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LETTER TO THE EDITOR

Letter to the editor regarding dosing accuracy of female low dose syringes

We read the article 'Female low dose tip syringes-increased complexity of use may compromise dosing accuracy in paediatric patients' with interest. As long-time members of the American Society of Parenteral and Enteral Nutrition and experienced nutrition support clinicians, we have some concerns we would like to share as both of our institutions are paediatric hospitals using ENFit connectors.

From the pharmacist perspective, safely providing medications to patients is a key daily role of every pharmacist. While I completely acknowledge the transition to ENFit can be challenging, the process is necessary to prevent enteral misconnections which have proven to be fatal in the past. Complete transition to the ENFit product is recommended by multiple pharmacy and nutrition organizations as well as ISMP and the FDA. While the federal government does not require the use of ENFit, the state of California does mandate its use. The authors refer to the FDA-approved instructions for use of both products with the ENFit products requiring more steps in the administration process. I would argue the steps are essentially the same for both products. ENFit's instructions include additional comments in steps 3 and 4. However, step 3 would not apply to medications drawn up in the pharmacy since these medications should be transferred from the medication bottle to the medication syringe via an ENFit compatible transfer device similar to the legacy transfer devices. Similar bottle caps or transfer devices have been utilized at home with legacy devices and are recommended for ENFit syringes in patients with feeding tubes. Therefore, step 3 only applies to medications which are drawn up from a medication cup. In many paediatric facilities, the use of patient-specific dose syringes is increasing whereas the use of standard-dose medication cups is decreasing. This would be particularly true for narrow therapeutic index drugs such as the ones mentioned in the article. Additionally, nurses should be utilizing ENFit compatible medication straws to prevent any excess medication in the moat. Step 4 while specifically listed for the ENFit product, I would argue applies to any medication no matter whether the medication was administered via an ENFit syringe or a legacy syringe.

Discrepancies in measurement observed more commonly with ENFit low-dose syringes can be overcome with increased education and awareness by pharmacists, pharmacy technicians and nurses. It is common to experience 'air bubbles' within smaller oral syringes particularly when small doses are being administered. Great care should be taken to ensure that 'air bubbles' are not present and displace a portion of the medication volume. This often involves expelling air from the syringe and then drawing it up more than once to ensure the correct medication volume is in the syringe. This challenge was present with the legacy syringes as well as the newer ENFit design. Since the problem tends to occur with the use of smaller oral syringes and with small liquid doses, use of appropriate concentrations for paediatric doses is critical. Two common challenging medications the authors mention in table 5 are morphine and methadone. These both can be utilized for neonatal abstinence syndrome; however, other concentrations are available. Specifically for morphine, the recommended standardized oral concentration through the ASHP 4 Safety Initiative is 0.4 mg/mL instead of 2 mg/mL. The more dilute concentration permits larger dose volumes which do not lead to excessive dose volumes but improve the process for measuring.

Examining table 5 further, many of the 20% dosing variance volumes indicated do pose potential concerns for dosing. However, these concerns would be present for ENFit and legacy syringes. When dose volumes are so small, one must consider the current oral medication concentration. Using dose volumes <0.1 mL and especially <0.05 mL can lead to inaccuracy in measurements. The human eye can often not differentiate between 0.02 and 0.03 mL. This challenge is why recommended standardized oral concentrations are critical in paediatrics.

For the authors' particular study, I applaud their efforts in investigating the accuracy of ENFit devices. I would have encouraged the study to provide more information on the sample size needed to show statistical significance for their assessment particularly with the majority of study syringes being ENFit versus legacy syringes. I would also recommend the use of other medications in the test process to observe differences related to drug consistencies.

I also appreciate your investigation of crushed tablet administration with these syringes. The administration of crushed tablets to patients with feeding tubes is challenging. However, aspirin is a product utilized in neonatal/paediatric patients at standard portions of the tablet. The standard of practice is to give at least a quarter of a baby aspirin to the patient. The entire dose would be administered in a liquid without using an aliquot method (i.e. taking a portion of the dissolved tablet solution to administer a dose). Using the aliquot method would be far more problematic if giving partial dosing.

As a nurse, my concerns focus on clinical, at the bedside, issues related to medication administration. The authors refer to the ENFit system as being more complex which can lead to more medication errors but we convened an interdepartmental, interdisciplinary committee to facilitate the transition and have no data to support this concern expressed by the authors. We organized education

opportunities for nursing staff and caregivers to show staff how to use various adapters for medication administration. While we did add some steps to the medication administration process, we did not get reports of medication administration errors. Nursing staff are as committed to accurate medication administration as the pharmacy staff is in accurate medication dispensing. I saw parents and caregivers showing the same level of interest and diligence as our staff.

Comments made regarding the use of adapters for oral dosing using ENFit syringes were interesting from a nursing perspective. When I, or any other nurse, gave an oral medication to an infant or child using legacy syringes, there was no adapter at all. We placed the syringe into the cheek of the patient and slowly instilled the medication with varying amounts of that medication escaping with an indeterminate amount of saliva. It was not uncommon to have a conversation with another nurse trying to discern if enough medication ended up on a washcloth to warrant re-dosing. Parents had the same challenge. Now with the adapters mentioned in this study, a nurse can get more of the medication comfortably and safely back into the cheek so that it is more apt to be swallowed. For a nurse, this is a true patient care and safety improvement! We would question which is preferable, use of a legacy syringe with an unknown amount of medication being lost with saliva out the mouth or the use of an aide to improve medication administration? If we see medication in the DoseMate DL after administration, we add a small bubble of air to assure all the medication is administered. This is going to be the case for any nurse delivering a small dose medication to a small patient as we know how important it is to administer all the medication, and we want to model this to parents. I would also mention that DoseMate DL was developed with input from experienced neonatal intensive care nurses.

I read about more dosing inaccuracy using medication cups or crushed tablets. I certainly concur that these two scenarios are the most challenging for both legacy and ENFit syringes. For crushed tablets, if we do not crush them thoroughly, the medication can plug the stem of the low-dose syringe. We nurses learned this quickly and are more diligent in crushing such medications as aspirin.

Finally, both of us had some questions about the research design. There is no power analysis to justify the sample size studied. We are not clear what 'unapproved adapter processes' means exactly.

Also, the change to ENFit connectors is a worldwide patient safety initiative that has been successfully implemented in many hospitals. It is our understanding that the European Union is approaching 100% conversion with 0 known reports of an adverse event after nearly 3 years. In the United States, highly influential healthcare systems have adopted and/or plan to adopt, by the end of 2019. Examples include Banner Health, Sharp HealthCare, Kaiser Permanente, Cleveland Clinic, Indianapolis Patient Safety Coalition and Mayo Clinic among others. These organizations have done their own research/testing and concluded ENFit adoption was best for the safety of their patients.

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