



Standardization of Oral Liquid Concentrations Between Inpatient and Outpatient Pharmacies at a Tertiary Care, Academic Medical Center

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Background

- The inpatient and outpatient pharmacies of University of Missouri Health Care (MUHC) use individualized recipes involving multiple concentrations of a variety of compounded liquid medications.
- According to the American Society of Health-System Pharmacists (ASHP), consistent medication concentrations reduce the potential for errors during transitions of care and resolve operational differences, ultimately increasing efficiency, patient safety, and overall communication between pharmacy settings.¹
- The purpose of this initiative is to standardize concentrations of oral liquids and recipes in the MUHC system through a data review process thereby decreasing the risk of serious medication errors.

Methods

- Data regarding unique medication types and concentrations used for oral liquid doses was collected from Simplifi 797®, a web-based application system used by MUHC as a system-wide Master Formulation Record (MFR).
- The data was compared between inpatient and outpatient pharmacies, as well as recommended evidence-based standardizations from ASHP and the Michigan Pediatric Safety Collaborative to identify discrepancies and optimization opportunities.
- The Patient Safety Network (PSN) within the MUHC system was used to identify relevant medication errors during the previous five years.
- Keywords “oral solution”, “oral liquid”, and “oral suspension” were used.

Endpoints

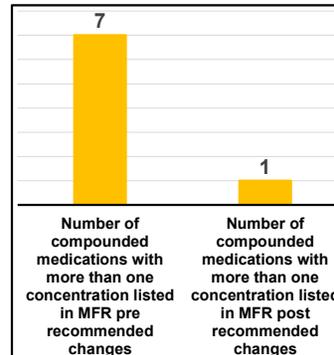
Primary Outcomes: Number of unique oral liquid medication types and concentrations used between inpatient and outpatient MUHC pharmacies.

Secondary Outcome: Number of patient safety reports related to oral liquid medications from January 1, 2015 to December 31, 2020.

Results

Medication Name	Concentrations Used in MUHC System (mg/mL)	Recommended Concentrations (mg/mL) ^{1,2,3}
amitriptyline	20	1
baclofen	5, 10	5
bethanechol	1	5
carvedilol	0.5	1.67
clonidine	0.1	0.2
desmopressin	0.01	0.03
flucytosine	50	10
hydroxyurea	50, 100	100
labetalol	40	10
mercaptopurine	50	20
rifampin	10, 25	25
spironolactone	2, 10	5
tacrolimus	0.5, 1	0.5
tretinoin	50	10
ursodiol	20, 50, 60	20, 60
vancomycin	25, 50	50
zinc sulfate (elemental)	2	10

- The total number of compounded oral liquid medications is 75.
- Among these medications, the number of concentrations used is 82.
- The number of recommended concentrations is 76.
- The compounded oral liquid included commercially available products and compounding kits.
- The number of identified errors from January 1, 2015 to December 31, 2020 is six.
- A limitation is that oral liquids from Simplifi 797® MFR was included and not all compounded oral liquids are recorded.



Related Patient Safety Error

The Number of Errors	NCC MERP Categories ⁴
2	B: An error occurred, but the medication did not reach the patient
3	C: An error occurred and reached the patient, but did not cause harm
1	D: An error occurred and reached the patient that required monitoring

Medications involved in Errors	Medication Use Process	Error Type
amoxicillin 50 mg/mL suspension	Verification	Wrong dose – misunderstanding of instructions or calculations
sulfamethoxazole/trimethoprim 200 mg-40 mg/5 mL suspension	Medication Reconciliation	Wrong dose – misunderstanding of instructions or calculations
acetaminophen-codeine 120 mg-12 mg/5 mL solution	Discharge	Wrong dose – misunderstanding of instructions or calculations
clonazepam 0.1 mg/mL suspension	Medication Reconciliation	Wrong formulation (ordered tablet form instead of suspension)
desmopressin 10 mcg/mL solution	Fill/Dispense	Wrong dose – misunderstanding of instructions or calculations
topiramate 6 mg/mL suspension	Medication Reconciliation	Wrong formulation (ordered tablet form instead of liquid)

Conclusion

- Standardization will decrease the number of various concentrations of compounded oral liquid in outpatient and inpatient pharmacies of MUHC system.
- The use of recommended concentrations of oral liquid in the MUHC system will reduce potential error in the future.
- Next step for reducing error is to standardize the recipes of oral liquids and then implement the standardization to the MUHC system.

References

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