory*, *satisfactory*, and *unsatisfactory*.

A database was created with the collected data and analyzed using the SPSS 21.0 statistical package. Ethical principles of medical research were upheld; participant anonymity was ensured, and information was used exclusively for scientific purposes within appropriate context.

RESULTS

The mobile application ICTUSPLUS can be executed on any Android device with version 5.1 or higher. A visually appealing and easy-to-use mobile application was developed to encourage its use and capture user attention. The main screen layout is shown in Figure 1. At the top (the Home Bar), from left to right, appear the Menu Button, the logo, the name, and the slogan of the application. The logo and title were designed so that users can easily identify the topic of the app upon opening it. The orange color of the logo references *World Stroke Day*, celebrated every October 29.

Source: Prepared by the authors.

Fig. 1 *Main screen.*

ISSN: 1561-3194 **RNPS:** 1877
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Beneath the home bar are the navigation buttons containing the application's main content: General Information on Stroke**,** Risk Factors–Symptoms**,** Diagnosis–Treatment**,** Natural and Traditional Medicine**,** and Sequelae–Prevention**.** The second group of buttons targets post-stroke patients and their family environment**,** offering recommendations on suggested topics such as Hygiene–Mobilization**,** Healthy Nutrition**,** Muscle Strength–Excretion, and Communication–Family. Whenever the user accesses any content, a floating button in the lower right corner shaped like the letter T allows font size to be enlarged up to three times (Figure 2).

Source: Prepared by the authors.

Fig. 2 *Button to increase font size.*

To access the Application Menu (Figure 3)—the first button in the upper left corner—the upper section displays the current version, ICTUSPLUS 1.0**.** The menu consists of three sections:

1. Home: Returns the user to the main screen.
2. About: Includes *Who We Are*, *Copyright*, *Privacy Policy*, and *References*.
3. Follow Us: Provides links to the application's social media accounts on Facebook, X, Instagram, Telegram, and Gmail.

ISSN: 1561-3194 **RNPS:** 1877
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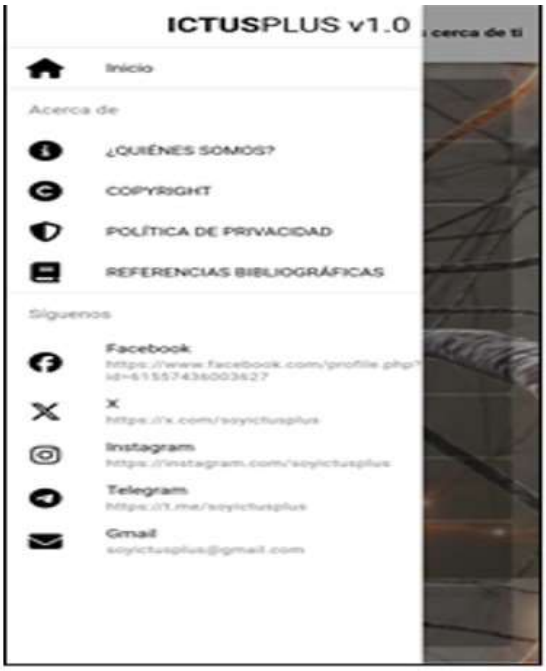

Source: Prepared by the authors.

Fig. 3 *Application menu.*

Validation Phase Results

Table 1. Expert evaluation of the application as a technological tool.

Dimensions	Highly Satisfactory		Satisfactory		Unsatisfactory	
	No.	%	No.	%	No.	%
Feasibility	15	88,24	2	11,76	0	0
Applicability	17	100	0	0	0	0
Generalization potential	16	94,12	1	5,88	0	0
Relevance	15	88,24	2	11,76	0	0
Originality	17	100	0	0	0	0

Source: Prepared by the authors.

It was found that 100 % of experts rated the dimensions applicability and originality as *highly satisfactory*. Additionally, 94,12 % rated the *generalization potential* as *highly satisfactory*, while 88,24 % considered both *feasibility* and *relevance* to be *highly satisfactory*.

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Table 2. Expert evaluation of the application according to user criteria.

Dimensions	Highly Satisfactory		Satisfactory		Unsatisfactory	
	No.	%	No.	%	No.	%
Design quality	17	100	0	0	0	0
Interface aesthetics	16	94,12	1	5,88	0	0
Ease of use	17	100	0	0	0	0
Functionality	17	100	0	0	0	0
Product content	14	82,35	2	11,76	1	5,88

Among respondents, 100 % rated the design quality**,** ease of use, and functionality dimensions as highly satisfactory. 94,12 % evaluated the interface aesthetics as highly satisfactory *and* 5,88 % as satisfactory*.* Regarding the product content**,** 82,35 % rated it as highly satisfactory*,* 11,76 % as satisfactory*,* and 5,88 % as unsatisfactory*.*

DISCUSSION

According to authors Vitón et al., [18] and Benavides et al., [19] eHealth currently constitutes a necessity and a reality; it represents an important tool in the transfer of resources and medical assistance, either synchronously or asynchronously, guiding healthcare to provide necessary information in a pertinent manner. Related to these practices, other concepts such as mHealth have emerged, where technological development has caused changes in healthcare and services, utilizing mobile devices as service tools. For this, the use of health-related mobile applications is indispensable.

From Saucedo et al.'s, [20] perspective, mobile-assisted health aims to improve medical care, facilitate decision-making, and reduce risks in healthcare practice. The WHO supports and promotes the development of mobile applications for medical practice, both among professionals and healthcare service providers. In this way, it contributes to empowering patients and making accessible medical care a reality for all.

One of the objectives of the 2030 Agenda for Sustainable Development of the United Nations (UN),[21] is to ensure healthy lives and promote well-being for all at all ages, where the expansion of information and communication technologies, as well as global interconnection, offer great possibilities to accelerate human progress, overcome the digital divide, and develop knowledge societies. The same applies to scientific and technological innovation in diverse fields such as medicine and energy.

This has led to the inclusion in the documents of the National Economic and Social Development Plan until 2030 of the Cuban state, [22] to elevate and strengthen technological sovereignty in the development of informatics and telecommunications, as well as to promote the enhancement of new technological platforms.

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Hernández et al., [23] reveal that, for several years, Cuba has been undergoing a process defined as the informatization of society: one of the three pillars supporting governmental management. The actions taken, although they have not yet reached the magnitude required by the country's development, have facilitated undeniable advances in electronic governance and commerce.

According to Rodríguez et al.,[24] in modern medicine, stroke represents a challenge. Technological advancements have made strides in the field of diagnosis and management of patients; however, there is still no effective therapy that has managed to reduce its incidence, making the adequate control of risk factors, i.e., primary prevention, the main weapon for its control.

As seen in the research by Vitón et al., [18] the development of the ICTUSPLUS application seeks to fill the gap in health education about stroke in Cuba, which contrasts with the increasing number of patients suffering from this disease each year and the limited availability of digital tools in Primary Health Care. For this, a simple application is used; it is not a closed system, and its design allows for new content to be added through regular updates, with minimal requirements, educating both the patient without stroke and the patient with sequelae.

The low production of mobile applications in the health area is not limited to stroke; Bustos et al., [25] demonstrated that there were no significant producers of mHealth and breast cancer; however, researchers with higher production conducted studies on mHealth and breast cancer aimed at supervised recovery compared to that supported by mobile applications.

On the other hand, a study conducted by Rodríguez et al., [26] employed expert criteria for the validation of an educational multimedia resource for studying the applications of Natural and Traditional Medicine in Stomatology, where 100 % of the specialists who validated the product concluded that the quality of the multimedia content was high and provided total practical utility.

Another study with results similar to the present research was conducted by Professor Candelaria et al., [27] who designed a website that contributed to the professional development process of postgraduate studies on Nephrogeryatry. In this work, 100 % of the professionals who validated the product agree that the design of images, texts, videos, and other elements has been developed to facilitate the direct participation of residents and other users in general in the search for information.

A study conducted by Montes de Oca et al., [28] used expert criteria to validate an educational resource on neurolinguistic programming, where favorable results were found in more than 80 % of specialists. The authors consider that despite the educational work carried out by the National Health System, there are few digital tools involving health education about stroke in Primary Health Care; thus, it is necessary to actively include the entire population, showing the benefits of turning patients and families into actors of educational programs and not just spectators.

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6816

CONCLUSIONS

The mobile application ICTUSPLUS was successfully developed and validated as an educational and preventive tool aimed at promoting knowledge about stroke (cerebrovascular disease). Its design quality, interface aesthetics, ease of use, functionality, and content were rated as highly satisfactory by the panel of experts, confirming the app's technological and pedagogical value**.** ICTUSPLUS contributes to strengthening health education, supporting both professionals and the community in the prevention, early detection, and rehabilitation of stroke**.** The application is accessible, functional, and aligns with international goals related to the use of digital technologies for health promotion and disease prevention**.** Future work should focus on evaluating its impact among users and exploring possibilities for integration into institutional health education programs and telemedicine platforms**.**

Author Contribution

AOCA: Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing, Writing – review and editing.
LNM: Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing, Writing – review and editing.
MRR: Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing, Writing – review and editing.
DGV: Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing, Writing – review and editing.
YCLO: Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing, Writing – review and editing.

All authors approve the final version of the manuscript.

Funding

No funding was received for the development of this study.

Conflicts of Interest

No conflicts of interest are declared.

BIBLIOGRAPHIC REFERENCES

1. Burgaya Subirana S, Macià Rieradevall E, Cabral Salvadores M, Ramos Calvo AM. Ictus: un reto diagnóstico. Rev Pediatr Aten Primaria [Internet]. 2021 Jun [citado 23/04/2024]; 23(90): 179-182. Disponible en: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1139-76322021000200012&lng=es.

2. Acebrón F, Valverde R. Estudio SEGUICTUS: manejo y seguimiento del paciente con ictus en Espana. Neurología [Internet]. 2023 [citado 23/04/2024]; 40(5): 456-467. Disponible de: https://www.elsevier.es/es-revista-neurologia-295-articulo-estudio-seguictus-manejo-seguimiento-del-S0213485324001014

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6816

3. Pérez Fernandez L, Pérez Marrero A, Ponce Concepción A. A propósito del incremento de la morbilidad y mortalidad por la enfermedad cerebrovascular isquémica [Internet]. CENCOMED. III Jornada y Taller Nacional científico de residentes y profesionales de la salud; 2024 [citado 23/04/2024]: 1-13. Disponible de: https://jorcienciapdcl.sld.cu/index.php/jorgecienciapdcl2024/2024/paper/viewFile/866/1159

4. Loyola Ceballos JC. Síntomas emocionales y la calidad de vida en pacientes post accidente cerebrovascular en el Hospital Daniel Alcides Carrión, Huancayo [Tesis]. Perú: Universidad Norbert Wiener; 2022 [citado 23/04/2024]. 31 p. Disponible de: https://repositorio.uwiener.edu.pe/handle/20.500.13053/7935

5. Soto Á, Guillén Grima F, Morales G, Muñoz S, Aguinaga Ontoso I, Fuentes Aspe R. Prevalencia e incidencia de ictus en Europa: revisión sistemática y metaanálisis. Anales Sis San Navarra [Internet]. 2022 Abr [citado 23/04/2024]; 45(1): e0979. Disponible en: https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1137-66272022000100012

6. Cagna Castillo DR, Salcedo Castillo AL. Prevalencia e incidencia de accidentes cerebrovasculares en Latinoamérica y el Caribe: revisión sistemática [Tesis]. Perú: Universidad Científica del Sur Facultad de Ciencias de la Salud carrera profesional de Medicina Humana; 2022 [citado 23/04/2024]. 100 p. Disponible de: https://repositorio.cientifica.edu.pe/handle/20.500.12805/2294?show=full

7. Ministerio de Salud Pública de Cuba. Dirección de Registros Médicos y Estadísticas de Salud. Anuario Estadístico de Salud [Internet]. La Habana; 2021 [citado 23/04/2024]. Disponible en: https://temas.sld.cu/estadisticassalud/2022/10/18/anuario-estadistico-de-salud-2021/

8. Ministerio de Salud Pública. Dirección de Registros Médicos y Estadísticas de Salud. Anuario Estadístico de Salud 2022, 51 edición [Internet]. La Habana; 2023 [citado 23/04/2024]. Disponible de: https://files.sld.cu/dne/files/2023/10/Anuario-Estadistico-de-Salud-2022-Ed-20231.pdf

9. Ministerio de Salud Pública. Dirección de Registros Médicos y Estadísticas de Salud. Anuario Estadístico de Salud [Internet]. La Habana; 2024 [citado 23/04/2024]. Disponible en: files.sld.cu/dne/files/2024/09/Anuario-Estadístico-de-Salud-2023-EDICION-2024.pdf

10. Buergo Zuaznábar MA. Programa Nacional de Prevención y Control de la enfermedad cerebrovascular. Rev Cubana Invest Bioméd [Internet]. 2001 Dic [citado 30 Abr 2024]; 20(4): 247-248. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-03002001000400002&lng=es.

11. González Sarría JD, Vázquez Cedeño AF. Reflexiones sobre la educación para la salud en Cuba. Revista Conrado [Internet]. 2020 [citado 30/04/2024]; 17(80): 61-67. Disponible de: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1990-86442021000300061

12. Gavilondo Mariño X, Vialart Vidal MN. Salud Móvil: retos y perspectivas de aplicación en Cuba. Rev. cuba. enferm [Internet]. 19 de marzo de 2016 [citado 17/08/2024]; 32(1). Disponible en: https://revenfermeria.sld.cu/index.php/enf/article/view/657

13. Pacora Camargo LA. CHECKEATE, aplicación tecnológica en la prevención y tratamiento de las enfermedades crónicas no transmisibles. Rev. cuba. inf. cienc. salud [Internet]. 2021 Jun [citado 17/08/2024]; 32(2). Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2307-21132021000200013&lng=es.

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6816

14. Fuentes Pacheco N, Hernández Rincón E, Barbosa Ardila S, Cadavid Dávila A. Aplicaciones móviles educativas en salud que surgieron durante el período 2020-2022 en Colombia. Revista Cubana de Información en Ciencias de la Salud [Internet]. 2023 [citado 17/08/2024]; 34. Disponible en: https://acimed.sld.cu/index.php/acimed/article/view/2328

15. Rodríguez Prunoto L, Cano de la Cuerda R. Aplicaciones móviles en el ictus: revisión sistemática. Rev. Neurología [Internet]. 2018 [citado 20/08/2024]; 66(07): 213-229. Disponible de: https://dialnet.unirioja.es/servlet/articulo?codigo=6368162

16. Trimiño Alcántara A, Fernández Moreno JA, Martínez Velázquez M, Savón Plutin R. Salud móvil: conceptos generales y potencialidades de implementación en Cuba. Rev. Inf. Cient [Internet]. 2022 [citado 20/08/2024]; 101(5). Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1028-99332022000500015&lng=es.

17. Filippi JL, Lafuente G, Bertone R. Aplicación móvil como instrumento de difusión. Rev. Multiciencias [Internet]. 2016 [citado 22/08/2024]; 16(3): 336-344. Disponible en: https://www.researchgate.net/publication/340949443_Aplicacion_Movil_como_Instrumento_de_Difusion

18. Vitón Castillo AA, González Romero D, Cisnero Piñeiro A, Suco-Serrano W, Cecilia Paredes EE, Rojas Concepción AA. DiRES: Directorio de Revistas Estudiantiles en Salud. Revista 16 de abril [Internet]. 2022 [citado 23/08/2024]; 61(286): e1706. Disponible en: http://www.rev16deabril.sld.cu/index.php/16_04/article/view/1706

19. Benavides Guerrero C, Hernández Cortés PL, Guevara Valtier MC. Rendon Torres LA. Percepción de las aplicaciones M-Salud en adultos mayores: revisión sistemática. SANUS [Internet]. 2022 [citado 23/08/2024]; 7: 1-16. Disponible en: https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2448-60942022000100108

20. Saucedo Pahua G, Fuentes Ocampo L, Jiménez González3 MJ. Salud asistida por el móvil en el adulto mayor con enfermedad crónica. Revisión integradora. REVISTA MÉDICA ELECTRÓNICA DE CIEGO DE ÁVILA [Internet]. 2024 [citado 12/06/2024]; 30: e3950. Disponible de: https://www.revmediciego.sld.cu/index.php/mediciego/article/view/3950

21. Asamblea general. ONU-agenda 2030 [Internet]. Naciones Unidas; 2015 [citado 12/06/2024]: p 40. Disponible de: https://www.un.org/sustainabledevelopment/es/2015/09/la-asamblea-general-adopta-la-agenda-2030-para-el-desarrollo-sostenible/

22. PNDES. Plan nacional de desarrollo económico y social [Internet]. La Habana; 2021 [citado 15/06/2024]: p45. Disponible de: https://www.mep.gob.cu/es/pndesods-2030/plan-nacional-de-desarrollo-economico-y-social-2030

23. Hernández Manso T, García Pulido YA, Díaz Blanco J. Ecosistema digital para la virtualización de la gestión de Ciencia, Técnica e Innovación. Rev. Cubana. De Transformación Digital [Internet]. 2023 [citado 19/05/2024]; 4(3): e219. Disponible de: https://rctd.uic.cu/rctd/article/view/219

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6816

24. Rodríguez Flores O, Pérez Guerra LE, Carvajal Ferrer N, Jaime Valdés LM, Ferrer Suárez V, Ballate González OL. Factores de riesgo asociados a la enfermedad cerebrovascular en pacientes del Policlínico "Marta Abreu". Rev Acta Médica del Centro [Internet]. 2018 [citado 15/07/2024]; 12(2). Disponible de: https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=78575

25. Bustos Viviescas BJ, Garcia Yerena CE, Villamizar Navarro A. mSalud y cáncer de mama en PubMed: producción científica en el período 2018-2022. Rev Méd Electrón [Internet]. 2024 [citado 17/06/2024]; 46: e5786. Disponible de: https://revmedicaelectronica.sld.cu/index.php/rme/article/view/5786/6023

26. Rodríguez Garcia K, Chi Rivas JC, Pérez Sánchez NE, Berenguer Gouarnaluses MdlC, Berenguer Gouarnaluses J. NatuEstom, multimedia para el estudio de las aplicaciones de la Medicina Natural y Tradicional en Estomatología. Univ Méd. Pinareña [Internet]. 2022 [citado 15/07/2024]; 18(2): e872. Disponible en: http://revgaleno.sld.cu/index.php/ump/article/view/872

27. Candelaria Brito JC, Acosta Cruz C, Ruíz Pérez FR, Labrador Mazón O, Gutiérrez Gutièrrez C. Nefroweb: alternativa para la superación profesional de posgrado sobre Nefrogeriatría. Rev Ciencias Médicas [Internet]. 2017 Jun [citado 15/07/2024]; 21(3): 99-105. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1561-31942017000300014&lng=es.

28. Montes de Oca Carmenaty M, Blázquez López A, Rodríguez García K, Tablada Podio EM, Cuza Guerra M, Filiu Farrera JL. ProNeuroMed, multimedia educativa para el estudio de la programación neurolingüística aplicada a la práctica clínica. Rev 16 de abril [Internet]. 2021 [citado 15/07/2024]; 60(281): e1359. Disponible en: https://rev16deabril.sld.cu/index.php/16_04/article/view/1359