

Standardize the Dosing Designations on Prescription Container Labels for Oral Liquid Medications to Metric (mL) Only

Dosing errors involving oral liquid medications have been a source of concern for many years. To administer most oral liquid prescription medications, a patient or caregiver must rely on the prescription container label dosing designations to guide measurement of the proper dose with a dosing device. The use of multiple volumetric units (e.g., teaspoons, tablespoons, droppersful) and multiple abbreviations (e.g., mL, cc, mLs; tsp, TSP, t) increase the likelihood of dosing errors by healthcare professionals, patients, and caregivers, which can cause patient harm. Common dosing errors include confusion between teaspoons and tablespoons, resulting in 3-fold dosing errors, and teaspoons and mLs, resulting in 5-fold dosing errors. The use of teaspoons and tablespoons on labels may encourage the inappropriate use of non-calibrated household spoons for dosing medications.

Milliliter (mL) Has Been Endorsed as the Standard Unit of Measure for Oral Liquid Medications by Many Professional Organizations Including:

National Association of Boards of Pharmacy (NABP): Model rules for pharmacy practice now require that “all drugs dispensed to ambulatory or outpatients, including drugs dispensed by practitioners, shall have a label affixed to the container in which drug is dispensed. The label shall conform with the USP chapter addressing prescription container labeling,” which requires metric-only dosing instructions for oral liquids.

American Society of Health-System Pharmacists (ASHP): “All prescription orders should be written in the metric system. [This] will help avoid misinterpretations and miscalculations when converting to metric, which is used in product labeling and package inserts.”

American Medical Association (AMA): “Encourage state Boards of Pharmacy to adopt the standards contained in the USP general chapter on prescription container labeling, which offers specific guidance on how prescription labels should be organized in a patient-centered manner.”

American Pharmacists Association (APhA): APhA “supports NCPDP recommendations for standardizing the dosing designations on prescription container labels of oral liquid medications.”

“...supports the use of the mL as the standard unit of measure for oral liquid medications.”

“...supports access to and universal availability of dosing devices with numeric graduations that correspond to the unit of measure that is on the container’s label for oral liquid medications.”

United States Pharmacopeial Convention (USP): “Use of metric units: Prescriptions shall be written to state the quantity and/or strength desired in metric units unless otherwise indicated...If an amount is prescribed by any other system of measurement, only an amount that is the metric equivalent of the prescribed amount shall be dispensed.”

Graduations on appropriate dosing devices (e.g., oral syringes, dosing cups) should be in metric units and limited to a single measurement scale corresponding with the dosing instructions on the prescription container label.

Teaspoon no longer is defined by USP as a standard unit of measure, and USP standards now require that dosing devices packaged with commercially available oral medications only include metric markings.

American Academy of Pediatrics (AAP): “Use appropriate dosing units (e.g., use mL-only and avoid spoon-based or nonmetric units; avoid nonvolumetric units [e.g., mg] in describing the dose amount).”

“Provide oral syringes when dosing accuracy is essential, especially when smaller doses are recommended (e.g., <5 mL) and when medications are for young children.”

“Provide a dosing tool with the smallest size to fit the dose without the need for filling the instrument multiple times for a single dose.”

“Encourage caregivers to ask for a dosing tool with all prescribed medications and to use their medication-specific tool each time.”

Pharmacy Leadership Call to Action: Inform, Educate, and Empower Pharmacy Staff

Use mL as the standard unit of measure whenever possible on prescription container labels. Avoid other abbreviations (cc, ml, ML) and the term milliliters spelled out.

When the prescription Sig contains dosing designations in units other than mL (e.g. teaspoons, tablespoons), convert to mL dosing instructions on the prescription container label.

When the prescription Sig contains dosing instructions in non-volumetric units (e.g., mg) or non-standard volumetric units (e.g., droppersful), convert the dosing instructions to mL, and use mL on the prescription container label.

Always use leading zeros before a decimal point for amounts less than one and never use trailing zeros after a decimal point on prescription container labels for oral liquid medications.

Use leading zeros (e.g., “0.5” mL, NOT “.5” mL).

Do NOT use trailing zeros after a decimal point, including in the hundredths or thousandths position (e.g., “2.5” mL, not “2.50” mL)

Place adequate space between the dose and unit of measure (e.g., “5 mL,” NOT “5mL”).

When dispensing an oral liquid medication, **include a dosing device with numeric graduations and units that correspond to the container labeling.**

Ensure that **point of dispensing verbal patient counseling, communication, and education use dosing designations that are consistent** with the prescription container label and the dosing device.

Educate patients or caregivers on how to use dosing devices correctly and ensure they have access to an appropriate dosing device before they leave the pharmacy. Educate the caregiver or patient and have them demonstrate how they will measure and administer the dose to validate comprehension.

Educate other pharmacy staff regarding importance of using **mL as the standard universal unit of measure for all oral liquid medications.**

Pharmacy leaders are encouraged to support patient counseling, communication, and education at point of dispensing. Community pharmacies may also provide patients with brochures or other patient-centered materials that emphasize patient safety measures to ensure safe use of medication and proper dosing.

Professional societies should educate prescribers about best practices for patient-centered labeling. Endorse the universal use of mL in prescribing oral liquid medications.

NCPDP RECOMMENDATION

mL (milliliter) should be the standard universal unit of measure used on prescription container labels for oral liquid medications.

e-Prescribing software must not permit prescriber override of metric units with U.S. customary (household) units (e.g., teaspoon).

Pharmacy systems should only generate dosing instructions for oral liquids in metric units.

NCPDP GUIDANCE

- The need to measure oral liquid medication volumes makes accurate dosing more challenging than solid medications.
- The use of multiple volumetric measures contributes to oral liquid medication dosing errors.
- Dosing errors related to the measurement of liquids result in wide variation in dosing, ranging from large multifold overdoses to significant underdosing.
- Studies confirm parents and caregivers measure liquids more accurately using mL.
- Many caregivers are unaware that use of nonstandard kitchen spoons for dose measurement should be avoided because kitchen spoons vary widely in size and shape.
- Pharmacy staff can contribute to caregiver dosing errors when they falsely believe translating metric instructions to household ones is more understandable.
- The standard abbreviation “mL” should be used on the prescription container label to avoid misreading lowercase “el” as the number one. Other abbreviations for milliliter (e.g., mls, cc) should not be used. If use of mixed case is not possible (e.g., because of legacy software limitations), lowercase (“ml”) or uppercase (“ML”) may be used while changes to the preferred and official “mL” abbreviation are implemented.
- Mnemonics, Sig codes, or any defaults used in computer systems to print prescription container labels should produce dosing designations using mL.
- e-Prescribing software should present prescribers with Sig options that apply metric volumetric units only and must not permit an option for prescribers to override metric with U.S. customary (household) units (e.g., teaspoon).
- When the prescription Sig contains dosing instructions in non-volumetric units (e.g., mg), convert dosing instructions to mL, and use only mL dosing instructions on the prescription container label to avoid challenges for the caregiver in calculating the correct volume to administer.
- When dispensing a different concentration than previously dispensed to the patient, it is critical that caregivers be instructed carefully about the volume to administer since it may differ from instructions they received with previous formulations of the oral liquid. They should be instructed to follow the current dosing instructions to avoid inadvertent underdosing or overdosing since medication concentrations may differ in each formulation.

Dose amounts should always use **leading zeros before the decimal point for amounts less than one and should NOT use trailing zeros after a decimal point** on prescription container labels for oral liquid medications.

- How dose amounts are expressed can cause significant overdoses.
- Existing healthcare standards indicate dose designations for decimal amounts should always use leading zeros and never use trailing zeros.
- Adequate space should be placed between the dose and unit of measure to improve readability and avoid errors (e.g., “5 mL” NOT “5mL”).

Dosing devices with numeric graduations and units that correspond to the container labeling should be made easily and universally available, such as **including a device each time oral liquid prescription medications are dispensed.**

Dosing devices should be of appropriate volume and graduated accuracy for the amount prescribed and should not use multiple units of measure (i.e., metric only, not metric plus household units).

For volumes up to 10 mL, oral syringes generally are the preferred dosing devices.

- How dosing designations are represented on dosing devices contributes to medication administration errors.
- Kitchen spoons vary considerably in delivered volume.
- Caregiver use of kitchen spoons is associated with higher rates of dosing errors. Spoon-based terms inadvertently endorse the use of nonstandard dosing tools such as kitchen tableware.
- Including multiple units on dosing devices (e.g., volume and mg-dose, metric and household) contributes to medication errors.
- The standard abbreviation “mL” should be used on the dosing device to correspond with the prescription container label.
- Oral syringes are more precise alternatives to dosing spoons and cups.
- Provide an optimal device that is not substantially larger than the recommended dose and does not require measurement of multiple instrumentsful for a single dose.