

Developmental and behavioral pediatrics service: comprehensive early childhood care in Mexico

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Abstract

Developmental pediatrics (DP) in Mexico has taken a crucial step forward in the creation of the Developmental and Behavioral Pediatrics Service (SPDC, for its acronym in Spanish) at Hospital Infantil de México Federico Gómez (HIMFG). The SPDC is a leading area in early detection and intervention in neurodevelopmental problems and contributes to children's well-being. Among its achievements are the development and implementation of the Child Development Evaluation Test, which has been validated for children under 6 years old, and of a free virtual training program for medical personnel that is supported by an interactive platform. Furthermore, the SPDC is the only center in Mexico to offer a postgraduate degree in DP. With a fair and evidence-based approach, the SPDC contributes to the strengthening of public policy, research, and comprehensive care to ensure children's development.

Keywords: Developmental pediatrics. Child development. Screening test. Early interventions.

Servicio de pediatría del desarrollo y la conducta: atención integral para la primera infancia en México

Resumen

La Pediatría del Desarrollo en México ha dado un paso crucial con la creación del Servicio de Pediatría del Desarrollo y la Conducta (SPDC) del Hospital Infantil de México Federico Gómez (HIMFG). Este servicio es líder en la detección temprana e intervención en problemas del neurodesarrollo, contribuyendo al bienestar de la infancia. Entre sus logros, destaca la implementación de la Prueba de Evaluación del Desarrollo Infantil, validada para menores de seis años; un programa de capacitación virtual gratuita para personal médico, apoyado en una plataforma interactiva y ser la única sede en México del posgrado de alta especialidad en Pediatría del Desarrollo. Con un enfoque equitativo y basado en evidencia científica, el SPDC contribuye al fortalecimiento de políticas públicas, investigación y atención integral para garantizar el desarrollo infantil.

Palabras clave: Pediatría del Desarrollo. Desarrollo Infantil. Prueba de tamizaje. Intervenciones tempranas.

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Introduction

In Mexico, attention to development in children under 5 years old is regulated by NOM-031-SSA2-1999, and section 9.6.1 of this regulation established the evaluation of psychomotor development during well-child visits, based on the behaviors defined in Appendix F¹. However, this standard lacks validated parameters in terms of sensitivity and specificity, which limits its diagnostic utility and generates discrepancies in the comprehensive assessment of children's physical, cognitive, social, and emotional development. Proxy indicators, such as enrollment in childcare or preschool education programs, were often used instead of standardized and validated tools². In 2011, a research group at the HIMFG was invited to validate a child development screening and the subsequent development of the modified version of the instrument, known since 2012 as Child Development Evaluation (CDE) Test (or Prueba EDI in Spanish).

In response to the limitations in the early detection and intervention of alterations in child development across the primary care in the Country, on October 15, 2012, the HIMFG, a National Institute of Health, created the Neurodevelopmental Research Unit (UIN for its acronym in Spanish). Although without a physical area inside the institution, the UIN in 2013 was ireresponsible for the development of the Model of Promotion and Care of Child Development (PRADI, for its acronym in Spanish). This model was designed to strengthen the Rules of Operation of the PROSPERA program (conditional cash transfer program for families in poverty across the country). Its implementation included two fundamental components: (a) the timely detection of and attention to child development problems and (b) community education that was intended to promote the active participation of the beneficiary families of the Social Inclusion Program³.

For the operation of the early detection of developmental problems, based on the CDE test, the UIN was committed to develop a series of manuals validated by a panel of experts, representing a key tool for the early detection of neurodevelopmental disorders ranging from the manual of application, facilitator manual, and a manual for the actions required when a child were identified at risk of delay in his or her development⁴⁻⁶, together with close collaborations with each of the 32 states from the Country, helping them with training in CDE test application, meetings for the reference, and implementation of the path of attention in primary care. This standardized approach facilitated the timely identification of children at risk, providing a critical window for the early intervention and personalized counseling⁷.

Due to its flexibility, efficiency, low cost, and minimal susceptibility to bias, the CDE test is considered the most appropriate instrument for assessing the Mexican child population aged 0-5 years old, becoming a central element of the Child Development Public Strategy since 2012⁵.

First neurodevelopmental research unit in Mexico

May 14, 2014, marked a milestone in child development care in Mexico, with the inauguration of the Neurodevelopmental Research Unit (UIN) facilities at HIMFG. This project, carried out in collaboration with the Ministry of Health and organizations in the private sector, was conceived as the first unit of its kind in the country, with a comprehensive approach to the detection, care, and study of neurodevelopmental disorders.

UIN's facilities were provided with high-quality furniture and electronic equipment, optimized for the evaluation and stimulation of children's neurodevelopment. The unit initially had four offices that were equipped for the application of specialized tests, and it currently has seven evaluation areas. In addition, a specific space is included for timely stimulation activities and the evaluation of motor skills and physiotherapy.

Originally, the main objective of the UIN was the early detection of problems related to neurodevelopment through the implementation of scientific evaluation protocols and the design of timely interventions that benefit the child and adolescent population in vulnerable situations, focused on the first level of care and support for implementation in the 32 states.

In addition, this space was proposed and consolidated as a center of excellence for the training of specialists in neurodevelopment, as well as a national reference for the generation of scientific knowledge, promoting applied research concerning the design of public policy and evidence-based intervention strategies. Among the main lines of research developed by the UIN were the following:

- The CDE test, which was designed and validated in Mexico, and today, is a fundamental screening tool for the early detection of developmental disorders in children between 1 month and 6 years of age. Its application provides for the evaluation of the impact of interventions intended to enhance neurodevelopment. In 2023, the National Health and Nutrition Survey (ENSANUT, for its acronym in Spanish) incorporated the percentage of children that had any CDE, strengthening the importance of CDE in primary care, where

in the majority of cases, CDE test is used, marking a significant advance in the population-based assessment of child development by facilitating the timely identification of risks of neurodevelopmental delay in children under 5 years of age^{8,9}.

- Development of strategies for the training of health personnel in the application of the CDE test was performed using a free access virtual platform. This component took advantage of advances in information and communication technologies to overcome geographic and logistical barriers, allowing for the remote and massive training of health professionals in the management and application of this key tool¹⁰. The virtual platform offered interactive modules, audiovisual resources, and support materials based on scientific evidence, which facilitated the standardization of evaluation procedures at a national level. It also contributed significantly to the promotion of equity in access to diagnostic tools in marginalized communities, where health infrastructure and specialized human resources are limited.

These lines of research, clinical interventions, and educational strategies have been implemented in collaboration with international and national organizations, such as the United Nations Children's Fund in Mexico and the Fundación Gonzalo Río Arronte, among others. These strategic alliances have strengthened the impact of the model proposed by the UIN, contributing to its sustainability and outreach to highly vulnerable populations.

Developments in comprehensive early childhood care approach

Due to its increased medical assistance activity, on October 1st of 2019, under the management of the Medical Division, the Neurodevelopmental Research Unit changed its name to the “Developmental and Behavioral Pediatrics Service” (Table 1)¹¹. It currently acts as a referral center for the care of neurodevelopmental disorders in children and adolescents from Mexico City, the Mexico City metropolitan area, and neighboring states, in addition to inter-hospital consultations from neurology, neurosurgery, internal medicine, rehabilitation, oncology, and genetics departments, among others.

Within HIMFG, as of 2024, together with psychiatry and neurology, the following diagnoses treated in the outpatient department were established:

- Autism spectrum disorder.
- Attention-deficit/hyperactivity disorder.
- Learning disorders.
- Intellectual developmental disorders.

- Sensory processing disorder in children with developmental problems.
- Behavioral disorders.
- Food selectivity.
- Parenting in neurological diseases.
- Loving and sensitive nurturing and care.

Creation of the first postgraduate medical course in developmental pediatrics (DP) in Mexico

The “High Specialty Course” or Fellowship in DP, a medical postgraduate course that has been recognized by the National Autonomous University of Mexico, was launched in 2017, with the HIMFG as its unique venue¹². This program is comparable in standards and scope to those offered in the United States, Canada, and countries of the Indo-Pacific region, becoming a reference in the training of specialists in this area.

DP, conceived at BPDS is: “a *transdisciplinary branch of pediatrics that is centered on children and adolescents from a comprehensive and rights-based approach to promote their overall development, focusing on them and empowering families.*” This specialty through a transdisciplinary approach promotes nurturing care, intend to maximize the individual potential of each patient, including the physical, social, and emotional dimensions. Professionals trained in this area foster the comprehensive development of children and adolescents, promoting their well-being and helping them to achieve the best version of themselves.

The main objective of the postgraduate program in DP is: “to plan and execute preventive actions related to environmental, social, ecological, and psychosocial factors that contribute to the comprehensive development of children and adolescents. In addition, it seeks to detect prenatal and postnatal risk factors that directly affect neurodevelopment to facilitate the design of intervention and treatment strategies based on scientific evidence.”¹³

In this program, specialists acquire skills to evaluate and accompany patients from an ethical and humanistic perspective, thus strengthening the quality and warmth of the care they receive. This includes the establishment of an effective rapport with patients and families, promoting an inclusive approach considering each individual's social, cultural, and family environment. In this training, we seek to generate a positive impact not only on health but also on the living conditions of children and adolescents from a comprehensive and transformational perspective.

Table 1. Medical-Healthcare activities in the developmental and behavioral pediatrics department in the 2019-2024 period

Activity	Year						
	2019	2020	2021	2022	2023	2024*	Projection for 2025
Total pediatric visits	2,377	1,266	2,604	3,524	3,556	3,105	3,747
Comprehensive developmental assessments (screening, diagnostic and intelligence evaluations)		377	537	1,736	1,373	1,456	1,547
Resident rotations at HIMFG and other institutes	140	42	58	86	86	68	86

Developmental and Behavioral Pediatrics Department (2024). Prepared by the authors, using reports provided by the Developmental and Behavioral Pediatrics Service: Data collected from January-to September 2024. HIMFG: Hospital Infantil de México Federico Gómez.

As of 2023, the DP Department has trained 24 highly qualified DP specialists in this area. Among them, two have stood out for their significant contributions in the field of research, earning recognition.

In 2019 and 2023, their research projects received honorific mentions for their impact and scientific rigor. In addition, one of these specialists, Dr. Melissa Cañete, out of more than 1200 students in highly specialized courses nationwide, was awarded first place at the 25th Research Conference in 2023, consolidating the prestige of the BDPS as a leader in scientific production in DP, across all specialties in Mexico.

The first project to receive an honorable mention focused on the validation of group 15 (60-71 months old) of the CDE test, which was specifically designed by Dr. Maria Salud-Trejo for the early detection of neurodevelopmental problems in children under 6 years of age in Mexico. This advance represents a fundamental step toward the expansion of the use of CDE test in older populations and strengthening early detection in the national context.

These awards highlight the quality of the graduates and the impact of the DBPS in the generation of scientific knowledge. The progress achieved by the specialists has made it possible to strengthen the use of standardized tools such as CDE test and to promote innovative strategies for the early detection, consolidating the Service’s commitment to the continuous improvement of child health care in Mexico, which is an area that, according to studies carried out by the National Institute of Public Health, is highly relevant¹⁴.

At the same time, to share and promote the knowledge generated concerning Developmental and Behavioral Pediatrics, the DP Annual Meeting was created, which is targeted at medical, healthcare, and education personnel. The first Meeting was held in July of 2017 and featured the participation of national and international experts from different governmental and

Table 2. Number of users who passed the EDI test course completed by means of the virtual training platform in the 2020-2024 period

Year	Staff who passed the test with the minimum passing grade (9.0)
Pilot test 2020-2021	1316
2022	767
2023	580
2024	605

Developmental and Behavioral Pediatrics Department (2024). Prepared by the authors, using reports provided by the National Center for Child and Adolescent Health: Data collected from January to September 2024.

civil society sectors, including topics related to the attention and care of children and adolescents, as well as comprehensive care for neurodevelopmental disorders.

To date, the scientific production of the department includes more than 21 scientific articles published in indexed medical journals and several book chapters. In recognition of the work and effort carried out in favor of early childhood, “Fondo Unido México” granted the BDPS two awards:

1. The “Al Aliado Vive Unido 2017” Award for the evaluation of girls and boys from the Nacer Aprendiendo Centers in 2016, which measures the effectiveness of Fondo Unido’s educational program, and for its contribution to the prioritization of child development in Mexico¹⁵.
2. The “Articulación Intersectorial para Cambios Sistémicos” (Intersectoral Articulation for Systemic Change) Award, for being the first public advocacy effort for Fondo Unido-United Way Mexico and incorporating the first standardized measurement of child development, together with that of the weight and height of children under 6 years of age who attend

Table 3. Number of CDE tests applied to child population nationwide in the 2018-2024 period

Year	Total CDE test applied	Total initial CDE tests	Total subsequent CDE tests	Remarks
2018	864,009	518,059	345,950	< 1 year old and 1-4 year old groups were included.
2019	653,413	406,716	246,697	
2020	346,109	221,489	124,620	
2021	463,546	291,746	171,800	As from 2021, the age group was expanded (1-5 year old children)
2022	608,180	368,675	239,505	
2023	496,972	294,685	202,287	
2024*	407,345	233,194	174,151	
Total	3,839,574	2,334,564	1,505,010	

Data from: Health Information System (SIS Consolidated SINBA) (2024). Care provided to children under 5 years old in preventive health appointments: Data collected up to September 2024. <https://sinba.salud.gob.mx/CubosDinamicos>.

Child Care Centers (CAI), awarded through the Strategy for the Accompaniment of Child Development and Nutritional Surveillance¹⁶.

Virtual CDE test training

In collaboration with the National Center for Child and Adolescent Health (CeNSIA, for its acronym in Spanish) and thanks to the founding from Gonzalo Río Arronte IAP Foundation, a free virtual training program was developed and implemented to support the correct application of the CDE test, targeted at first level healthcare personnel. This training seek to promote the detection and timely intervention of neurodevelopmental delay in at-risk children from 1 to 59 months of age, through the acquisition of skills in a course that is structured in 15 interactive modules, equivalent to 40 h of theoretical and practical training, held on a web-based platform.

The design of this strategy ensures the standardization of screening at the national level, with the objective of reaching 4 million children, guaranteeing homogeneous and high-quality results. The virtual modality and 24-h availability facilitates access and optimizes the scope of the training, strengthening the capacities of health personnel and promoting an evidence-based approach to early childhood development in Mexico.

To consolidate the progress achieved in the early detection of child developmental disorders, it was necessary to evaluate the operational feasibility and effectiveness of the training strategies being implemented. For this, a pilot test for the virtual training on the CDE test was designed and implemented in 2020, with the objective of evaluating the effectiveness of the training

program in the correct application of the CDE test, as well as its feasibility for real operational contexts.

This pilot involved a representative sample of 2139 participants who were recruited from health units distributed across different states of Mexico, including Aguascalientes, Campeche, Colima, Chihuahua, Guanajuato, Guerrero, Nayarit, Nuevo León, Puebla, Querétaro, Tabasco, Tamaulipas, Yucatán, Zacatecas, Oaxaca, Tlaxcala, Baja California Sur, State of Mexico, Mexico City, and Sonora. Out of the initial participants, 1316 people passed the course, representing 61.5% of the total sample (Table 2)¹⁷.

According to reports provided by CeNSIA, from the analysis of the pilot group, a significant increase in the number of applications of the CDE test was observed at the national level following the training of primary care personnel (Table 3)¹⁸.

This increase can be attributed to several key factors: (a) the easing of the social coexistence restrictions that were imposed during the COVID-19 pandemic, which facilitated access to health services; (b) the comprehensive updating of the virtual training course, drawing on feedback obtained from the first groups that used the interactive platform; (c) the revision and publication of the 2021 version of the manual for the application of the EDI test, which included the incorporation of group 15 (60 months to 71 months and 29 days), developed by Dr. María Salud Rodríguez Trejo in 2020¹⁹; and (d) the national distribution, both physical and digital, of 20,000 copies of the updated materials in conjunction with the CeNSIA, starting in 2022. These factors contributed to the standardization and massification of the screening, thus favoring the timely detection of child development problems.

A central current challenge is the optimization of the capacity of the server hosting the training platform to expand its scope and improve the user experience in terms of accessibility, interaction, and functionality.

Improvements in the technological infrastructure, together with pre-course updates and training materials, will not only consolidate the standardization of screening at the national level but also guarantee a more efficient and accessible training experience for health personnel, thus contributing to the strengthening of timely detection strategies in child development.

Conclusion

Developmental and behavioral pediatrics in Mexico is a crucial training field in pediatrics, and of high importance for the future of children, with significant advances in early detection, timely intervention, and professional training. However, its consolidation faces important challenges. It is essential to promote the greater dissemination and understanding of its relevance among health professionals and society at large, fostering a collective approach to comprehensive child development.

It is also important to reduce inequality in access to specialized services, in particular in rural and marginalized communities, where structural limitations continue to be an obstacle. Finally, ensuring the sustainability of the training and care efforts will require innovative strategies to overcome human and technological resource constraints. Addressing these challenges will be key to strengthening DP and guaranteeing an equitable and healthy future for Mexican children.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The study does not involve patient personal data nor requires ethical approval. The SAGER guidelines do not apply.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

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