

Children's Developmental Intervention Services: A Scoping Review of Canadian Experiences and Trends

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Abstract

Background: Children's treatment centres are a key service point for children with impairments and developmental disabilities. However, the current state of children's developmental intervention services (CDIS) in Canada has been only minimally described. Currently, two knowledge gaps in CDIS research need to be addressed, requiring a scoping review of the existing literature. First, the current trends and areas understudied in CDIS in Canada are unknown. Second, there is a need to explore important factors and outcomes of children's service utilization in a comprehensive manner, a topic which is of interest to readers globally.

Objective: The objective of this scoping review is to identify key factors shown to influence service utilization and areas understudied in CDIS based on Canadian literature.

Methods: Twenty-three peer-reviewed articles were selected for review. Andersen's Model of Healthcare Utilization was used as a lens to extract the data, and the findings were examined through the domains of Andersen's Model.

Results: Studies focused heavily on exploring the healthcare system and family-centred services. The analysis revealed that higher rates of service utilization are associated with younger age, males, and children with lower cognitive or motor functioning. Occupational therapists, physiotherapists and speech-language pathologists are the most utilized disciplines. Higher perceptions of service satisfaction are related to increased presence of FCS at the centres. At the same time, personal health practices, participation and functional outcomes in relation to service utilization require more research.

Conclusion: We recommend future researchers examine interactions among key factors identified in this scoping review, as well as explore understudied areas to obtain a comprehensive understanding of CDIS factors.

Keywords: Andersen's Health Care Model; Children; Developmental disabilities; Health services; Rehabilitation utilization; Scoping review

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Introduction

Approximately 4% of children in Canada live with a developmental disability or speech impediment requiring rehabilitation services such as physiotherapy, occupational therapy, speech-language therapy, and counseling services [1]. While children's treatment centres (CTCs) are a key point of service, the current state of children's developmental intervention service (CDIS) utilization in Canada has been minimally described. No study

has comprehensively described service utilization patterns for children centres in terms of individual, family, and environmental factors. Exploring these components would provide insight into the relationship between an individual and their health, as well as an assessment of service utilization, health behaviors, and health outcomes. Furthermore, examining the current state of CDIS utilization is crucial to understand how service planning and service satisfaction differs across children, and what factors influence utilization and outcomes. Currently, two knowledge

gaps in CDIS research need to be addressed, for which a scoping review of the existing literature is useful. The objectives of this scoping review are to: (1) identify the current trends and areas understudied in CDIS in Canada; and (2) describe major factors that influence CDIS utilization and outcomes in a comprehensive manner.

CTCs are used by children with varying levels of impairments from a minor speech impediment, which requires only speech-language services, to pervasive developmental disabilities that impact many areas of functioning such as speech, mobility, and cognitive ability, requiring specialized services from a wide range of clinicians. Optimizing functioning and health outcomes of children with developmental disabilities is the goal of every CTC. Developmental intervention services received in childhood improves lifespan developmental trajectories and healthcare status into adulthood [2], making it essential to examine CDIS delivery. Crucial aspects that play a role in understanding healthcare utilization and service satisfaction are missed if family and environmental factors are not fully considered [3]. For example, goal-setting and client-centred care practices are key predictors of positive therapy outcomes [4]. In another instance, families of children who receive services for chronic pain experience a large degree of financial burden in terms of direct costs (e.g., costs of services) and indirect costs (e.g., loss of missing work to attend appointments) [5,6]. Prominent factors need to be identified and examined across recent literature to evaluate CDIS utilization and outcomes. By gaining a better understanding of key factors associated with service utilization, and the relationships among these key factors and outcomes, service managers can improve service delivery to families.

Andersen’s Health Care Model

The complexities of examining service utilization and outcomes in a scoping review require a conceptual framework that is capable of making a multifaceted assessment. Andersen’s Healthcare Utilization Model [7] provides a good system-focused framework. Andersen’s Model has commonly been used to describe service utilization and outcomes in health among different populations [8-10]. The model comprehensively describes CDIS utilization with its broad health perspective, allowing for an appropriate examination of a service system. The model has four major domains, with sub-categories (Figure 1).

Environment domain

The environment domain considers environmental supports and barriers, as well as treatment centre characteristics like family-centred services (FCS) and private or public funding.

Population characteristics

Potential factors within population characteristics include predisposing characteristics such as age, gender; enabling resources such as ethnicity, income, social support, and family health habits; and needs related to diagnosis, severity, perceived needs, and level of functioning. Predisposing characteristics are personal factors such as age, gender and ethnicity. Enabling resources are characterized by elements that mediate the use

of services, for example living arrangements, family income, parental education, parental work status, and social supports. Needs are assessed by complexity or severity of health conditions that lead to families needing to acquire health services.

Health behaviors

Personal health practices of children and their parents are captured under health behaviors; included are the use of health services, exploring the type and amount of services utilized.

Outcomes

Under the outcomes domain, perceived health status is an important indicator because it represents how families and children assess their personal well-being and health-in line with values of FCS. Studies selected for this review will be examined using the domains and categories from Andersen’s Model to inform about important key factors of service utilization and outcomes.

Literature Review

Based on the five stages specified by previous researchers [11-13], a scoping review was conducted using the following steps: identifying the research question, identifying relevant studies, selecting appropriate studies, documenting and analyzing data, and synthesizing results. The research inquiries asked: “What areas are understudied in CDIS utilization in Canada?” and “What are the current state of knowledge about factors that influence service utilization and the impact of these factors on outcomes among children receiving developmental intervention services in Canada?” Andersen’s model was used to organize and explore these questions.

Identifying relevant studies and selection of studies

A search conducted on September 17, 2018 identified relevant studies. The database search scanned OVID, EMBASE, AMED, CINAHL, and Pubmed from 2003 to 2018. The rationale for this time frame was to span 16 years of literature in which changes have come from incorporating FCS approaches at CTCs and shifting to a developmental perspective [14]. The keyword searches used the following terms: “Children or youth or juvenile or adolescent or preschool or toddler” and, “rehabilitation or healthcare or service or treatment or therapy or intervention”

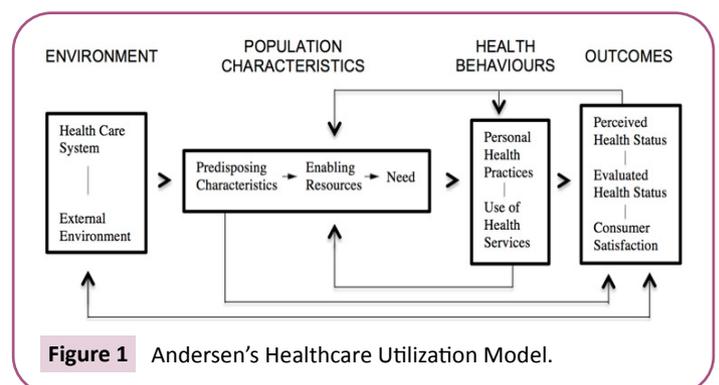


Figure 1 Andersen’s Healthcare Utilization Model.

and, “developmental disabilities or developmental disorders or neuro”, and “Canada or Canadian”, and not “adult or senior”. This search produced 1,698 articles (duplicates removed). The selection of articles ensured the following key inclusion criteria: (i) the study’s objective is focused on CDIS delivery and utilization (that is, occupational therapy, physiotherapy, speech-language therapy as well as other services that would be provided through a CTC); (ii) services are provided to clients that centres categorize as children (0 to 21 years); and (iii) the study is conducted in Canada and published since 2003. Studies that did not include Canada, topics unrelated to CDIS utilization (such as a strict focus on mental health and mental health populations), specific program evaluation exclusive to certain ages (e.g., residential immersive life skills evaluation), and theoretical articles (toolkit, conceptual framework, or model development) were excluded. **Figure 2** shows the flow diagram of the article selection process.

In the first step of the selection review, the titles and abstracts were reviewed, and 255 out of the 1,698 articles remained. The elimination in this step was due to many of the articles focusing solely on mental health, the keyword search not removing adult or senior populations, or the study being outside of Canada. In the second step, the method sections were reviewed in their entirety to identify that the study focused on CDIS, and 42 studies were selected for inclusion. Articles were removed from this step for three key reasons: (1) the article was theoretical and described a model/framework, assessment tool, or the development of a

toolkit; (2) evaluated a specific program using a restricted age group; (3) the study was conducted by a non-service agency such as a support, information, or advocacy group. Each of the 42 articles was assessed by the first and second authors by using the quantitative and qualitative research assessment tools created by Child Care and Early Education Research Connections. Of the 42 articles that were read in their entirety to assess content, a total of 23 articles were selected for the final review. Overall, the level of detail and methods provided in the 23 articles met the rigor for inclusion in this scoping review. The final decision to include or exclude the studies based on the quality assessments was based on an appraisal by all authors during a meeting, where agreement was reached for each article. Any discrepancies or confusion in the analysis were discussed among all authors in detail based on content of the studies, and all discrepancies were resolved through this discussion.

Data extraction

Two tables were created for charting information from the 23 studies selected for the final review. **Table 1** provides descriptive information about the studies, including the study population, site, sample size, children’s age in years, instruments used, study design, data collection, and data analysis. **Table 1** also includes a checklist that reports on domains defined in Andersen’s model. The domains are checked-off if the investigators of the study discussed the domain at some point throughout the article. **Table 2** was formed based on the primary and secondary

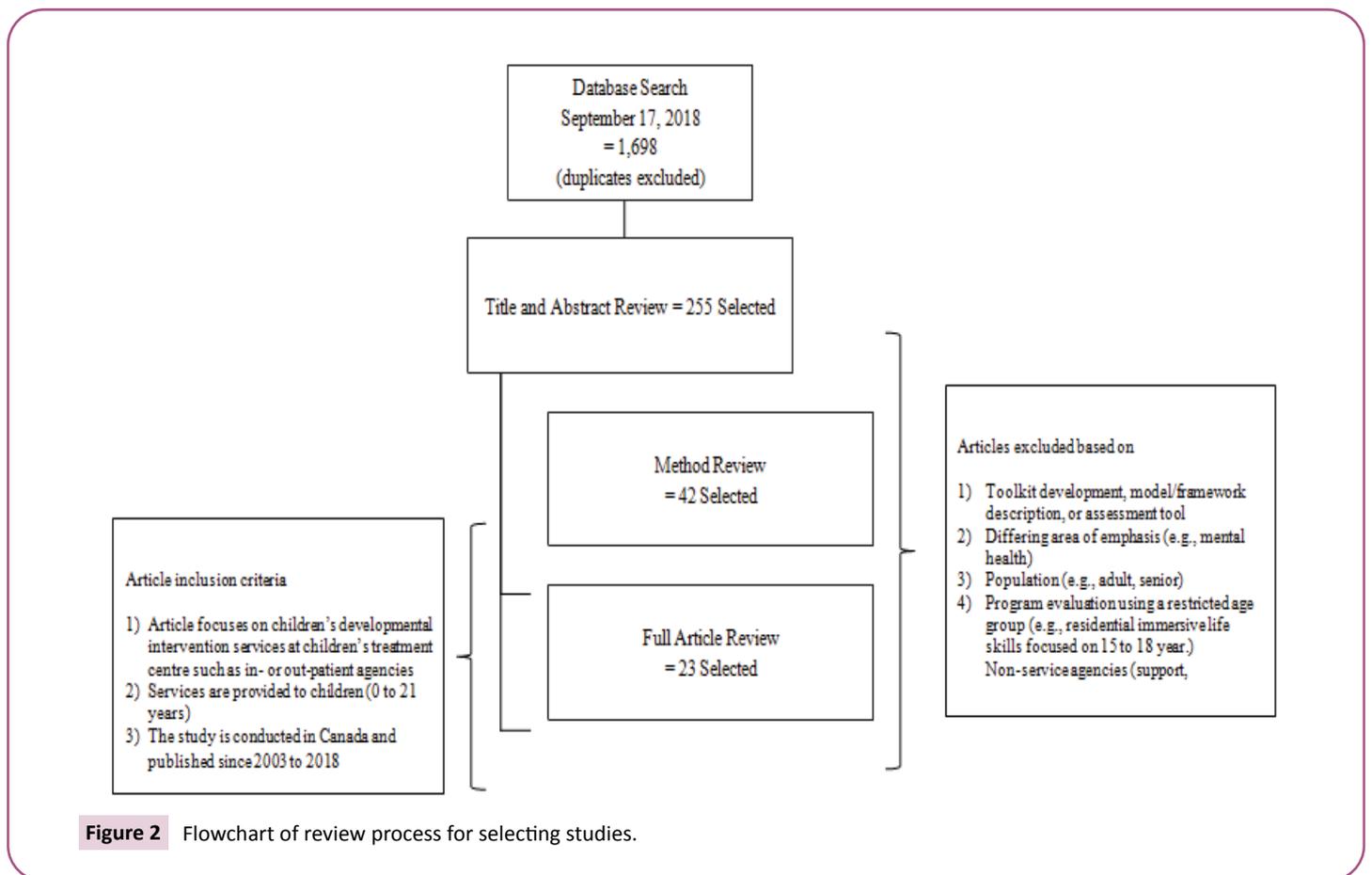


Figure 2 Flowchart of review process for selecting studies.

Table 1 Assessment of children’s treatment Centre services.

Citation	Population	Site	Sample size	Age (years)	Measures	Study Design	Data Collection	Data Analysis	Environment	Pop. Char.	Behaviors	Health Behaviors	Outcomes
1. Arcuri [26]	GDD	CTC	19 parents	2 to 5	MPOC-SP	Mixed-Method	Survey, interviews, focus groups	Thematic analysis, descriptive,	x				x
			7 SP		MPOC-20			Independent T-Tests					
2. Camden [37]	DD, dyspraxia, speech and language, motor	Out-patient centre	222 families 129 SP	0 to 21	MPOC-SP, MPOC-56	Mixed-Method (3-year longitudinal)	Survey, open ended questionnaire	Descriptive, chi-square, ANOVA, t-tests, correlations, thematic analysis	x	x			x
3. Darrh [19]	CP	Out-patient centre	37 program managers 54 OTs/PTs 39 parents	0 to 18	MPOC-SP	Mixed-Method	survey, 11 semi-structured focus groups, 2 interviews	Descriptive	x				x
4. Darrah [27]	All disabilities	n/a	8 researchers	n/a	n/a	Qualitative	Delphi with researchers, Semi-structured interviews with therapists	Descriptive, thematic analysis	x				x
			17 SP										
5. Feldman [18]	All disabilities except cognitive disorders	Out-patient centre	124 parents	2 to 9	WeeFIM, PEDS-QL 4.0, service system subscale of the family empowerment scale	Quantitative	Face to face and telephone survey	Descriptive, survival curve, multiple linear regression Constant comparative approach	x		x		x
6. Fellin [20]	Undefined	2 CTCs	43 SP	n/a	n/a	Qualitative	Interviews		x				
7. Kertoy [15]	All disabilities	3 Community centres	Phase 1: 73 researchers (including SPs), policy makers families	0 to 16	phase 2: ICD-10, about my child, LIFE-H, CHIEF, MPOC-20, Support and Services questionnaire	Mixed-Method	Phase 1: Focus groups; Phase 2: Mailed survey	Descriptive, t-tests, general linear model	x	x	x	x	x
			Phase 2: 182 families										
8. King [24]	All disabilities	2 CTCs	42 SP	Not indicated	n/a	Qualitative	Interviews	Thematic analysis	x				
9. King, Maxwell [28]	All disabilities	Rehabilitation hospital	18 Caregivers	Not indicated	n/a	Mixed-Method	Survey, focus groups, interviews	Descriptive, Reliability coefficient (Cronbach’s alpha),	x				x
			5 SP					Thematic analysis					
10. King, Servais [34]	All disabilities	Rehabilitation hospital	6 SP	Not indicated	Background Information Form, Self-Rating Scale of Listening and Interactive Communication Skills, Peer-Nomination Scale of Listening and Interactive Communication Skills, ELICS, ELICS-AR	Mixed-Method	Interviews, member checking	ANOVA, Thematic analysis	x				
11. King, SchwelInus, Keenan [30]	CP	Rehabilitation hospital	10 youth	11 to 19	PRIME-SP	Quantitative	Inventory scoring	Descriptive	x				x
			2 SP		COPM								
					GAS								
12. King, SchwelInus, Servais [29]	All disabilities	Rehabilitation hospital	9 caregivers 2 youth	3 to 21	n/a	Qualitative	Two sets of interviews	Thematic analysis	x				x

Citation	Population	Site	Sample Size	Age (years)	Measures	Study Design	Data Collection	Data Analysis	Environment	Pop. Char.	Behaviors	Health Behaviors	Outcomes
13. Law [17]	CP, SB, various syndromes, DD, communication disorder, ABI, autism, PDD, and muscular disease.	Multiple CTCs	494 parents 324 SP 15 CEOs	infancy-late adolescence	FCS beliefs questionnaire	Quantitative	Survey	SEM	x	x	x	x	
14. Le Roy [33]	CP	CTC	8 PT	n/a	n/a	Qualitative	Interviews	Thematic analysis	x			x	
15. Lindsay [23]	Undefined	CTC	13 SP	0 to 17	n/a	Qualitative	Focus groups, interviews	Thematic analysis	x	x		x	
16. Lindsay [25]	Undefined	2 CTCs	17 OT	n/a	n/a	Qualitative	Interviews	Constant comparative analysis	x	x			
17. Majnemer [35]	CP	Out-patient clinic, private clinic	92 children 167 adolescents	6 to 19	GMFM-66, Leiter Intelligence Scale, VABS	Quantitative	Survey	Descriptive, chi-square, t-tests	x	x	x	x	
18. Mazer [21]	All disabilities	Children's hospital	60 parents	Entry into Kindergarten	Hospital Database, Service Utilization Questionnaire, MPOC	Quantitative	Admin data, survey	Descriptive, Chi-square (McNemar)		x	x	x	
19. McLennan [22]	ASD	4 CTCs	64 parents	25 months to 6 years	Parent self-report service utilization questionnaire	Quantitative	Survey	Descriptive			x		
20. Palisano [36]	CP	Children's hospitals, CTC	134 children	18 months to 5 years	GMFCS, Service Questionnaire, Parents perceptions of the focus and family-centred processes of intervention	Quantitative	Telephone survey	One-way ANOVA		x	x	x	
21. Pollock [31]	CP	CTC	41 children	12 months to 5 years 11 months	COPM, GMFM-66. PEDI	Quantitative	Inventory scoring	Linear regression, Pearson correlation, thematic analysis	x	x	x	x	
22. Rivard [32]	ASD, ID	8 CTCs	75 SP & managers	n/a	24-item open ended questionnaire	Quantitative	Survey	Descriptive	x		x		
23. Stewart et al. [16]	CP, SB, DD, syndromes, other behavioral or communication disorder.	CTC	13 parents	3.10 to 6.4	GAS, MPOC, CSQ, chart audit tool	Mixed-Method	Survey, interview	Descriptive thematic analysis	x	x	x	x	

Abbreviations: ABI: Acquired Brain Injury; Admin Data: Administrative Data; ASD: Autism Spectrum Disorder; CBCL: Child Behavior Checklist; CDN: Canadian; CHIEF: Craig Hospital Inventory of Environmental Factors; Ceos: Chief Executive officers; CNPHS: Canadian National Population Health Survey; COPM: Canadian Occupational Performance Measure; CP: Cerebral Palsy; CSQ: Client Satisfaction Questionnaire; CTC: Children's Treatment Centre; DCD: Developmental Coordination Disorders; DD: Developmental Delays; Desc Stats: Descriptive Statistics; ELICS/ELICS-AR Effective Listening And Interactive Communication Scale/-Assessment Rubric; FCS: Family-Centred Services; GAS: Goal Attainment Scaling; GDD: Global Developmental Delay; ICD: International Classification of Diseases; ID: Intellectual Disorders; IFS: Impact On Family Scale; LIFE-H: Assessment of Life Habits; MPOC: Measure of Processes of Care; OTs: Occupational Therapist(S); PDD: Pervasive Developmental Delay; PDMS-II: Peabody Development Motor Scales; PedsQL: Pediatric Quality of Life Inventory; PPVT-IV: Peabody Picture Vocabulary Scale; Pop. Char.: Population Characteristics; PRIME-SP: Pediatric Rehabilitation Intervention Measure of Engagement – Service Providers; PCSA: Pictorial Scale of Perceived Competence And Social Acceptance; PT: Physical Therapist(S); SB: Spina Bifida; SEM: Structural Equation Modeling; SLP: Speech-Language Pathologist(S); SP: Service Provider(S); SW: Social Worker(S); TBI: Traumatic Brain Injury; US: United States; VABS: Vineland Adaptive Behavior Scale; WeeFIM: Functional Independence Measure For Children; WPPSI: Weschler Primary And Preschool Scale of Intelligence.

Table 2 Primary and secondary objective(s) examined in studies mapped onto Andersen’s domains.

ENVIRONMENT		HEALTH BEHAVIORS	OUTCOMES
Healthcare System			
Stewart [16], supports and barriers of service, program evaluation		Personal Health Practices	Perceived Health Status
Feldman [18], wait-times		None	Feldman [18], change in quality of life*
Darrah [19], unformalized practices			
Camden [37], reorganization of services and assessment of service quality after changing care delivery model			Evaluated Health Status
Kertoy [15], system planning, outcome measurement system	POPULATION CHARACTERISTICS	Use of Health Services	Stewart [16], setting goals on functioning outcomes*
Lindsay [23], cultural sensitivity for working with immigrant families	Predisposing Characteristics	Law [17], number of service sources*	
Lindsay [25], cultural brokerage	None		Feldman [18], change in function
Fellin [20], cultural competence for working with immigrant families	Enabling Resources	Stewart [16], number and type of services*	Palisano [36], functional assessment*
King [24] communication and engagement for immigrant families including elements of a culturally sensitive approach and strategies for effective intervention	None		Pollock [31], parent-identified goals on functional change
LeRoy [33], negotiating walking goals with families	Need	McLennan 2008, type of services	
Rivard [32], assessment, intervention, and training needs of rehabilitation staff	Law [17], child health complexity*		
King [28], Use, utility, and impact of family health portal	Kertoy [15], social supports; service and supports questionnaire *	Palisano [36], frequency and type of services	Consumer Satisfaction
King [34], pilot on listening skills			Law [17], factors associated with FCS and FCS evaluation
King [29], solution-focused coaching to enhance youth engagement		Majnemer [35], location, frequency, type of services, and funding type	Law [17], satisfaction and parental perception*
King [30], experience of using solution-focused coaching			Stewart [16], FCS evaluation*
External Environment			Stewart [16], client satisfaction*
Stewart [16], supports and barriers of service*		Mazer [21] type, frequency, and approach of services	Darrah [19], FCS
Kertoy [15], environmental barriers (accommodation, resources, access and equality)*			Camden [37], FCS evaluation*
			Kertoy [15], FCS evaluation*
			Palisano [36], FCS evaluation*
			Di Rezze [27], essential behaviors for FCS
			Acuri [26], barriers and facilitators to FCS and perception of service provision being family-centred

The study is listed twice (or more) if the studies had a secondary objective indicated respectively by “”*

objectives reported in each study. These objectives of each study were mapped onto categories in Andersen’s model to organize the findings of the studies, in order to explore CDIS utilization in Canada. The domains checked-off in **Table 1** may or may not

reappear in **Table 2** domains checked-off in **Table 1** reappear in **Table 2** only if the domains are the primary or secondary objectives. This is why, for example, FCS may be noted as a check in **Table 1** but may not transfer to **Table 2**. However, if a key objective is reported in **Table 2**, it will be checked off in **Table 1**.

Results

Study designs, features and characteristics

Table 1 presents evidence that of the 23 studies, 9 were quantitative, 7 used mixed-methods, and 7 employed a qualitative approach. Fifteen studies reported on service providers, of which 12 had a qualitative component. Twenty studies reported on factors from the *environment* domain, focusing on examining "physical, political, and economic" structures of the external environment and characteristics of the service centre [3]. Ten studies reported factors from the *population characteristics* domain, exploring factors such as age, gender, socioeconomic status (SES), diagnosis, and perceived/evaluated service need. Ten studies examined factors from *health behaviors* (for example, personal health practices and utilization of health services), and 17 studies examined factors of perceived/evaluated health status under the *outcomes* domain.

Domains studied and understudied, in CDIS based on Andersen's Model

Domains studied: The primary purpose of **Table 2** is to present the main objective(s) of the studies. Fifteen of the 23 studies focused on the healthcare system sub-category under the *environment* domain. The majority of studies under healthcare system conducted an overall assessment of the centre and its practices along with assessing the efficacy of practical and interpersonal skills.

Six studies looked at use of health services in the *health behaviors* domain, exploring factors such as frequency, duration and type; these studies focused mainly on children with cerebral palsy (CP). The four studies that evaluated health status in the outcomes domain focused on examining physical functioning, skill improvement, and goal attaining behaviors. Ten studies explored consumer satisfaction within the outcomes domain, with the majority exploring FCS.

Domains understudied: Two studies under the external environment focused on assessing factors such as region, supports and barriers and transportation [15,16]. Under population characteristics, need was described in two studies that focused on assessing diagnosis, severity and perceived needs [17]. One study focused on perceived health status [18]. No study explored predisposing characteristics, enabling resources, or personal health practices as key factors of CDIS utilization.

Factors influencing service utilization

This section examined the relationship between the domains and service utilization by aggregating the content of the studies.

Environment: Studies from the environment domain discussed non-formalized processes (defined as non-standardized practices at the clinics such as intake procedures, coordination procedures, transition and assessment services). FCS [19], clinical methods (such as observations, interviews, steps in therapy with parents), and treatment plans [16,20] were not formalized procedures among therapists. These non-formalized procedures resulted

in lowered parental perception of FCS [19] and decreased collaborative, culturally competent practice [20]. Darrah and colleagues suggest that a lack of standardization precludes making confident conclusions from these data, while standardizing procedures may lead to enhance efficiency at centres. Family-centred processes, type and frequency of services, goal-setting and coordination of children's services, such as a successful transition to school, are additional health system components assessed across studies [21,22].

Studies with qualitative components provided details to the perceptions of CDIS delivery at CTCs relative to immigrant families. Service providers who work with immigrant families caring for a child with a disability shared five key challenges [23]. The therapists described that they desired more cultural sensitivity training and more time to build relationships with families. They reported that communication barriers existed, that there were differing views among parents and service providers about disability, and that families were unaware of resources available in the community. Strategies to overcome constraints when working with newcomer families include cultural brokerage of the Canadian health system, understanding the family system, building a trusting collaborative relationship through communication, exploring social support networks, exploring common ground interests for therapy, tailoring therapy, and providing culturally competent care through a formalized process [24,25].

In other studies, where the first language of parents using the centre was not identified, parents were satisfied with having open communication with their therapists, and they felt empowered by therapists who kept families informed, taught skills and knowledge, and showed empathy, warmth and respect for diversity [26,27]. Other practices parents perceived as beneficial included coordination among services and coordination with external resources, flexibility of scheduling to meet with therapists for appointments, and improvements in participation, especially in school-based activities [16]. In terms of time allocation, 45% of therapists' time was spent in direct therapy, 30% in consultation, education and training, and 17% in meetings [16].

Perceived environmental issues and concerns of families waiting or receiving services, identified in various studies within this scoping review, included: obtaining information on services [15], costs of bills and services [15], babysitting services [16], and busy schedules/obtaining a referral [16]. The top two external environment barriers to service utilization and participation, as reported by the Craig Hospital Inventory of Environmental Factors (CHIEF), are 1) physical and structural barriers, and 2) services and assistances [15]. Differences existed in reported environmental barriers between children 5 years and younger, and those 5 years and older [15]. These prominent environmental barriers may be non-meaningful to vastly different regions than Canada.

Multiple studies explored practices and strategies to enhance intervention. Two studies highlighted the importance of partnerships to enhance collaboration with families by introducing a communication portal [28], and utilizing solution-focused therapy [29]. Key aspects to enhance intervention

included: setting participation goals by using assessment tools [30]; therapist and family involvement [19]; individualized and context-focused therapy that aims to modify the tasks and the environment [31,32]; functional tasks interventions [19,33]; enhancing skills such as listening [34] and practical skills training [33]. Eleven studies within the healthcare system category focused upon service providers to explore the efficacy of intervention approaches, with one study exploring the training needs of service providers [32].

Population characteristics: Higher rates of utilization were associated with younger age [34-36], male children [17,18,35,36], and children who had lower cognitive and/or motor functioning [35,36]; however, it is important to note this description is based on a very small number of studies.

Personal health practices: No study explored the impact of personal health practices on service utilization.

Use of health services: Occupational Therapists (OT), Physiotherapists (PT), and Speech Language Pathologists (SLP) are the three most utilized disciplines in CDIS and those perceived as needed most often by families [15,21,22,35,36]. Visits to a clinic were on average twice a month or more [36]. Wait times were reported to be nine months for public CDIS in one study [18]. During this waiting period, a decrease in psychosocial quality of life scores and mobility scores was noted [18]. Nearly half of families with children around 3.5 years of age paid out of pocket to utilize private services during the waiting period [18], but less than 5% of families sought private services for children with CP seven years and older [35], indicating differences in utilization associated to age, need, and financial resources over a long period of time.

The distribution of utilization was 60% to 64% for PTs, 53 to 55% for OTs, and 34% for SLPs among children with CP [35,36]. In both educational and clinic settings, Canadian children with CP ages 2 to 6 years spent on average 164 minutes in PT and 106 minutes in OT per month, with 2 to 4 sessions per month [36]. Young children (18 months to 5 years) with CP utilized services most commonly through clinical settings [36]. In contrast, school-aged children and adolescents with CP more often used developmental intervention services from school rather than a public Centre [35]. A higher proportion of children and adolescents received services if they attended a specialized classroom rather than a regular classroom [35]. Mean time spent with PT and OTs was higher if a child was in a specialized school [35] or received services in both educational and clinic settings [36]. Approximately 85% of children with CP received at least one type of developmental intervention service during their early school years, but service utilization decreased in adolescence [35]. Challenging transitions were observed when children were moving from a clinic approach to a school-based therapy approach [19,21], with better FCS if transition services are used [16]. Additionally, children with any disorder received a higher number of services in the clinic than in a school setting [21,36]. These findings indicate there may be a barrier for children who may have multiple diagnoses and/or chronic conditions associated with higher needs.

Health outcomes: No study explored or evaluated perceived health status in relation to service utilization.

Consumer satisfaction: Family satisfaction was a central focus for several studies. Improved perceptions of services are associated with higher ratings of family satisfaction and child quality of life outcomes [17,18]. Number of service locations [16,17], child's health conditions [17], and perceived supports [26] influence family satisfaction [17] and child's quality of life [18]. Specifically, family satisfaction increased with fewer location of services [16,17], increased accessibility and communication/collaboration with therapists [16,26,27], ease of accessing external resources [16], respect for diversity [26,27], increased attention to psychosocial needs [26,27], lower number of health conditions [17], decreased institutional barriers [26], and coordination between services and therapists [16,26].

FCS can be evaluated by using the Measure of Processes of Care (MPOC), and many studies evaluating FCS used MPOC. Families and service providers reported overall service quality to be high. Respectful care received the highest scores, whereas providing general information received the lowest scores [12,15,37]. Lower MPOC scores were associated with families who acquired additional years of education [37] and among older children [15,37]. Lower scores on all MPOC scales were reported by parents with older children (5 years and up) than parents with children younger than 5 years [15].

Discussion

These findings reveal important patterns and trends among studies conducted about CDIS in Canada. Key factors identified in this review provide researchers with direction to examine relationships between service utilization and outcomes of children with developmental disabilities in a therapy context. In this scoping review, we identified areas requiring further examination that need to be assessed comprehensively within the context of a health system that explores individual, family, and environmental aspects of children with disabilities. This scoping review shows that minimal or no information exists on population characteristics, personal health practices, or evaluated/perceived health status in relation to service utilization.

Environment

Notable environmental factors exist across Canada, including weather, road conditions, and distance and driving time to centers from rural and urban locations, public and private funding systems, as well as special governmental programs that give access to special funds or school programs. The barriers identified in this scoping review are likely a snapshot of obstacles encountered by families living in different health regions of Canada. Due to the particular environmental circumstances and geographical location of each center, we encourage researchers to explore barriers encountered by families using a standardized approach (such as during intake) to increase awareness of barriers and supports for families within their regions.

Population characteristics

This scoping review raises the importance of exploring population characteristics in order to identify vulnerable populations to enhance supports and well-being of families due to the paucity of information available on predisposing characteristics, enabling resources, and need-presenting a significant gap in CDIS. Population characteristics are crucial for determining healthcare utilization in Canada [10]. Studies, globally, that have explored population characteristics reveal large gaps in services for vulnerable families. For example, families who experience financial strain, lack of childcare supports, and are single or young parents are at higher risk for lower service utilization [38-40]. As such, CTCs are encouraged to explore demographic factors that identify families in vulnerable groupings to mitigate risk to children with developmental disabilities for underutilization of necessary developmental intervention services.

Health behaviors

Amount of service utilization has also been reported by researchers globally. Researchers identified 212 parents of children from the Northern Ireland CP Register. The researchers found rehabilitation therapy sessions for children aged 4 to 14 years with moderate to severe CP consisted of 30 minutes twice a week, and services were used at seven centres within a six-month period, indicating high service utilization [41]. On the other hand, in Canada, 76% of families using services desired to have more service usage and reported difficulties coordinating multiple services. While this study was published in 2002, families continue to desire more services [42] and experience complications associated with using multiple agencies [16,17,43]. The importance of reporting families' health service usage is further substantiated by a study conducted in Finland. Parents' (n=496) perception of service delivery is associated to health outcomes as a result of receiving therapy [44]. The strongest predictor of better psychosocial and physical functioning was higher attendance for outpatient rehabilitation. This research indicates that families perceive and report benefits of improved functioning when spending more time in therapy.

Studies conducted in age-specific specialty CDIS programs have examined personal health practices and have found that parent-therapist relationships optimize developmental outcomes because parents are the key knowledge holders of what works best for their families [45,46]. Hurtubise and Carpenter [47] emphasize parents are motivated to learn and utilize varying learning strategies in order to work with their children. This study highlights the importance of incorporating learning practices within therapy to mobilize families. Regarding the level of services, studies have found that the optimal amount of service utilization required for functional change is 1 to 5 days per week, intensity up to 3 hours per day, and 15 days to 6 month period for each goal [48-54]. These findings provide indicate that the majority of Canadian children may not be receiving sufficient therapy services. A strategy that can be implemented is championing parents to identify how to seek solutions and practices at home so they are not completely reliant on CTCs for change,

thus enhancing personal health practices. Because parents are receptive to learning [45], learning strategies can be taught in therapy so parents learn the process of modifying environmental barriers in the home, school/daycare, and community settings.

Health outcomes

A key finding of this scoping review is that no study to our knowledge, in the scoping review or elsewhere, has examined the impact or relationship of service utilization to health outcomes, for example, amount and intensity of participation. Participation has strong implications for clinical practice, because it is a mutable factor [3], meaning levels of participation can change greatly due to changes in implementing healthier habits, notably during younger ages [55]. Therefore, unlike population characteristics or environment, which is much more rigid and difficult to change, participation is an important factor to measure and change in clinical practice. Studies in Canada and internationally have substantiated a link between participation and quality of life [56,57], personal and family factors [58], and environmental factors such as supports and barriers [59]. These factors can facilitate or hinder participation. Perhaps, participation frequency and involvement are associated with higher levels of service utilization [10]. A comprehensive study that examines the relationships among child and family characteristics, service utilization and health outcomes is required to provide insight into the nature of the interactions between these factors.

Our findings support that families and service providers value FCS and standardized procedures, and desire more general information to help identify and coordinate services. Jeglinsky, Autti-Rämö, and Carlberg [60] advocated conducting regular evaluation of FCS using MPOC to assess if providing general information is improving. MPOC-20 was feasible for completion by families and provided valuable information to both families and service providers [15], thus its use should be continued to evaluate satisfaction with FCS. Only a few studies have measured MPOC longitudinally [61-64], so more studies are required to report MPOC's sensitivity to change. Similar findings with respect to high scores on respectful and supportive care and lowest scores on providing general information have been found [65], in regard to FCS evaluations using MPOC in CDIS.

Recent literature is revealing that family-orientated services promote family wellness [66]. In line with this scoping review, King and colleagues demonstrate that multiple studies provide supporting evidence of key factors contributing to the quality and outcome satisfaction of CDIS utilization. An indicator of quality service and satisfaction concerns the assessment of key factors and challenges that families experience at each center.

Limitations

A limitation of this scoping review was the ambiguity of classifying article features such as mapping study factors onto domains from Andersen's model that required the authors' discretion. A structured approach to classifying and categorizing the studies mitigated misplacing information, resulting in reliable information. For example, FCS was reflected in both

the environment and consumer satisfaction domain. FCS was classified in the environment domain when the researchers of the study explored FCS as practices of the center; whereas, FCS was classified into the consumer satisfaction domain when FCS was assessed in the study as an outcome of service satisfaction.

A second limitation of the scoping review was the inclusion of one article that used a comparative sample in the United States [36]. However, considering the limited number of studies available, we decided to use this study because it included children with developmental disorders using rehabilitation service utilization. This review reported only on the Canadian participants within the results section.

A third limitation of this review was using Andersen's model without evidence of this model's capability to report on factors comprehensively within the domains. Even though previous studies have used Andersen's model to explore factors of health service delivery [67,68], no study has examined strength of the relationship between factors and domains presented in the

model within CDIS research. Nonetheless, Andersen's model allowed for a comprehensive, structured approach to organize multiple factors of CDIS utilization as supported by this scoping review.

Conclusion

In examining CDIS, it is imperative to assess carefully the interplay between healthcare utilization, client outcomes and family satisfaction with services. As specified by the number of studies published each year within the past decade, there is a paucity of evaluation in this area. Research in CDIS utilization is a focal point to improve health services. Because treatment centers are a key point of contact for children with disabilities, services are important to determine health trajectories and interactions of children with disabilities with their health system. We hope that our scoping review provides information that will inform researchers about factors that influence, or have the potential to influence, utilization and outcomes in CDIS systems.

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