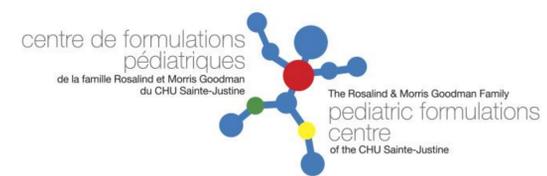


Compounded medicines most in need of commercialized oral pediatric formulations: a Pan-Canadian study

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Introduction

- In 2017, drug compounding is still commonly used to compensate for the lack of oral formulations adapted to children's needs
- Manipulation of dosage forms designed for adults may increase the risk of dosing errors, exposure to unsafe excipients, and therapeutic failure in children
- The Rosalind and Morris Goodman Family Pediatric Formulations Centre of the CHU Sainte-Justine (the Goodman Centre), established in 2016, aims to promote and facilitate the development and market authorization of pediatric formulations, for both off- and on-patent drugs, through partnership with multiple stakeholders:
 - Pharmaceutical industry
 - Pediatric hospitals
 - Regulatory agencies
- It also aims at promoting practices that increase safety of pediatric medicines
- Using a patient-focused approach, the Centre has undertaken a mapping of the needs for pediatric formulations in Canada

Objectives

- To determine the most frequently compounded medicines in Canadian pediatric hospitals and the challenges associated with drug compounding
- To identify compounded medicines most in need of commercialized oral pediatric formulations in Canada
- To establish criteria the Goodman Centre should use to prioritize which medicines to address first

Methods

- The Head of the Pharmacy Department of each of the 16 Canadian university affiliated teaching hospitals was contacted to identify pharmacist(s) best placed, in their institution, to participate in the study
- We designed a questionnaire to determine which drugs are currently compounded and to assess the needs in terms of pediatric formulations
- The questionnaire included 12 open-, close-ended or Likert-scale questions and was sent electronically to each participant 1 week before the telephone survey
- The duration of the telephone survey was up to one hour
- Median, counts and proportions were computed using STATA 13
- This study was approved by a central Research Ethics Board

Results

- Thirteen centers among 16 contacted, completed the telephone survey between April and June 2017 (81.3%)
- Sixteen pharmacists from 13 centers participated in the survey
- When sites were asked to list their 10 most commonly compounded medicines, a total of 43 unique drugs were identified



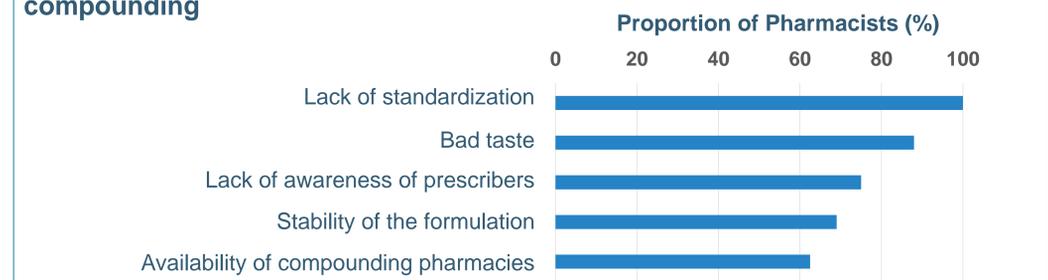
Results continued

Table 1: Drugs most in need of commercialized oral pediatric formulations and most compounded according to Canadian pediatric hospitals

Drugs	Number of hospitals that ranked drug as :		Availability of pediatric oral formulations outside of Canada	
	Most in need of a pediatric formulation, n (%) N=13	Most frequently compounded, n (%) N=13	United States	Europe
Levetiracetam	8 (62)	10 (77)	Yes (oral solution)	
Spirolactone	8 (62)	7 (54)	No	
Tacrolimus	8 (62)	7 (54)	No	Yes (sachets for oral suspension)
Clonidine	7 (54)	7 (54)	No	
PPI ¹	6 (46)	7 (54)	Yes (sachets for oral suspension) ²	
Hydro-chlorothiazide	6 (46)	6 (46)	No	
Dexamethasone	4 (31)	10 (77)	Yes (oral solution) ³	
ACE inhibitors ⁴	4 (31)	5 (38)	Yes (oral solution)	
Sildenafil	4 (31)	4 (31)	Yes (oral solution) ⁵	
Topiramate	4 (31)	4 (31)	Yes (sprinkle hard capsules)	
Amlodipine	4 (31)	2 (15)	No	Yes (oral solution)
Hydroxyurea	4 (31)	2 (15)	No	

¹Proton pump inhibitors; ²for omeprazole and esomeprazole in the US and for esomeprazole in Europe; ³contains propylene glycol and sorbitol; ⁴Angiotensin converting enzyme inhibitors (captopril, enalapril); ⁵contains sorbitol

Figure 1: The most frequently mentioned challenges associated with drug compounding



- The most important factors to consider when prioritizing a drug over another to develop a commercial pediatric formulation:
 - A drug with a small therapeutic window
 - High risk of error in the compounded preparation
 - Short stability or lack of stability data of the compounded preparation
 - Complexity of the compounded preparation in community pharmacies

Conclusions

- This study highlights which drugs are most in need for pediatric oral formulations in Canada
- For compounded medicines with pediatric formulations available outside Canada, the Goodman Centre is currently assessing their adequacy. The Centre is also looking for pharmaceutical partners willing to bring these formulations to the Canadian market. A better understanding of why Canada has fallen behind regarding the access to some pediatric formulations is part of the Centre's mandate
- For those medicines without available commercialized pediatric formulations, the Goodman Centre is looking for pharmaceutical partners interested in developing such formulations. The Centre intends to promote their access to the largest number of children, across boundaries, by working with different stakeholders to facilitate data sharing and regulatory harmonization