

June 30, 2015

Move toward full use of metric dosing: Eliminate dosage cups that measure liquids in fluid drams. Use cups that measure mL.



A fatal event was reported recently to the ISMP National Medication Errors Reporting Program in which a nurse confused two dosing scales that appear on a plastic oral liquid dosing cup. It has an archaic measure—drams (fluid drams)—which the nurse confused as mL. This particular dosing cup is commonly used in US healthcare facilities today (**Figure 1**).

Many healthcare professionals are familiar with mix-ups that have occurred when measuring doses of liquid medicine using dosing cups, sometimes causing serious medication errors. To prevent mix-ups between variable measurement systems, multiple national organizations have called for the adoption of the metric system (milliliter) as the standard for prescribing and measuring doses of liquid medications. These organizations include the:

- American Academy of Pediatrics (AAP)¹
- American Society of Health-System Pharmacists (ASHP)²
- Centers for Disease Control and Prevention (CDC)²
- Institute for Safe Medication Practices (ISMP)^{3,4}
- US Food and Drug Administration (FDA)⁵
- Consumer Healthcare Products Association (CHPA)⁶
- National Council for Prescription Drug Programs (NCPDP)⁷
- American Pharmacists Association (APhA)⁸
- US Pharmacopeial Convention (USP)⁹

- US Metric Association¹⁰
- National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP)¹¹
- Several other organizations⁸

While progress is being made in hospitals in regards to prescribing liquids in mL, many hospitals still use dosing devices that have household measures (e.g., teaspoonful, dessertspoonful, tablespoonful) and, as above, even drams and ounces. This sets healthcare professionals up to fail because the dosage scales on embossed cups are difficult to read, have dangerous abbreviations that are easily confused (e.g., TBS and TSP), and measures that are no longer used (e.g., drams).



Figure 1. Commonly used dosing cup includes archaic measurement scale in drams, which has been confused with mL. Dosing cups should have only a mL scale.

In the case referred to above, a nurse measured a dose of morphine sulfate oral solution 20 mg/mL incorrectly for an opioid-naïve hospice patient. The nurse misread the scale marked drams as mL and administered

1 dram of the medication instead of 1 mL. One dram is equivalent to 3.7 mL, so the patient received close to 75 mg of morphine. In another similar case, a nurse gave a patient 5 drams of a formerly available acetaminophen liquid concentrate, 100 mg/mL, instead of 5 mL, a total of 18.45 mL, or 1.845 g of acetaminophen! Drams and ounces, which also appear on these cups, are from an apothecary system that is no longer in clinical use or taught to student healthcare professionals.

Healthcare providers should stop using dosing cups that include a scale that measures in drams.

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This alert is based on information from the National Medication Errors Reporting Program operated by the Institute for Safe Medication Practices.

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Unfortunately, these cups are still available from major vendors, so it's possible they will be found in your healthcare facility. In their place, available oral syringes that measure only in mL should be used to measure doses of oral liquid medications whenever possible. If a dosing cup must be used, ideally it should allow measurement in mL only. Although, these cups are not widely available at this time, some suppliers can customize dosing cups to measure in mL only. If a customized cup is not available, you may need to rely on cups measuring in mL and household measures until mL-only cups can be supplied. Make sure your purchasing group or department knows what type of cup to purchase. Also, only purchase dosing cups that have printed, rather than embossed, measurement scales, so they are easier to read.

A proposed change in USP <17> will require that an appropriate dosing component (e.g., oral syringe, dosing cup) be provided to the patient or caregiver to accurately measure and administer the oral medication. The graduations on the component "shall be legible and indelible, and the associated volume markings shall be in metric units and limited to a single measurement scale that corresponds with the dose instructions on the prescription container label."⁹

References

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- 2) Traynor K. Standardize units for dosing liquid oral prescription medicines, task group says. *Pharmacy News*. In: *AJHP News*. July 1, 2014. Available at: www.ismp.org/sc?id=548.
- 3) ISMP. Best practice 5: Purchase oral liquid dosing devices (oral syringes/cups/droppers) that only display the metric scale. 2014-2015 Targeted Best Practices for Hospitals. 2014. Available at: www.ismp.org/sc?id=549.
- 4) ISMP Board of Trustees. ISMP statement on use of metric measurements to prevent errors with oral liquids. October 2011. Available at: www.ismp.org/pressroom/PR20110808.pdf.
- 5) US Department of Health and Human Services Food and Drug Administration, Center for Drug Evaluation and Research. Over-the-counter pediatric liquid drug products containing acetaminophen. Guidance for industry. October 2014. Available at: www.ismp.org/sc?id=550.
- 6) Consumer Healthcare Products Association. CHPA board of directors approves changes to industry's voluntary guidelines for pediatric liquid products. November 19, 2014. Available at: www.chpa.org/volguid.aspx.
- 7) National Council for Prescription Drug Programs. NCPDP recommendations and guidance for standardizing the dosing designations on prescription container labels of oral liquid medications. Version 1.0; March 2014. Available at: www.ismp.org/sc?id=551.
- 8) National Council for Prescription Drug Programs. Appendix A: Documents and resources consistent with the White Paper recommendation on the use of milliliter (mL). In: NCPDP recommendations and guidance for standardizing the dosing designations on prescription container labels of oral liquid medications. Version 1.0; March 2014; p.46-50. Available at: www.ismp.org/sc?id=551.
- 9) US Pharmacopeial Convention. General chapters, <17>. Prescription container labeling. Briefing on proposed changes. Correspondence number—C151044. *Pharmacopeial Forum*. 41(3):96.
- 10) US Metric Association. USMA mission and activities. November 18, 2014. Available at: <http://lamar.colostate.edu/~hillger/#usma>.
- 11) National Coordinating Council for Medication Error Reporting and Prevention. Recommendations to enhance accuracy of prescription/medication order writing. 1996, revised 2014. Available at: www.nccmerp.org/recommendations-enhance-accuracy-prescription-writing.

The National Alert Network (NAN) is a coalition of members of the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP). The network, in cooperation with the Institute for Safe Medication Practices (ISMP) and the American Society of Health-System Pharmacists (ASHP), distributes NAN Alerts to warn healthcare providers of the risk for medication errors that have caused or may cause serious harm or death. NCC MERP, ISMP, and ASHP encourage the sharing and reporting of medication errors both nationally and locally, so that lessons learned can be used to increase the safety of the medication use system.