Nipissing District Developmental Screen

Patterns of use by physicians in Ontario

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ABSTRACT

OBJECTIVE To determine if providing the Nipissing District Developmental Screen (NDDS) free of charge is associated with increased use of this measure and to investigate regional variations in the use of the NDDS in Ontario.

DESIGN Retrospective analysis of purchasing data from before the NDDS was available at no cost compared with analysis of the results of a brief questionnaire completed by those downloading the NDDS for free.

SETTING Ontario.

PARTICIPANTS Users of the NDDS.

INTERVENTION Provision of free on-line access to the NDDS.

MAIN OUTCOME MEASURES Patterns of purchasing or downloading of the NDDS by FPs and health care professionals (HCPs) before and after implementation of the program.

RESULTS Before the program, 91 FPs (0.9% of FPs in Ontario) purchased the NDDS, and an additional 129 FPs (1.3% of FPs in Ontario) downloaded the NDDS in the year after the start of the program. Including all other HCPs increased the estimated number of users to 504 (representing an estimated 5.0% of all FPs in Ontario). Adjusting for group practice increased the estimate to 16.5% of all FPs in Ontario who had access to the NDDS. There were no significant differences in NDDS usage by FPs between central, southwestern, and northern Ontario ($P>.05$). Significantly fewer FPs in eastern Ontario accessed the NDDS than FPs in other areas of the province did ($P<.001$).

CONCLUSION Despite measures to increase usage, only a small number of FPs access the NDDS in Ontario. However, free access to the NDDS does seem to contribute to removing barriers to screening, as indicated by a 3-fold increase in the number of FPs accessing the NDDS. Further research is required to investigate the reasons for these trends so that effective methods to increase the use of developmental screening measures in clinical practice can be implemented.

EDITOR'S KEY POINTS

- Recent recommendations have emphasized the importance of screening for developmental disabilities. However, many physicians do not perform routine screening with the assistance of objective measures. Several barriers to screening exist, including insufficient time or reimbursement and a lack of access to inexpensive measures.
- The Nipissing District Developmental Screen (NDDS) is a brief screening tool for children between 1 and 72 months of age to assess vision, hearing, speech, language, communication, gross and fine motor function, self-help, and cognitive, social, and emotional function. This study examined whether making the NDDS available free of charge would increase its use.
- Although making the NDDS available free of charge did increase the number of FPs who accessed the tool, the authors found that few physicians in Ontario accessed the NDDS. Less than 1% of FPs purchased the NDDS before it was free, and approximately 1% downloaded the measure after it was available for free. Even with liberal assumptions about other health care professionals representing physicians and about sharing the NDDS in group practices, the estimate of those accessing the NDDS represented only 16.5% of FPs in Ontario at most.

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Le Nipissing District Developmental Screen

Son utilisation par les médecins ontariens

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RÉSUMÉ

OBJECTIF Déterminer si le fait d'offrir gratuitement le Nipissing District Developmental Screen (NDDS) entraîne une augmentation de l'utilisation de cet outil de mesure et examiner les variations régionales de l'utilisation de cet outil en Ontario.

TYPE D'ÉTUDE Analyse des données sur l'achat du NDDS avant qu'il soit offert gratuitement, par rapport à l'analyse des résultats d'un court questionnaire auprès de ceux qui l'ont téléchargé gratuitement.

CONTEXTE L'Ontario.

PARTICIPANTS Les utilisateurs du NDDS.

INTERVENTIONS Le fait de rendre le NDDS accessible en ligne sans frais.

PRINCIPAUX PARAMÈTRES ÉTUDIÉS Modes d'achat ou de téléchargement du NDDS par des MF et des professionnels de la santé (PS), avant et après l'instauration du programme.

RÉSULTATS Avant le programme, 91 MF (0,9% des MF ontariens) ont acheté le NDDS et 129 autres MF (1,3% des MF ontariens) l'ont téléchargé durant l'année suivant le début du programme. L'inclusion de tous les autres PS faisait grimper le nombre d'utilisateurs à 504 (ce qui correspond en gros à 5% de tous les MF ontariens). Cette estimation s'élèvait à 16,5% de l'ensemble des MF ontariens ayant accès au NDDS si l'on tient compte d'une utilisation partagée dans les polycliniques. Il n'y avait pas de différence significative entre les régions du centre, du sud-ouest ou du nord de l'Ontario en termes d'utilisation du NDDS par les MF ($P>,05$). Par rapport à ceux des autres régions de la province, un nombre significativement plus faible de MF de l'est l'Ontario ont eu accès au NDDS ($P>,001$).

CONCLUSION Malgré des mesures pour promouvoir l'utilisation du NDDS, seuls un petit nombre de MF ontariens l'utilisent. L'accès gratuit au NDDS semble toutefois contribuer à faire disparaître certains obstacles au dépistage, tel qu'indiqué par le triplement du nombre de MF ayant eu accès au NDDS. Il faudra d'autres études pour comprendre les raisons de ces tendances afin de pouvoir mettre en place des mesures efficaces pour accroître l'utilisation du dépistage des troubles de la croissance en pratique clinique.

POINTS DE REPÈRE DU RÉDACTEUR

- Des directives récentes soulignaient l'importance de dépister les problèmes de croissance. Toutefois, plusieurs médecins négligent d'en faire un dépistage systématique à l'aide de mesures objectives. Plusieurs obstacles entravent ce dépistage, incluant le manque de temps, la rémunération insuffisante et la difficulté d'accéder à des mesures peu onéreuses.
- Le Nipissing District Developmental Screen (NDDS) est un outil de dépistage simple qui permet d'évaluer chez les enfants de 1 à 72 mois la vision, l'audition, l'élocution, le langage, la communication, la motricité fine et globale, l'autonomie, et les fonctions cognitives, sociales et émotives. Cette étude cherchait à savoir si le fait d'offrir le NDDS gratuitement augmenterait son utilisation.
- Même si le fait d'offrir gratuitement le MDDS a augmenté le nombre de MF qui y ont eu accès, les auteurs ont constaté que peu de médecins ont utilisé cet outil en Ontario. Moins de 1% des MF ont acheté le NDDS avant qu'il soit gratuit, et environ 1% l'ont téléchargé après qu'il le soit devenu. Même en supposant de façon libérale que d'autres professionnels de la santé ont agi au nom de médecins et que des membres de polycliniques ont partagé le NDDS, le nombre de ceux qui y ont eu accès représente tout au plus 16,5% des MF ontariens.

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Currently in Canada a considerable portion of pediatric primary care is provided by FPs.[1] While most physicians assess child development in some manner during routine well-child visits, their specific assessment practices and the extent to which they include standardized developmental screening tests is unknown.[2]

The importance of this issue cannot be underestimated. The burden of developmental disabilities is substantial, affecting between 4% and 16% of children.[3,4] Developmental delay is the leading cause of disability among children younger than 4 years of age in Canada. Most children's developmental problems are mild, and there is mounting evidence that providing early intervention improves outcomes for children and their families.[5-8] Despite this, only 30% of children with disabilities are identified before beginning school, and up to one-quarter of children who enter the first grade have learning, health, and behavioural problems that will interfere with their academic and social performance.[3,9-11]

Family physicians are an invaluable resource for screening for developmental disabilities, as they see children routinely for health care and immunizations. Although the Canadian Task Force on Preventive Health Care has suggested excluding the use of standardized screening tests, this decision was based largely on studies of screening using the Denver Developmental Screening Test, which is now known to have poor sensitivity and specificity.[3,12-14] In contrast, new recommendations in Canada by the Best Start Expert Panel on Early Learning and the Expert Panel on the 18 Month Well Baby Visit (sponsored by the Ontario College of Family Physicians) recommended routine developmental review and evaluation by primary care providers using the Nipissing District Developmental Screen (NDDS).[8,15] These recommendations come in light of the mounting evidence of the importance of early brain development in the preschool years, as well as findings showing that providing early intervention through education, anticipatory guidance, and referral for specialized services improves outcomes for children and their families.[2,5-8,16] While the NDDS requires further study as an effective screening instrument, it is being endorsed in Canada because of its face validity, its ease of use, its provision of educational information to parents, and preliminary findings of reasonable sensitivity and specificity.[8,15,17-20]

In order to increase awareness and monitoring of development, the Ontario government recently purchased the rights to the NDDS and made the test available free of charge to all residents of the province. Despite the rich potential for benefit from screening programs, there is limited information on actual patterns of developmental screening in family practice. The objective of this study was to determine if making the NDDS available for free was associated with increased physician use in Ontario.

METHODS

The NDDS is a brief screening tool for children between 1 and 72 months of age that can be administered by parents or health care professionals (HCPs).[19,20] It explores development in the domains of vision, hearing, speech, language, communication, gross and fine motor function, self-help, and cognitive, social, and emotional function. Responding no to 1 or more questions is considered to be a positive screening result, implying potential developmental disability. The NDDS was developed by a multidisciplinary team with expertise in child development and has been validated on a small sample of children.[19,20]

The NDDS is protected by copyright, and users were required to purchase copies of the test between 2001 and 2006. In October of 2006, the Ontario government acquired rights to make the NDDS broadly available by free download (**www.ndds.ca**).*

In October 2007, we approached the managers at the NDDS who were responsible for distribution to participate in this study.

Use before October 2006

Staff at the NDDS reviewed the Canadian customer records of purchases between January 2001 and September 2006 to determine whether purchasers were physicians. These purchasers were assumed to be FPs for the purposes of this study. Purchasers whose titles included medical clinics, medical groups, hospitals, health centres, health services, or health teams were counted as HCPs. Information on geographic location of customers, aside from the province of purchase, was not made available.

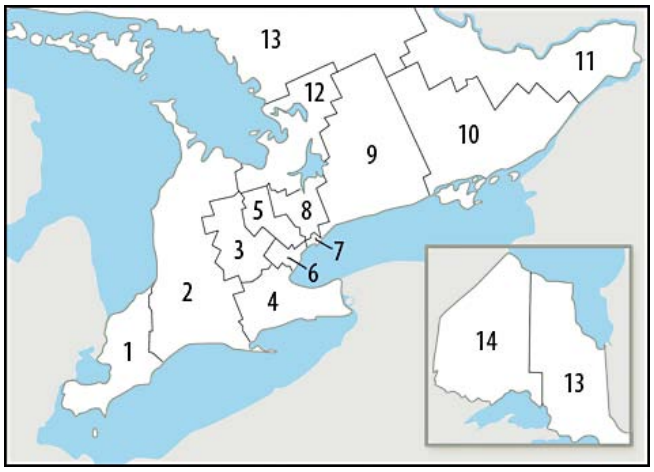
Use after October 2006

Following the implementation of the program to make the NDDS available for free on-line, the website collected information on users through a brief questionnaire. The purpose of data collection was to understand how widely the NDDS was being used. Type of user was among the items collected, which included *physician* and *health care professional* as options. The specialty of the physician was not collected, but all physicians were assumed to be FPs for the purposes of calculating proportions. Staff

CFPlus GO

* The Nipissing District Developmental Screen is also available at **www.cfp.ca.** Go to the full text of this article on-line, then click on **CFPlus** in the menu at the top right-hand side of the page.

Figure 1. Geographic distribution of LHINs in Ontario



REGION OF ONTARIO	LHIN
Southwestern Ontario	1. Erie St Clair 2. South West 3. Waterloo Wellington 4. Hamilton Niagara Haldman Brant
Central Ontario	5. Central West 6. Mississauga Halton 7. Toronto Central 8. Central 9. Central East 12. North Simcoe Muskoka
Eastern Ontario	10. South East 11. Champlain
Northern Ontario	13. North East 14. North West

LHIN—Local Health Integration Networks.
Data from the LHIN.[21]

at the NDDS determined the geographic location of individuals using a database of Internet protocol addresses.

Estimates of the number of physicians accessing the NDDS after October 2006 were added to the number of purchasers before that date to give a final estimate of all the physicians who had access to the NDDS.

Geographic distribution

Geographic distribution of physicians was determined using the map and summary tables for the Local Health Integration Network (LHIN) in Ontario (**Figure 1**).[21] Clients were grouped according to their LHINs, then into 4 larger regions: southwestern Ontario (LHINs 1 to 4); central Ontario (LHINs 5 to 9 and 12); eastern Ontario (LHINs 10 and 11); and northern Ontario (LHINs 13 and 14).

The proportion of physicians working in group practice was available for each specific LHIN region in Ontario.[21] The average number of physicians in group practice was determined using data from the National Physician Survey.[22]

Data analysis

Use of the NDDS before October 2006 is expressed as the number of customers identified as FPs, other HCPs, or a combination of the 2 (all HCPs). Total use of the NDDS after October 2006 is expressed as the number of users (FPs, HCPs, or all HCPs) who downloaded the NDDS, added to the number of purchasers before October 2006. In some analyses, health care professionals were assumed to represent FPs, and the calculations of proportions were therefore performed based on the total number of FPs in Ontario.[21]

To account for shared access to the NDDS, the number of purchases or downloads was multiplied by the proportion of physicians in group practice; that number was multiplied by 4.83, the average size of a group practice in Ontario, to obtain the total number of physicians who would have group access. This number was added to the number of those with individual access in order to estimate the total number of FPs or HCPs who would have access to the NDDS.

Comparison of proportions among groups was done using χ^2 tests. Differences between geographic regions were examined using serial 2×2 contingency tables between each region, as well as using a 4×2 table for comparison among all regions. Results were considered significant at $P < .05$.

RESULTS

Use before October 2006

A total of 91 physicians (0.91% of FPs in Ontario) purchased the NDDS between January 2001 and September 2006. During this period, there were 65 purchasers who were identified as nonphysician HCPs. As seen in **Table 1**,[21,22] when we controlled for group practice, we estimated that 299 FPs (2.98% of all FPs in Ontario) would have had access to the NDDS.

The estimate of all HCPs who had purchased the NDDS was 156 (1.6% of all FPs in Ontario); after controlling for group practice, this represented 513 physicians (5.1% of all FPs in Ontario) who had access to the NDDS (**Table 1**[21,22]).

Use after October 2006

The number of physicians who downloaded the NDDS was 129 (1.3% of all FPs in Ontario). Thus, the total number of physicians who ever purchased or downloaded the NDDS was 220 physicians (2.2% of all FPs in Ontario). Controlling for group practice, 723 FPs (7.2% of all FPs in Ontario) would have accessed the NDDS.

An additional 284 individuals identified as HCPs accessed the NDDS. Thus, 504 HCPs either downloaded or purchased the NDDS. Controlling for group practice, 1658 HCPs (16.5% of all FPs in Ontario) would have access to the NDDS. This represented a 320% increase in access after the NDDS became available free of charge.

Geographic variations

As seen in **Table 2**,[21,22] significantly fewer FPs in eastern Ontario (1.2%) used the NDDS than in northern (3.0%), southwestern (3.2%), or central (4.2%) Ontario ($\chi^2_3 = 34.3$, $P < .0001$). A significant difference also existed between the proportion of FPs accessing the

Table 1. Patterns of use of the NDDS by FPs and all HCPs in Ontario before and after October 2006

PROVIDERS	NDDS REQUESTS	PROPORTION IN GROUP PRACTICE*	PROPORTION IN INDIVIDUAL OR OTHER PRACTICE*	TOTAL NO. OF FPs WITH GROUP ACCESS	TOTAL NO. WITH INDIVIDUAL OR OTHER ACCESS	TOTAL NO. WITH ACCESS TO NDDS (GROUP AND INDIVIDUAL)	PROPORTION OF FPs IN ONTARIO USING THE NDDS†
All HCPs‡							
• Purchases before 2006	156	59.8	40.2	450.58	62.71	513.29	5.11
• Downloads after 2006	348	57.0	43.0	958.08	149.64	1107.72	11.02
• All HCP access	504	59.8	40.2	1455.72	202.61	1658.33	16.50
FPs§							
• Purchase before 2006	91	59.8	40.2	262.84	36.58	299.42	2.98
• Downloads after 2006	129	57.0	43.0	352.94	55.47	408.41	4.06
• All FP access‖	220	59.8	40.2	635.43	88.44	723.87	7.20

HCP—health care professionals, NDDS—Nipissing District Developmental Screen.
*Data from the Local Health Integration Network[21] and the National Physician Survey.[22]
†The estimated number of FPs in Ontario was 10053.[21]
‡All HCPs are those individuals who purchased or downloaded the NDDS and identified themselves as HCPs, added to those identified as physicians.
§FPs are those individuals who purchased or downloaded the NDDS and identified themselves as physicians.
‖All FP access represents the sum of purchases (before October 2006) and downloads (after 2006) of the NDDS by those identified as physicians.

Table 2. Geographic distribution within Ontario of FPs and all HCPs who downloaded the NDDS after October 2006

GEOGRAPHIC AREA OF ONTARIO	LHINs NUMBER*	TOTAL NO. OF FPs AND GPs*	NO. OF NDDS DOWNLOADS	PROPORTION IN GROUP PRACTICE†	PROPORTION IN INDIVIDUAL OR OTHER PRACTICE†	TOTAL NO. OF FPs WITH GROUP ACCESS‡	TOTAL NO. OF FPs WITH INDIVIDUAL OR OTHER ACCESS	ESTIMATED NO. WITH ACCESS TO NDDS	PROPORTION OF THE TOTAL NO. OF FPs ACCESSING THE NDDS
All HCPs									
• Southwestern	1,2,3,4	1942.91	76	47.25	52.75	173.45	40.09	213.54	10.99
• Central	5,6,7,8, 9,12	5015.34	202	36.00	64.00	351.24	129.28	480.52	9.58
• Eastern	10,11	1619.4	33	48.50	51.50	77.30	17.00	94.30	5.82
• Northwestern	13,14	768.16	37	29.00	71.00	51.83	26.27	78.10	10.17
FPs‡									
• Southwestern	1,2,3,4	1942.9	22	47.25	52.75	50.21	11.61	61.81	3.18
• Central	5,6,7,8, 9,12	5015.3	89	36.00	64.00	154.75	56.96	211.71	4.22
• Eastern	10,11	1619.4	7	48.50	51.50	16.40	3.61	20.00	1.24
• Northwestern	13,14	768.2	11	29.00	71.00	15.41	7.81	23.22	3.02

HCP—health care providers, LHIN—Local Health Integration Network, NDDS—Nipissing District Developmental Screen.
*See Figure 1 for a diagram of LHIN locations and geographic distribution; LHINs were used to provide estimates of the number of physicians in each geographic area.[21]
†Data from the Local Health Integration Network.[21]
‡The average size of group practice was estimated to be 4.83 physicians per group.[22]
‡FPs are those individuals who purchased or downloaded the NDDS and identified themselves as physicians.

NDDS in southwestern and central Ontario (χ^2_1=3.98, P=.046).

Similarly, the proportion of all HCPs with access to the NDDS was significantly lower in eastern Ontario than in all other regions (P<.0001).

DISCUSSION

The findings of this study demonstrate that a minority of physicians in Ontario access the NDDS. Fewer than 1% of FPs purchased the NDDS and approximately 1% downloaded the tool when it was made available free of charge. Even with our liberal assumptions about other HCPs representing physicians and about the NDDS being shared in group practices, the estimate of those accessing the NDDS at most represented only 16.5% of physicians in Ontario. The trend of low rates of accessing the NDDS was seen across the province, but was significantly lower in eastern Ontario. These findings point to a need for enhanced dissemination of guidelines as well as further investigation into the reasons for low rates of use of developmental screening measures in family practice.

Although the NDDS is only one of several tools available for developmental screening, it is particularly attractive for use in routine practice because it is easy to administer, available free of charge, and endorsed by experts in the field. Although there are few data on the validity of the NDDS, it has several advantages over other tools, including written educational information on child development provided to parents.[19,20] Many physicians continue to rely on the developmental section of the Rourke Baby Record for developmental surveillance, but that instrument has a limited number of test items and has never been validated as a screening measure.[17,18] Our finding that few HCPs in Ontario access the NDDS is likely reflective of a low frequency of use of any objective developmental screening measures by FPs across Canada.

Such low frequency of use has been identified by research on primary care physicians in the United States. Through mailed surveys, Sand and colleagues demonstrated that only 23% of pediatricians used standardized developmental instruments.[23] Similarly, Sices and colleagues found that up to half of primary care physicians used a formal developmental screening instrument.[24] Although our study did not assess actual physician practices, it raises the possibility that use of developmental screening measures might be substantially lower among physicians in Ontario than among those in the United States. These findings raise concerns about the adequacy of screening in family practice, particularly because the ability of physicians to detect developmental delays without the aid of objective measures is limited.[12,25,26] These problems cannot be underestimated, particularly in Canada, where a large proportion of pediatric care is provided by FPs, who might have less training in developmental assessment than pediatricians do.

The usefulness of routine developmental screening has been debated, which might explain the low rates of use of the NDDS in this study. Indeed, the Canadian Task Force on Preventive Health Care recommended excluding screening with the Denver Developmental Screening Test, citing evidence of a lack of benefit from using this measure in routine practice.[13,14,27] In recent years, however, many authorities have endorsed the use of developmental surveillance and screening, including the NDDS, by FPs.[8,15,28] These changes come in light of new research demonstrating the consequences of undetected developmental problems and the potential for improvements with early intervention.[5,16] This evidence, coupled with our findings of low rates of use of one standardized screening measure, suggest that an opportunity for improving child health in Canada is truly being missed. The need to increase dissemination of recommendations on developmental screening, as well as to investigate ways to remove other barriers to screening, cannot be overstated.

Our finding of a 3-fold increase in use of the NDDS with the introduction of the program making it available for free, however, is encouraging. Barriers to the use of developmental screening measures include the complexity of administering tests, the expense of materials, and the lack of adequate remuneration.[29] It appears that providing free and easy-to-use measures could be a first step in increasing compliance with recent guidelines. However, there is considerable room for improvement, and research on physician, test, and social-policy factors associated with improved screening should be a priority.

Limitations

There are several limitations to this study. Downloading or purchasing the NDDS does not directly represent actual use. Furthermore, several factors in this study could lead to underestimation of usage of the NDDS; for example, we could not assess uncopyrighted use and we included all FPs in Ontario, some of whom do not provide pediatric primary care. Conversely, several assumptions could have led to overestimation of use; for example, we did not include pediatricians in our calculations and we did include other HCPs as representatives of FPs. Finally, our study was conducted only 1 year after the initiation of the program that made the NDDS available for free, which might not have been an adequate amount of time to capture increases in use. It has, however, been more than 2 years since the publication of the recommendations encouraging use of developmental screening instruments, and our findings show a clear trend toward underuse of developmental screening instruments in family practice.

Conclusion

Our study begins to explore the patterns of developmental screening, particularly as they pertain to the recent guidelines and incentives for using the NDDS in family practice. Although the overall frequency of accessing the NDDS by physicians was extremely low in Ontario, it appears that making the measure free and accessible might be somewhat effective in increasing the use of standardized developmental measures. Future research should examine actual screening practices in family medicine settings in Canada so that interventions to improve developmental screening can be developed and implemented.

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Contributors

Drs Limbos and **Joyce** conducted the background research, developed the research question, and wrote the manuscript. **Ms Roberts** assisted from the start of the project with data collection and analyses, background research, and connecting with Nipissing District Developmental Screen staff, and contributed to writing the manuscript. All authors reviewed and made suggestions on the final draft of the manuscript.

Competing interests

None declared

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