


Childhood obesity diagnosis and management remains a challenge despite the use of electronic health records: A retrospective study

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Abstract

Background: The use of electronic health records (EHR) has revolutionized medical practice by improving the quality of care. Childhood obesity (CO) increases the risk of developing other chronic diseases and has a serious psychosocial impact on children. Using EHR may improve this clinical condition since early diagnosis is a crucial means of preventing its negative impacts.

Objectives: The aim of the study was to assess the diagnosis and management of CO in a Canadian academic family medicine group unit (FMG-U) that uses EHR with an integrated CO diagnosis tool.

Methods: This is a retrospective study conducted in an FMG-U in the province of Quebec. The clinical practice guidelines established by the World Health Organization (WHO) were used to assess diagnosis and management of CO. EHR of every patient from 5 to 12 years old who had a medical appointment at the FMG-U in 2017 ($n = 618$) were analyzed. EHR use by clinicians was assessed by a closed-ended online survey sent to clinicians who provided pediatric care at that clinic in 2017.

Results: We identified 69 patients as obese according to the WHO, of whom 40 had been diagnosed by health professionals at the clinic. Of these, 33 received nutritional counseling; 33 received physical activity counseling; 13 received parent involvement counseling; 19 were referred to another health professional; and 12 were followed up within 6 months. Ten out of 15 clinicians responded to the survey. They all used the EHR integrated CO diagnosis tool but only 20% were truly familiar with it.

Conclusions: This study shows that CO is still underdiagnosed in primary care, notwithstanding the use of EHR with integrated tools. This affects the quality of care. Moreover, even if CO were correctly diagnosed, its management remains

incomplete. Knowledge translation by medical organizations plays an important role in addressing this problem.

KEYWORDS

childhood obesity, clinical guidelines, electronic health record, exercise, nutrition, pediatrics

1 | INTRODUCTION

Electronic health record (EHR) use by clinicians is now widespread. For more than 10 years, this study tool has been part of their daily routine.¹ The perceived benefits of EHR by clinicians are numerous: increased efficiency, clearer notes, better management of clinical data, and more.¹ The diagnosis and management of several pathologies are also improved, which translates into better patient health, including as regards childhood and adult obesity.^{2–8}

Childhood obesity (CO) is a chronic condition that increases the risk of developing cardiovascular diseases, respiratory diseases, and metabolic syndrome. It also has a serious psychosocial impact on children.^{9,10} From 2009 to 2011, the prevalence of obesity in Canadian youth from 5 to 17 years old was 13.3%.¹¹ Unfortunately, CO is under-diagnosed by primary care providers, as described in studies published between 2004 and 2010, when EHR use was in its very early stages.^{12–17} The diagnosis of obesity is associated with better healthcare management.^{8,12} Thus, improving CO diagnosis is the first step toward improving quality of care.¹² Using EHR templates and integrated tools such as an automated body mass index (BMI) calculator improves obesity diagnosis precision.^{2–6,18–20} It is important to update tools that are so vital to clinical practice.²

The definition of CO is crucial because it establishes the basis for diagnosis. The evidentiary framework for defining CO has evolved considerably in recent years.¹⁰ Several recommendations have been issued, including those of the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO).^{21–24} The CDC and WHO do not use the same reference chart.²⁵ In Canada, the gold standard for CO diagnosis is the WHO growth chart.^{10,25,26} In this country, the *Institut National d'Excellence en Santé et Services Sociaux* (National Institute of Excellence in Health and Social Services, or INESSS), a health research institute, was mandated by the government of Quebec to develop CO clinical practice guidelines based on WHO recommendations.¹⁰ For CO management, INESSS recommends a multidisciplinary approach combined with early parental involvement to bring about the behavior changes needed and to ensure that the condition is managed effectively.^{10,27,28} A 2017 Cochrane systematic review on CO among children from 6 to 11 years old confirmed the INESSS management recommendations.^{9,29}

In this study, we evaluate the diagnosis and management of CO in a Canadian academic primary care setting (located in the province of Quebec) that uses EHR. We want to assess whether the situation has improved compared to the state of affairs depicted in previous studies, which report that only

18%–53% of cases are diagnosed and managed in primary care setting.^{12,13,30}

2 | MATERIALS AND METHODS

2.1 | Setting and participants

The setting for the study is a medical clinic defined as a Family Medicine Group unit (FMG) in the province of Quebec, Canada. The FMG in question is also an academic setting affiliated with Université Laval (FMG-U). As of February 2022, there were 361 FMG in Quebec, including 48 FMG-U facilities.³¹ In this province, an FMG is defined as a group of family physicians working closely with nurses and other providers in the delivery of care to enrolled patients on a nongeographical basis.³² This is part of a provincial funding and professional support program.³³ FMG receives financial assistance and enlist various human resources, including other medical personnel such as nurses, social workers, nutritionists, and occupational therapists. The financial and personnel support offered to a given FMG is proportional to the number of patients registered and the types of services offered by the clinic.³³ In the FMG of this study approximately 16,000 patients are served by 15 family physicians, 24 medical students, and 15 healthcare professionals. Such clinics do not formally exist in other provinces of Canada. However, primary care clinics that bring together several family physicians, nurses, and healthcare professionals could be compared to FMG (i.e., Family Health Teams in Ontario, Primary Care Networks in Alberta).^{34,35} Since they are not officially listed, it is difficult to get a clear picture in Canada.

An EHR approved by the Quebec government, Toubib by Logipromedic, is used in over 75 clinics (FMG and FMG-U) throughout the province, including the FMG-U of this study. The EHR in question includes various integrated tools including templates, pediatric charts, and a BMI percentile calculation tool with a CDC reference chart that does not pertain to Canada. It is important to note that the label on this tool is “BMI calculation tool”; there is no mention of its reference (CDC or WHO). The EHR was up to date (latest version) at the time of the study. The integrated tools are optional instruments added by Logipromedic at the request of clinicians. It is the responsibility of users to request updated versions of these tools.

We conducted a retrospective study using the EHR of every patient 5–12 years of age (cutoff at age 12) consulting at an FMG-U, namely *Groupe de Médecine de Famille Universitaire du Nord de*

Lanaudière (CISSS Lanaudière), between January 1, 2017, and December 31, 2017, thus encompassing 920 patients. We included only follow-up visits (routine or annual examinations) and not visits in a walk-in context, since during walk-in encounters the focus is on acute problems and not on chronic issues, and often only one issue is treated at a time. Patients with secondary obesity caused by a genetic or endocrine disorder, drug-induced obesity, or psychological issues and patients who came to the walk-in for an acute problem were excluded.

Obesity management and diagnosis is assessed by physicians, medical residents, and nurse practitioners, so if patients had not been seen by at least one of these healthcare professionals we did not include them since professionals such as social workers, nursing assistants, and psychologists cannot diagnose CO related conditions, nor manage them without an order from a physician or nurse practitioner in Quebec.

We identified children who were obese by applying recorded data to the WHO growth chart.¹⁰ For every patient, we determined whether management interventions recommended by INESSS had been completed.¹⁰ We considered any intervention recorded in the EHR as completed.

2.2 | Assessments

2.2.1 | EHR use by clinicians

We conducted a closed-ended online survey to validate the use and assess the knowledge of FMG-U clinicians with respect to the prevailing provincial CO guidelines and the pediatric BMI percentile calculation tool integrated with the EHR. The questions were validated by family physicians practicing in Quebec and by a quality care specialist at the FMG-U. The survey was sent to clinicians at the FMG-U who performed at least one routine pediatric follow-up in 2017. Their answers were kept anonymous to increase the reliability of the survey.

2.3 | Statistical analysis

Sociodemographic variables and BMI were used to assess population characteristics. The quality of medical care provided by healthcare professionals for patients diagnosed with CO was assessed by calculating the percentage of patients who received the counseling recommended by INESSS guidelines. Statistical analyses were performed using SAS 9.4.

3 | RESULTS

3.1 | Childhood obesity diagnosis

A total of 920 patients between the ages of 5 and 12 had an appointment at the medical clinic in 2017. Some 618 patients met

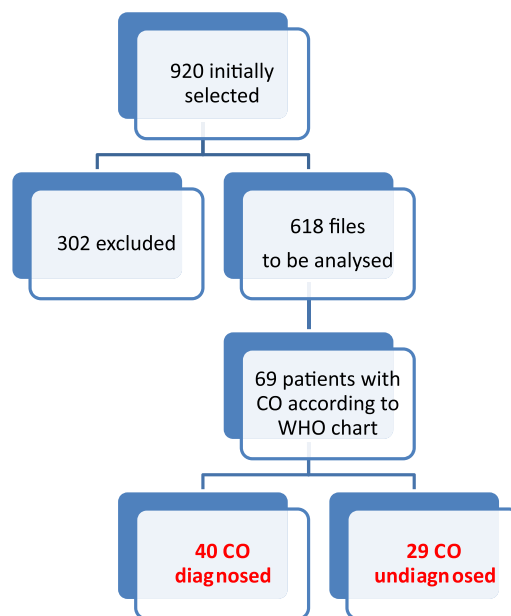


FIGURE 1 Patient selection flow chart. CO, childhood obesity

inclusion criteria and 302 were excluded (Figure 1). We identified 69 patients as obese according to the WHO chart, with a mean BMI of 23.6 kg/m² (SD 4.2) with a median of 22.3 kg/m². Of these, 22 were girls (32%) and 47 were boys (68%). The mean age was 8 years old (min 5.0–max 11.0). Clinicians diagnosed 40 of the 69 patients as obese, with a mean BMI of 24.7 kg/m² (SD 4.4) and a median of 23.4 kg/m². Thus, 29 CO diagnoses were missed (Table 1).

3.2 | Childhood obesity management

Results among patients identified as obese according to WHO guidelines (69 patients) showed that a total of 46 patients (67%) received nutritional counseling; 47 (68%) received advice on physical activity; 35 (51%) received counseling concerning their sedentary lifestyle; 15 (22%) received counseling on behavior management; 16 (23%) of the visits focused on parental involvement; 20 (29%) of patients were referred to other professionals; and 13 (19%) had a medical follow-up within 6 months. Only eight patients (11%) met overall INESSS recommendations (Table 2).

Once diagnosed by clinicians at FMG-U (40 patients), a total of 33 patients (83%) received nutritional counseling; 33 (83%) received advice on physical activity; 27 (68%) received counseling concerning their sedentary lifestyle; 14 (35%) received counseling on behavior management; 13 (33%) of the visits focused on parental involvement; 19 (48%) of patients were referred to other professionals; and 12 (31%) had a medical follow-up within 6 months. Only seven patients (18%) met overall INESSS recommendations (Table 2).

TABLE 1 Comparison between childhood obesity (CO) cases diagnosed at the FMG-U and true CO identified with the WHO chart (gold standard)

CO cases	True CO according to WHO chart N = 69 (n (%))	Absence of CO according to WHO chart N = 549 (n (%))	Total N = 618 (n (%))
Diagnosed cases	40 (58)	0 (0)	40 (6)
Undiagnosed cases	29 (42)	549 (100)	578 (94)
Total	69 (100)	549 (100)	618 (100)

Abbreviations: FMG-U, family medicine group unit; WHO, World Health Organization.

Interventions	WHO (69) (n (%))	Diagnosed at FMG-U (40) (n (%))
Nutritional counseling	46 (67)	33 (83)
Physical activity counseling	47 (68)	33 (83)
Counseling on minimizing sedentary behavior	35 (51)	27 (68)
Counseling on behavioral changes	15 (22)	14 (35)
Parental involvement counseling	16 (23)	13 (33)
Referral to another professional	20 (29)	19 (48)
Follow-up within 6 months	13 (19)	12 (31)
Overall INESSS recommendations	8 (11)	7 (18)

Abbreviations: FMG-U, family medicine group unit; INESSS, Institut National d'Excellence en Santé et Services Sociaux; WHO, World Health Organization.

Questions about EHR childhood obesity embedded diagnosis tool	WHO or INESSS (n (%))	CDC (n (%))	Don't know (n (%))	Total (n (%))
Which EHR embedded tool is used?	2 (20)	2 (20)	6 (60)	10 (100)
Which chart is recommended in Quebec (Canada)?	4 (40)	0 (0)	6 (60)	10 (100)

Note: Ten (n = 10) clinicians responded to the survey. All of them (100%) confirm the use of the CO diagnosis tool.

Abbreviations: CDC, Centers for Disease Control and Prevention; CO, childhood obesity; INESSS, Institut National d'Excellence en Santé et Services Sociaux; WHO, World Health Organization.

TABLE 2 Comparison between the interventions recommended by INESSS that were carried out for patients identified as cases of childhood obesity according to the WHO (N = 69) and those diagnosed by the FMG-U clinicians (N = 40)**TABLE 3** Assessment of clinicians' electronic health record (EHR) childhood obesity embedded tool knowledge

3.3 | Assessment of clinicians' use of EHR integrated tools

Ten out of 15 (66%) family physicians responded to the survey (Table 3). All responders confirmed that they used EHR integrated tools to diagnose CO, with 20% of clinicians assuming that the integrated tool was the WHO chart; 20% assuming it was the CDC chart; and 60% unsure of which chart pertained. When asked which chart they should use in their practice, only 40% named the WHO chart (Table 3).

4 | DISCUSSION

The prevalence of CO in this study (11%) is similar to the population prevalence of 13%.¹⁰ Given this fact, we found that CO is underdiagnosed if we compare the number of patients (40) that

clinicians diagnosed using the integrated tool (CDC) and the number of patients (69) who should have been diagnosed (WHO). A total of 29 patients remained undiagnosed and did not receive primary care according to current clinical practice in the FMG-U region. Our results are similar to what has already been published in the literature (18%–53% CO diagnosis in primary care), with only 58% (40 out of 69) of patients diagnosed.^{12,13,30} This suboptimal situation has a direct impact on patients' health since their medical condition is not addressed or managed. Thus, despite the use of an EHR, which also incorporates a CO diagnostic tool, the situation does not seem to show any improvement. This finding contrasts with previous work revealing an increase in the documentation of obesity after EHR implementation.⁶ The discrepancy may be due to different EHR-related contexts. The focus of Bordowitz's study is an EHR implementation context, whereas our study addresses a setting where the EHR had been used for nearly 10 years. However,

according to Bordowitz, increased documentation of obesity does not necessarily lead to better treatment. This may seem paradoxical, but documenting a medical condition does not inevitably result in diagnostic action by the clinician, even though it is reasonable to assume that when a clinician makes a diagnosis, he or she formally recognizes the condition, which would normally trigger the formulation of a treatment plan.⁸ To improve the situation, it would behoove us to devise a way to diagnose the 29 patients (42%) who were missed.

Regarding the EHR diagnosis tool itself, all responding clinicians reported using it to diagnose CO. This is consistent with what has already been described in the literature, namely that clinicians use the EHR and its integrated tools.¹ In our study, the FMG-U is located in Canada and the guidelines used were those of the WHO.¹⁰ However, the tool integrated in the clinic's EHR was the CDC tool, which is not the recommended instrument since it tends to underestimate CO cases.¹⁰ If FMG-U clinicians used the CDC chart, as we believe was the case, this can be one element explaining the under-diagnosis we observed in our results. Moreover, the version and name of the tool were not labeled in the EHR. Clinicians simply applied it, trusting what was already integrated in the EHR. As the EHR in our study is found in more than 75 of 361 FMG clinics in Quebec, it would be of particular interest to analyze the tools used in other settings as well.³¹

The entire process highlights the importance of verifying tool quality. Diagnostic tools need to be updated and consistent with the standards of the country in which the clinicians practice. Expert groups should be involved at this level to ensure verification.

As concerns CO management, the clinicians provided suitable care with respect to nutritional counseling and advice on physical activity, but less so regarding behavioral counseling, parental involvement, and medical follow-up. Their record is a little better than what has been described in other contexts, where the emphasis is on diet rather than physical activity.¹³ The suboptimal level of care provided may have been due to a lack of knowledge, making a multidisciplinary approach difficult to apply. When asked which guidelines should be used for CO management in Quebec, only 4 of 10 clinicians correctly answered the guidelines of the WHO. This was unexpected, and given that academic settings such as the FMG-U are known to provide continuous medical education, it is easy to extrapolate that in nonacademic clinics, the situation would be the same or worse.³⁶ This may also indicate a lack of effective knowledge translation on the part of larger medical organizations. Up-to-date clinical tools are crucial to address this challenge. EHR developers have a shared responsibility. Clinicians need to correctly recognize the tools they are using.

The main limitation of our study is its external validity. Although the clinic chosen is a typical FMG-U clinic that represents the reality of primary care in Quebec and that avails itself of a widely used EHR (75 out of 361 clinics), it is only one clinic. The results would be more representative if the study had focused on several clinics located in different regions of Quebec and other provinces of Canada. However, the structure of the selected clinic (FMG-U) corresponds

to similar models in Ontario (Family Health Teams) and Alberta (Primary Care Networks). In addition, the level of knowledge of clinicians may vary from one province to another, but it is reasonable to assume that there is some consistency since national organizations, such as The College of Family Physicians of Canada and The Canadian Medical Association, ensure that continuing medical education is available across the nation, including throughout Quebec. Considering all the above, it is realistic to assume that the results could be similar elsewhere, but more in-depth studies would be needed for purposes of confirmation.

Our study is also limited by the fact that this audit is a retrospective evaluation of EHR. If clinicians did perform certain interventions (nutritional counseling, etc.) and did not record them in the chart (unrecorded information) then we cannot verify that the interventions were in fact carried out.

5 | CONCLUSIONS

As a rule, clinicians have tended to inaccurately identify the number of CO cases. The sole use of EHR does not appear to significantly improve the diagnosis and management of CO in a primary care setting. EHR users must also be educated about this chronic disease and have the necessary up-to-date knowledge. They should not rely solely on EHR. The quality of care provided to CO patients would improve if EHR companies updated integrated tools; medical organizations provided updated guidelines on continuing professional development; guideline developers improved techniques of dissemination; and clinicians followed the latest guidelines. In 2022, the FMG-U in this study will change to a newer, cloud-based EHR system with updated integrated tools. It will be particularly interesting to see if this has a positive impact on the quality of care provided to CO patients.

AUTHOR CONTRIBUTIONS

Jean-Sébastien Paquette: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; supervision; validation; writing—original draft; writing—review & editing. **Laurence Théorêt:** Conceptualization; data curation; formal analysis; investigation; methodology; project administration; writing—original draft. **Laurence Veilleux:** Conceptualization; formal analysis; methodology; writing—original draft. **Johann Graham:** Writing—review & editing. **Marie-Pier Paradis:** Writing—review & editing. **Nathalie Chamberland:** Data curation; writing—review & editing. **Gabrielle Lanctôt:** Data curation; writing—review & editing. **Pascale Breault:** Formal analysis; supervision; writing—review & editing. **Mathieu Pelletier:** Methodology; supervision; writing—review & editing. **Samuel Boudreault:** Conceptualization; methodology; supervision; writing—review & editing.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data are available on request from the authors.

ETHICS STATEMENT

We obtained an exemption from the local ethics committee of CISSS *Lanaudière* since the audit was part of a quality improvement initiative. However, all ethical principles of the Declaration of Helsinki were taken into account.

TRANSPARENCY STATEMENT

The lead author* affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained. *The manuscript's guarantor.

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