



UNIVERSITY of MARYLAND SCHOOL OF PHARMACY

Collaborative Effort to Prioritize Compounded Pediatric Formulations for USP Monograph Development

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Background

- Compounded preparations are utilized in children due to inappropriate dosage forms or concentrations, excipients, and/or palatability of many commercially available medications. No standardized concentrations are mandated in health systems. This results in significant variation in compounded liquid preparations, which increases the potential for errors.
- Groups like the Michigan Pediatric Safety Collaboration, Standardize 4 Safety and United States Pharmacopeia (USP) are working to standardize concentrations of liquid compounded medications.
- A new USP initiative, the Compounded Preparation Monograph Donation Program, accelerates the creation of compounded monographs which provides standardized formulations based on patient needs.
- The creation of USP monographs requires prioritization of commonly compounded preparations.
- This project aims to identify gaps in the availability of formulations and stability data and to determine if there are any discrepancies between recommended standard concentrations.

Objectives

The purpose of the project is to develop a list of priorities for USP monograph development of oral liquid formulations for pediatric patients.

Methods

- In June 2017, a collaboration was formed with members from USP, a school of pharmacy, and an academic medical center.
- Pediatric oral compounded formulations from 4 academic medical centers, USP, and the Michigan Pediatric Safety Collaboration were compared.
- The list of formulations and concentrations was narrowed down by four pediatric pharmacists to 18 clinically relevant medications.
- A 3-question survey was sent through pediatric pharmacy listserv groups to further prioritize and narrow this list of clinically relevant medications.
- In a survey, participants were asked to select the top ten medications needing a USP monograph with beyond-use dates supported by stability information. Participants were also asked to provide suggestions for alternative concentrations and/or medications that were not included in the survey. The survey was open for 2 weeks.
- Once the Standardize 4 Safety list of medications and concentrations was available, the priority list from this project was compared to determine whether the concentrations were consistent.
- The finalized list of medications and associated concentrations was presented to USP as prioritized formulations for monograph development.

Results

Figure 1. Initial Prioritization

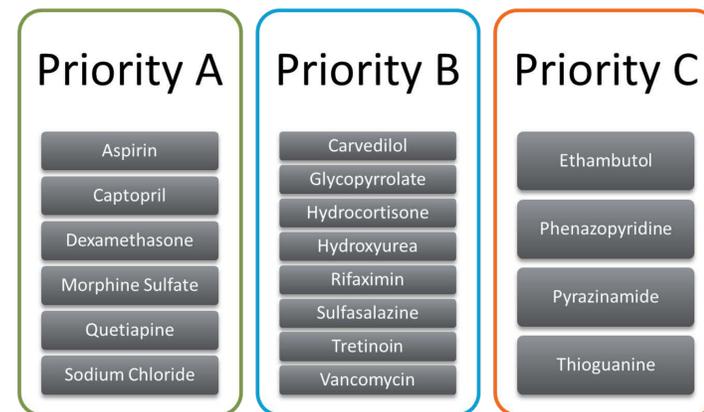
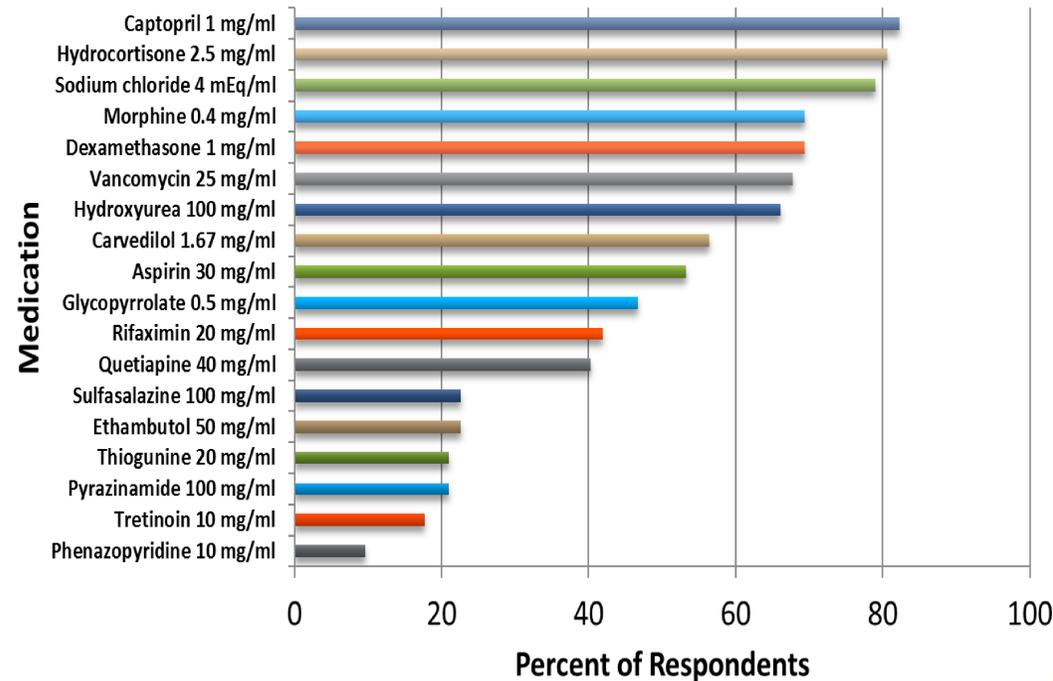


Figure 2. Medication Rankings from National Survey



- Sixty-two participants responded and chose an average of 8.7 medications needing a USP monograph for a total of 538 selections.
- Selections for each medication ranged from 9.7% to 82.3%.
- Additional medications requested to add to the list without existing USP monographs or commercially available preparations include bosentan and hydrochlorothiazide.
- The second prioritization list contained the top 10 medications by survey responses along with quetiapine, which was deemed clinically necessary by the researchers.
- The second prioritization list was compared to the Standardize 4 Safety concentrations. Of those medications included, only hydrocortisone had a different concentration. This was adjusted for the final prioritization.

Table 1. Final Prioritization

Medication	Standardization 4 Safety List
Aspirin 30 mg/ml	Not included
Carvedilol 1.67 mg/ml	Not included
Captopril 1 mg/ml	✓
Dexamethasone 1 mg/ml	Not included
Glycopyrrolate 0.5 mg/ml	Not included
Hydrocortisone 2.5 mg/ml	Recommended 2 mg/ml
Hydroxyurea 100 mg/ml	✓
Morphine 0.4 mg/ml	✓
Quetiapine 40 mg/ml	Not included
Sodium chloride 4 mEq/ml	✓
Vancomycin 25 mg/ml	Not included

Discussion

- Eleven medications were identified as priorities for pediatric patients for USP monograph development.
- From these efforts additional groups connected to expand USP's work: Children's Oncology Group (Akron, Ohio), Rosalind & Morris Goodman Family Pediatric Formulations Center (Quebec, Canada), European Directorate for the Quality of Medicines (Strasbourg, France)