Applicability of a Tool for Comprehensive Assessments: the Expanded Guide for Monitoring Child Development

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Research

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Abstract

Background: Pediatricians globally are in critical need of tools enabling comprehensive information about children and families while also saving face-to-face time. This study examined the applicability of the expanded version of the Guide for Monitoring Child Development (GMCD), a free-of-charge tool used in over 30 countries. The Expanded GMCD is a written tool incorporating the biopsychosocial model of healthcare delivery, bioecological theory of child development, and two World Health Organization frameworks: International Classification of Functioning, Disability and Health, and Nurturing Care.

Methods: Parents of children attending Ankara University Developmental Pediatrics Division, Turkey, were given or digitally sent the Expanded GMCD to complete before their first assessment. The completeness of the responses to the four Expanded GMCD domains and factors associated with full completion were ascertained using multivariate analyses.

Results: Of 480 children, 57% were boys, median age was 17.0 (IQR: 9.0-27.0) months. Completion rates were 78%, 87% and 92% for all four, at least three and at least two domains, respectively. All four domains “body structures and functioning,” “health conditions,” “activities and participation,” and “environmental factors” had completion rates >80%. The Expanded GMCD provided holistic information: 87% of children had developmental difficulties and special needs; 60% had chronic conditions requiring follow-up; over 20% of parents reported stigmatization and maternal depression; over 10% unemployment and financial difficulties, not getting enough support from friends and relatives, paternal depression; and 5% intra-family conflict. In the logistic regression analyses, parents of children ≤ 6 months more likely completed <4 domains compared to parents of older children (OR: 2.24; 95% CI: 1.25-3.72); maternal education less than high school (OR: 1.38; 95% CI: 0.87-2.20) and having multiple children (OR: 1.48; 95% CI: 0.94-2.35) were not significantly associated with the full completion of the Expanded GMCD.

Conclusion: The applicability of the Expanded GMCD in this study in children with diverse health conditions and families with different educational levels implies its potential for applicability in other settings. Using the free-of-charge Expanded GMCD in healthcare delivery including telemedicine may address the gaps in the implementation of the theory, model and framework-based comprehensive tools for children and their families.

Background

Since the 1970s when Engel published in *Science* the crucial need for the biopsychosocial model for medicine [1], it has been emphasized that this model must be implemented in healthcare delivery for adults and children alike [2]. There are still major gaps, however, in applying this model, as clinicians in many countries encounter constraints including inadequacies in the workforce, insufficient time devoted to healthcare visits, inadequate training and paucity of related tools [2-6]. The new type coronavirus disease (COVID-19) pandemic brings novel challenges by adding inordinate stress on the health system

and further jeopardizing the time that needs to be spent during face-to-face history taking to obtain holistic biopsychosocial information.

Children and youth constitute one third of the world's population [7]. Due to the rapid development of the brain, the life-span influences of the contextual environment, and the high prevalence of suboptimal health and development during childhood[8-10], international organizations are increasingly prioritizing the promotion of optimal child health and development [11]. The prevention, early identification, and management of chronic health conditions and developmental difficulties are leading research priorities [12]. These, however, require a comprehensive assessment that enables holistic biopsychosocial information on children and families [13]. Healthcare systems, therefore, are greatly in need of practical tools that can be applied to obtain this information [13,14].

The World Health Organization (WHO) has two frameworks derived from the biopsychosocial model and related to comprehensive assessment of children's health and development: the *International Classification of Functioning, Disability and Health for Children and Youth*(ICF-CY) [15] and Nurturing Care [16]. The ICF-CY includes "health conditions," "body structures and functions," "activities and participation," "environmental (contextual)" and "personal" factors. The ICF-CY was a WHO approved "derived" classification but the two have now been merged and are referred to as ICF-CY to address all aspects of functioning across the lifespan. Tools based on ICF-CY have involved children with disabilities [16], autism [17], cerebral palsy [18], and chronic illness [19]. The recently launched WHO Nurturing Care Framework [20] for young children includes "good health," "adequate nutrition," "responsive caregiving," "opportunities for early learning," and "security and safety." To date, tools that incorporate all components of the Nurturing Care Framework have not been constructed. Both of these frameworks also emphasize family-centered care as the cornerstone of healthcare delivery to children [21]. Research is needed on biopsychosocial model, ICF-CY and Nurturing Care framework-based, family-centered tools that are applicable to and provide information on all children and that are developed specifically to address the challenges of the healthcare workforce.

The Expanded Guide for Monitoring Child Development (Expanded GMCD)[22] is a version of the International Guide for Monitoring Child Development (GMCD) [23, 24] which is a tool grounded in bioecological theory, family-centered care. [25, 26]. Using the GMCD, during a brief ten-minute encounter with families, service providers can monitor and support children's development, identify strengths and needs of the child and the family including developmental delays and risk factors and subsequently plan early intervention. The GMCD has been standardized and validated in four diverse countries, Argentina, India, South Africa and Turkey [23,24] and has been rated highly among tools that can be used internationally [27,28]. Clinicians from over 30 countries have been trained in using the GMCD and national trainers exist in 13 countries including Italy[25,26]. The GMCD developers, Ertem et al, have constructed the Expanded GMCD by distilling, incorporating and bridging seminal techniques of the GMCD as well as family-centered comprehensive history taking and developmental assessments, and all components of the ICF-CY and Nurturing Care frameworks. The open-ended question structure of the GMCD was largely kept, but so as not to increase face-to-face time during history taking, the Expanded

GMCD was constructed as a written, fourth grade reading level questionnaire for families to complete at home or in waiting rooms for outpatients, and during hospitalization for inpatients. Examples of the Expanded GMCD questions are shown in Figure 1. It takes approximately 30 minutes for the families to complete the Expanded GMCD. The questions are mostly open-ended to allow for unrestricted descriptions and explanations from the family but structured checklist components also exist. Clinicians reading the completed Expanded GMCD in five minutes learn details about the current and prior health conditions, functioning, participation in life and psychosocial context of the child and family, their strengths, needs and unmet needs. Clinicians can then readily partner with the family stating that they are knowledgeable about the child because of the information the family has provided, they can elicit further history if needed, and subsequently conduct the face-to-face components of the assessment such as physical examination and developmental observations. The Expanded GMCD can be used by family physicians, pediatricians, pediatric subspecialists, pediatric surgeons, child and adolescent psychiatrists as well as clinicians from allied disciplines such as psychologists, social workers, occupational and physical therapists, teachers, early intervention specialists and other service providers. The Expanded GMCD can be combined with other tools and techniques for medical and developmental assessments but can be used also as a stand-alone instrument to provide comprehensive information to clinicians caring for all children, particularly those children with chronic healthcare problems, developmental difficulties and special needs. The Expanded GMCD is available as a free-of-charge tool with a brief online training program for service providers around the world who are already trained in the GMCD.

The Expanded GMCD development and validation study included chronically ill-hospitalized children whose mothers completed the Expanded GMCD during their hospital stay. This study showed that the Expanded GMCD enabled coding of 95% of the ICF-CY codes and was completed by nearly all mothers although 90% had less than high school education [22]. Its applicability, however, has not been established for outpatient settings. The aim of this study, therefore, was to examine the applicability of the Expanded GMCD, specifically, to determine to which extent parents complete its domains, and whether there are children or family related factors associated with completion rates.

Material And Methods

Study design and participants

In this cross-sectional study, children aged 0–42 months, referred to Ankara University Developmental-Behavioral Pediatrics Division clinic over a twelve-month period were recruited. Children were included if they came for their first developmental assessment and their caregivers provided consent. The Ethics Committee of the Ankara University School of Medicine approved the study.

Procedures

The study followed the routine procedures of the clinic. When they came to obtain an appointment, parents were given the printed Expanded GMCD and explained the following: parents or legal guardians of the child should complete the Expanded GMCD together; completion time is approximately 30 minutes;

other family members or friends can assist in reading the questions and writing; detailed responses by parents to all questions are crucial for the assessment; the Expanded GMCD must be brought back for the developmental assessment appointment. This information was also written on the Expanded GMCD. The number of Expanded GMCD forms given out and brought back was recorded and the completion rate of the Expanded GMCD was computed and entered into a database.

Measures

All domains of the ICF-CY (“health conditions,” “body structures and functioning,” “activities of daily living and participation in life,” “environmental” and “personal factors”) and Nurturing Care were included in the Expanded GMCD and used in this study. To enable content flow, questions on Nurturing Care (“adequate nutrition,” “responsive caregiving,” “opportunities for early learning,” and “security and safety”) were incorporated into the “environmental” domain; and “personal factors” (temperament, interests, and dreams of the child, aspirations of the family for themselves and the child) was integrated into “body structures and functioning” resulting in four Expanded GMCD domains to be analyzed. Figure 1 shows examples of questions for each domain. Only information written by the parents was used to determine Expanded GMCD completion.

The diagnoses of the children were provided by developmental pediatricians who conducted the comprehensive developmental assessment based on principles of bioecological theory, biopsychosocial model, ICF-CY, transdisciplinary, and family-centered care. The clinicians read the answers that had been written by the parents on the Expanded GMCD. They elicited further history when needed, observed child-caregiver play, and conducted a physical examination. Standardized assessment tools were used according to the child’s needs and included the GMCD, Bayley Scales of Infant and Toddler Development Third Edition, Vineland Adaptive Behavior Scales Third Edition, and the Childhood Autism Rating Scale Second Edition (CARS-2). The diagnoses were based on the WHO International Classification of Diseases-10 criteria for chronic illness, cerebral palsy and genetic disorders; and the Diagnostic and Statistical Manual of Mental Disorders 5th Edition and CARS-2 criteria for autism spectrum disorder.

Statistical analyses

Descriptive statistics included frequencies for categorical data; means and standard deviations for normal distributions; and medians and interquartile ranges otherwise. The four domains were scored “1” if completed and “0” if not completed and the scores were added, thus total completion score ranged from a minimum of 1 to a maximum of 4. The sample was designated two groups: completion score = 4 and completion score < 4. This stringent cut-off for completion score was chosen so as to determine which families provided fully complete and less than fully complete information on the Expanded GMCD. Based on anecdotal observations, it was hypothesized that younger child age (because families of younger children may know less about their child); lower maternal and paternal education (because parents with lower education may have difficulties in written questions and responses) and having multiple children (because numerous children may pose more work and distraction for parents), may impede completion. Due to possibilities of gender inequality leading to reporting bias, we also examined

whether completion rates were different for girls and boys. First, bivariate analyses were conducted for categorical variables using Pearson and Fisher-Exact Chi Square tests. Odds ratios for the two groups were computed for girls versus boys, 0–6 months versus older, single versus multiple children, and maternal and paternal education less than high school versus at least high school education. Next, multivariate logistic regression analysis was applied entering variables with odds ratio p values < 0.10 to determine independent factors associated with the dependent variable (completion score < 4). For statistical significance 95% confidence intervals (CIs) were used. Statistical analyses were done using IBM SPSS 20.0 (SPSS Inc., Chicago, IL, USA) package program.

Results

During the study period, 494 eligible children were given first appointments, and 14 (3%) did not return for their appointment. All 480 families coming for their appointment brought back the Expanded GMCD and comprised the study sample. The sociodemographic characteristic of the children and families are shown in Table 1. Most children were boys (57%); the median age of the sample was 17.0 (IQR: 9.0–27.0) months. The median maternal and paternal ages were 31.0 (IQR: 27.0–35.0) and 34.0 (IQR: 30.0–38.0) years, respectively. The median maternal and paternal education were 12.0 (IQR: 8.0–16.0) and 12.0 (IQR: 12.0–16.0) years, respectively; and most mothers (68%) and fathers (76%) had at least high school education. Most families had multiple children (55%) and as per the Turkish healthcare system, all family members had health insurance.

Table 1
Sociodemographic characteristics of the sample (N = 480)

		n	%
Boys		272	56.7
Child age (months)	0–12	180	37.5
	13–24	152	31.7
	25–42	148	30.8
Maternal age (years)	< 20	8	1.7
	21–30	219	45.6
	> 30	253	52.7
Paternal age (years)	< 20	1	0.2
	21–30	130	27.1
	> 30	349	72.7
Maternal education	Less than high school	153	31.8
	High school	131	27.3
	Higher education	196	40.8
Paternal education	Less than high school	115	24.0
	High school	163	34.0
	Higher education	202	42.1
Number of children	Single child	217	45.2
	Multiple children	263	54.8

The psychosocial information that was obtained from the Expanded GMCD and the health and developmental status of the children as per the assessment are shown in Table 2. Most children had problems in body structures and functioning due to chronic disorders; 87% had developmental delay in at least one developmental domain; 10% had autism or cerebral palsy; and 13% had only behavioral problems. Activities and participation were limited, most children (93%) did not attend nursery school, daycare or preschool or early intervention services. Between 20–27% of families reported perceived stigmatization or feelings of depression in mothers; 10–17% reported unemployment or financial difficulties, not getting enough support from friends and relatives, or feelings of depressions in fathers; and 5% reported marital problems or family violence. Of 263 families with multiple children 29 (11%) reported social-emotional problems in siblings.

Table 2
Health, development and psychosocial characteristics of the sample (N = 480)

	N	%
Health conditions		
Chronic illnesses or congenital disorders	190	39.6
Prematurity and its complications	98	20.4
Autism spectrum disorder	33	6.9
Cerebral palsy	14	2.9
Impairments/delays in body structures and functioning		
Expressive or receptive language	265	55.2
Gross or fine movement	161	33.5
Cognitive development	151	31.5
Social-emotional development	79	16.5
Behavioral problems	63	13.1
Impairments in body structures (examples: gastrostomy, colonostomy, tracheostomy, ventriculo-peritoneal shunt)	40	8.3
Vision or hearing impairment	49	10.2
Problems in activities and participation		
Child attends preschool	14	2.9
Child attends early intervention/special services	21	4.4
Risks in environmental factors including nurturing care		
Perceived stigma	128	26.7
Mother's feelings of depression	96	20.0
Unemployment, financial problems	81	16.9
Not getting enough support from friends and relatives	69	14.4
Father's feelings of depression	50	10.4
Marital problems/family violence	25	5.2

The proportions of families completing the Expanded GMCD domains are shown in Table 3. Most families completed all four domains (78%); 87% completed at least three, and 92% completed at least two

domains. The domain with the highest completion rate was “child functioning” (94%) and the domains “activities and participation,” “health” and “contextual (nurturing care) environment” all had completion rates above 80%.

Table 3
Completion rates of the Expanded-GMCD* and its domains (N = 480)

	N	%
Completion of Expanded GMCD		
Completion of all four domains	372	77.5
Completion of at least three domains	415	86.5
Completion of at least two domains	442	92.1
Completion of domains		
Body structures and functioning	452	94.2
Activities and participation	430	89.6
Health conditions	428	89.2
Environmental factors (including nurturing care)	399	83.1
* GMCD: Guide for Monitoring Child Development		

Table 4 shows the bivariate odds ratios of child and family related factors that were examined for their association with Expanded GMCD completion. Variables with odds ratio p values < 0.10, included child’s age, maternal education, and number of children in the family. Child sex, and paternal education both had odds ratio p values ≥ 0.10 . In the multiple logistic regression analysis (Table 4), child age was found to be the only statistically significant independent variable. Families of children aged 0–6 months were 2.24 times more likely than families of older children to have completion scores < 4 (less than full completion).

Table 4
Bivariate and multivariate analyses of child and family related factors associated with Expanded GMCD* completion (N = 480)

	Proportions		Exp-GMCD completion score < 4					
	n	%	n	%	OR	95% CI	p value	
Bivariate analyzes								
Child related factors								
Girls	208	43.3	41	19.7	0.75	0.48–1.16	0.201	
Boys	272	56.7	67	24.6				
Age ≤ 6 months	89	18.5	31	34.8	2.18	1.31–3.60	0.002	
Age > 6 months	391	81.5	77	19.7				
Family related factors								
Maternal education < high school	153	31.8	42	27.5	1.49	0.95–2.33	0.076	
Maternal education ≥ high school	327	68.1	66	20.2				
Paternal education < high school	115	24.0	31	27.0	1.38	0.85–2.23	0.189	
Paternal education ≥ high school	365	76.0	77	21.1				
Multiple children	263	54.8	68	25.9	1.54	0.99–2.39	0.053	
Single child	217	45.2	40	18.4				
Multivariate logistic regression analyzes								
Age ≤ 6 months					2.24	1.25–3.72	0.002	
Multiple children					1.48	0.94–2.35	0.088	
Maternal education < high school					1.38	0.87–2.20	0.166	
*GMCD: Guide for Monitoring Child Development								

Post-hoc analyses were conducted to determine whether families with children aged 0–6 months were more likely to not complete specific domains of the Expanded GMCD. The domains “health condition”, “functioning”, “activities and participation” and “environmental factors” were completed by 88%, 86%, 83%, 75% of families with children aged 0–6 months, respectively. Compared to families with older children, families with children aged 0–6 months were statistically significantly more likely not to complete “body structures and functioning” (OR: 4.28; 95% CI: 1.96–9.37); “activities and participation” (OR: 2.06; 95% CI: 1.07–3.96); and “environmental factors” (OR: 1.84; 95% CI: 1.06–3.22). This association was not significant for the domain “health condition” (OR: 1.20; 95% CI: 0.59–2.44).

Discussion

This study has demonstrated the applicability of the Expanded GMCD for young children attending a developmental pediatric clinic in Turkey. The Expanded GMCD provided crucial information on the child as well as important and sensitive information on the caregiving environment. The full completion of the Expanded GMCD was high and similar across child sexes, parental education levels and numbers of children in the family but families of the youngest children were less likely to fully complete the Expanded GMCD. The Expanded GMCD, bridging contemporary developmental theories, models and frameworks, may help fill the gap in the literature on tools that encompass the biopsychosocial model, family centered care and seminal WHO frameworks.

The ICF-CY, available for nearly two decades, has been the recommended biopsychosocial model based framework for the assessment of child health, development, illness and disability [29-32]. The complexity of the ICF-CY coding has been cited as a limiting factor for research on the clinical use of ICF-CY [31]. Most pediatric research on ICF-based tools has involved specific disorders [32]. The Expanded GMCD offers a practical tool incorporating ICF-CY for all children regardless of the health diagnosis or developmental condition. This research conducted in Turkey, provides evidence for its applicability in other settings, but alerts clinicians to examine ways of supporting families in its use for young infants.

The open-ended question structure of the GMCD which develops rapport and partnership with caregivers was retained in the Expanded GMCD even when it is a written tool. Performance on written open-ended questions has been found to correlate with quality of self-explanations, whereas performance on multiple-choice questions correlates with prior knowledge on topic [33]. In contexts where caregiver knowledge of child development may be low [34], the written open-ended question technique may have advantages for obtaining comprehensive information on children.

The main strength of this study is the study design which avoids the Hawthorne effect, the effect of participating in research that modifies individual's behavior [35]. To avoid this and ascertain real life applicability, families completed the Expanded GMCD as a routine procedure. The large sample size and low refusal rates for the study are further strengths. The urban, single center setting is a limitation of the study. The research took place in the center where the Expanded GMCD originated. The longstanding experience, dedication and diligence in using the tool by the clinicians in this center may have increased its completion rates by families. The Expanded GMCD is for children of all ages and parents of all education levels. This study, however, included children in their early years and the sample was skewed towards educated parents. Further research, therefore, is needed to investigate the applicability and usefulness of the Expanded GMCD in multiple, preferably international settings, for older children, and families with lower education levels.

The Expanded GMCD is available free-of-charge, with brief online training to service providers who are already trained in using the GMCD. There is growing demand for its use internationally and translations to other languages are becoming available. A barrier, however, is that globally we are leaving paper and pencil behind and using digitalized tools. Nevertheless, recent research from the United States found that

fifth grade adolescents' responses to open-ended self-reflective questions were longer and with richer content on computerized than on paper surveys[36]. This study may be pointing to the fact that the generation of parents in the near future may have better digital writing and responding skills than with paper and pencil. In an era when a growing number of parents are using written communication, digitalized versions of tools such as the Expanded GMCD may offer rich information on child development and may promise alternatives to using digitalized checklist.

Finally, as this manuscript was being prepared during the coronavirus disease pandemic, at Ankara University Developmental Pediatrics Division, the Expanded GMCD was used to obtain information through electronic mails or telephone contact and was the crucial component of providing remote care and telemedicine to children and families. Using the Expanded GMCD, our team of clinicians was able to rapidly re-read the comprehensive information on their patients that required follow-up, to hold telemedicine sessions with them having holistic information about the child and the family, and were able to rapidly obtain such information from newly referred families during this period.

Conclusions

Tools that can provide comprehensive information when assessing children's development and that can be applied in real-life settings are of critical importance. This study has shown the applicability of the Expanded GMCD, a written tool with open-ended questions that can replace most of the face-to-face time required for detailed history taking during a comprehensive developmental assessment. The Expanded GMCD bridges bioecological theory, family-centered care and key frameworks, the World Health Organization International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) and Nurturing Care and may serve to address the paucity of comprehensive assessment tools that can be used for children and families across countries.

List Of Abbreviations

GMCD

Guide for Monitoring Child Development

COVID-19

The new type coronavirus disease

WHO

World Health Organization

ICF-CY

International Classification of Functioning, Disability and Health for Children and Youth

Expanded GMCD

The Expanded Guide for Monitoring Child Development

CARS-2

The Childhood Autism Rating Scale Second Edition

CI

Confidence Interval
IQR
Interquartile range
OR
Odds Ratio

Declarations

Ethics approval and consent to participate:

This study was approved by Ankara University School of Medicine Ethics Committee and the primary caregivers provided written consent to participate in the study.

Consent for publication:

The author provides full consent for publication.

Availability of data and materials:

All data and materials were available to the author and can be made available to the journal upon request.

Competing interests:

There is no competing interests.

Funding:

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Authors' contributions:

The first and only author conceptualized and designed the study, prepared the materials, collected and analyzed the data and wrote the manuscript.

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Figures

Exp-GMCD domains and examples of questions	Needs support
Developmental functioning	
Expressive language. How does your child let you know when she wants something? Please write down examples of sounds, words, hands or body gestures she uses.	
Activities and participation	
Please check your child's regular activities, write number of days per week she does these. ☐ Plays with other children:..... ☐ Visits relatives or friends:..... ☐ Goes to the playground:..... ☐ Plays with a pet animal:..... ☐ Plays in nature:..... ☐ Does sports:..... ☐ Goes to preschool:..... ☐ Plays music:.....	
Environmental factors (Nurturing Care framework is incorporated to this domain)	
As caregivers, what do you do to support your child's learning and development? What does mother do?..... What does father do?..... What do other family members do?.....	
Psychosocial risks. Sometimes caregivers may have a lot going on. They may find it hard to support their child's development. Please check all difficulties we listed below that are true for you or your family. Explain each one you checked. ☐ Unemployment, financial problems:..... ☐ Mother feeling down, depressed:..... ☐ Father feeling down, depressed:..... ☐ Marital problems, divorce:..... ☐ Family violence:..... ☐ Problems with other siblings:..... ☐ There is an ill person in the family:..... ☐ Not getting enough support from friends and relatives:..... ☐ Other difficulties:.....	
Services. Did your child receive services to support her learning, development, movement? ☐ No ☐ Yes, check below all services received, write their duration. ☐ Physical therapy/Rehabilitation.....months ☐ Occupational therapy.....months ☐ Early intervention.....months ☐ Special education.....months ☐ Name any other special services and write duration:.....	
Stigma. Sometimes caregivers may experience prejudices, stigmatization or negative attitudes of others because of their child's situation. These attitudes may affect your child, hurt your feelings, or make your life harder. Please explain any such situations:	

*GMCD: Guide for Monitoring Child Development

Figure 1

Examples of Expanded GMCD* format and questions for each domain