ISMP Institute for Safe Medication Practices
An ECRI Company

ISMP *Guidelines for Safe Electronic Communication of Medication Information*

ISMP has revised the ***Guidelines for Safe Electronic Communication of Medication Information***. The first draft of these guidelines was originally published in our February 20, 2003 newsletter, when implementation of electronic health records (EHRs), electronic prescribing (e-prescribing), and other health information technology (HIT)-related tools began to evolve in both inpatient and outpatient settings. Over the years, additional recommendations have been added to these *Guidelines* as these technologies have become a mainstay in healthcare, and their introduction has brought about significant changes in how medications are prescribed, dispensed, and administered. If the conventions used to communicate medication information electronically are not carefully considered, these technologies may contribute to medication errors rather than mitigate risks.

The scope of the ISMP ***Guidelines for Safe Electronic Communication of Medication Information*** covers only issues that deal with how information about medications is communicated in electronic formats, including EHRs, pharmacy computer systems, e-prescribing systems, and other displays of electronic information when using medication administration records (MARs), barcode scanning systems, smart infusion pumps, automated dispensing cabinets (ADCs), and intravenous workflow management systems (IVWMS). If you have any concerns with the guidelines, please contact ISMP to let us know (ismpinfo@ismp.org), and we will consider your comments.

Safe Presentation of Drug Names

1. When expressing a generic drug name, use all lowercase letters (unless using tall man letters as mentioned in *Item #5*), ensuring that the name matches the US Food and Drug Administration (FDA)-approved nomenclature so that electronic medication records agree with the manufacturer's carton and container labels.

2. When expressing a generic drug name, do not include the salt of the chemical unless there are multiple salts available or the salt alters the drug release (e.g., metoprolol tartrate and metoprolol succinate) and thus conveys meaningful information. If the salt is used as part of the name, display the full name of the salt unless an abbreviation has been approved by USP (i.e., K [potassium], Na [sodium], HBr [hydrobromide], and HCl [hydrochloride]). The salt should follow the drug name.

   Comment: The symbols Na and K are intended for use in abbreviating the names of the salts of organic acids, but these symbols should not be used when the word sodium or potassium appears at the beginning of an official drug name (e.g., Na bicarbonate is not acceptable because it may be misread as "no bicarbonate"). Do not use an abbreviation to replace the drug name (e.g., KCl is not acceptable).

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3. When expressing a brand drug name, use an uppercase first letter, followed by lowercase letters (unless using tall man letters as mentioned in *Item #5*); do NOT use all uppercase letters for drug names. Trademark symbols (e.g., TM, ®) should not be used. Do not allow medications to be ordered (or displayed) by a brand name that has been discontinued (e.g., Versed).

4. Display all medication names on one line in all electronic screens, medication administration records (MARs), and other electronic forms of communication. This includes drug names with associated modifiers. For example, include the word "Mix" and any numerical values that are part of the brand name for fixed combination insulin products (e.g., Novo**LOG** Mix 70/30) together on the same line.

5. Use **bolded**, UPPERCASE tall man letters (e.g., vin**CRIS**tine, vin**BLAS**tine) for specific groups of dissimilar letters in look-alike drug name pairs to visually differentiate them on all electronic screens. This helps minimize the risk of selecting the wrong product, particularly when medication names appear alphabetically in drop-down menus and search results. To promote standardization of the letters presented in UPPERCASE and **bold** font, follow the recommendations on the ***FDA and ISMP Lists of Look-Alike Drug Names with Recommended Tall Man Letters***.

6. Express suffixes (e.g., XL, SR, CD, CR) that are part of the brand name within the drug description field. When expressing modified-release formulations of generic medications, use terms that accurately and unambiguously convey the release formulation (e.g., dil**TIAZ**em 24-hour extended release [Cartia XT] 180 mg capsule).

7. Do not express a drug name in a manner that incorporates a number (e.g., 5-fluorouracil, 6-mercaptopurine), as these numbers have been confused with the dose or number of tablets/capsules to be administered. Express the drug name without the number if it is not needed or is not part of the official drug name (e.g., fluorouracil, mercaptopurine). Also, do not include numbers as superscripts and subscripts with drug names (e.g., vitamin K_1, vitamin B_6). Use drug or product names (e.g., phytonadione, pyridoxine).

8. Do not abbreviate drug names or refer to them by shortened names. Drug name abbreviations and shortened names have frequently been misunderstood, sometimes leading to harmful or fatal medication errors. For example, "nitro" has been misinterpreted as either nitroglycerin or nitroprusside infusions.

9. Avoid using drug regimen or protocol acronyms without defining the regimen or protocol at least once within the order set or other form of electronic communication.

Safe Presentation of Doses, Dosing Units, Weights, Measures, and Directions

10. Use standard terminology and safe expressions that are clear of ambiguity when expressing doses, dosing units, weights, measures, and directions for use. Avoid the use of known error-prone abbreviations, symbols, and dose designations, including those on the organization's "Do Not Use" list and the ISMP ***List of Error-Prone Abbreviations, Symbols, and Dose Designations***.

11. For acceptable route abbreviations, use all uppercase letters—IV, IM, SUBQ, and PO, without spaces or periods between the letters.

12. For acceptable frequency abbreviations, use all uppercase letters—BID, TID, QID, and QHS, without spaces or periods between the letters. For frequencies according to a specific time, use the lowercase letter "q" for "every," "h" for "hour(s)," and "min" for "minute(s)." Display time-specific frequencies without spaces or periods between the abbreviations and the time, and use Arabic numerals only (e.g., q4h, q5min).

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Safe Presentation of Selection Menus and Search Choices

13. Software vendors should develop and implement an algorithm that allows users to enter the exact number of characters to get only one unique drug name to appear on the screen when searching for medication names. If a dynamic search function is not available, consider requiring entry of a minimum of the first five letters of the drug name.

Comment: The entry of the first two, three, or four letters of the drug name (e.g., "met"), skipped character abbreviations (e.g., "ctx"), or a combination of the first few letters and dose (e.g., "meth10") has led to presentation of similar looking drug names together on the screen, which has resulted in selection errors or population of a field with an unintended drug.

14. Provide users with the ability to search by brand or generic name. Both brand and generic names should be displayed, when possible.

15. In drop-down menus and search results, the drug name, dose/strength, and dosage form are all visible together, without having to scroll left to right, or hover to see more details.

Examples:

simvastatin (Zocor) tablet 10 mg		met**FORMIN** 500 mg tablet
simvastatin (Zocor) tablet 20 mg	or	met**FORMIN** 850 mg tablet
simvastatin (Zocor) tablet 40 mg		met**FORMIN** 1,000 mg tablet

16. Do not list doses numerically by the first digit only, always list in order of strength (e.g., never 1 mg, 10 mg, 2 mg, 20 mg, 3 mg, 30 mg; always 1 mg, 2 mg, 3 mg, 10 mg, 20 mg, 30 mg).

Safe Presentation of Complete Medication Orders or Prescriptions

17. On the MAR, list the name of the drug and the patient-specific dose first, then the strength as needed (exception, see *Item #18*).

18. On the MAR, do not include the concentration (e.g., U-100, U-200, U-300) immediately after the name of the insulin (e.g., Humu**LIN** R U-100), except for regular insulin U-500 (Humu**LIN** R U-500). For all concentrations other than U-500 insulin, list the patient-specific dose after the insulin name, and the concentration after the dose (e.g., Humu**LIN** R 20 units [U-100]). For U-500 insulin, include the concentration before the patient-specific dose (e.g., Humu**LIN** R [U-500] 60 units).

19. Avoid situations, including automatic wraparound of entries, that result in listing the name of the drug and available dosage strength on the first line, and the patient-specific dose on the next line.

Electronic System Design Features: Medication Information

20. When drug names, dosing units, routes of administration, and frequencies appear on the same text line provide adequate space between items as well as a sufficient character limit to avoid use of potentially dangerous abbreviations.

21. For weight- and/or body surface area-based medication orders, include a required field for the mg/kg dose (or mg/kg/hour, mcg/kg/min, mg/m^2, or similar parameter-based dosing formula), and a field for the total dose, which should be calculated (and often rounded and/or standardized) automatically by the electronic system.

22. Provide a field to enter the purpose/indication for all medications prescribed.

Comment: Communicating the drug's purpose/indication may make errors more visible.

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23. Require entry of the minimum components of a complete medication order or prescription (e.g., drug name, strength/concentration, dose, frequency, route, purpose/indication).

a. Do NOT allow doses to be prescribed only by volume, number of tablets, or number of vials/ampules (examples of exceptions include vaccines, eye and ear drops, creams and ointments, liquid multivitamins, and mineral oil).

Comment: The order/prescription should contain the strength/concentration and not be communicated only by volume, number of tablets, or number of vials/ampules which increases the risk of mix-ups between available concentrations and dosage strengths that may result in wrong-dose errors.

b. Do NOT allow single orders for medications with range doses, various frequencies, or more than one route of administration. If orders for the same drug are prescribed at different doses, frequencies, and/or routes, require separate orders for each that specify objective measures to guide determination of which dose to administer, at which frequency, and by which route.

For example, an order written as: morphine 2 mg to 4 mg IV every 4 hours PRN mild pain, should be written as two separate orders: morphine 2 mg IV every 4 hours PRN mild pain, morphine 4 mg IV every 4 hours PRN moderate pain.

Comment: Examples of measures that may be used to guide determination of the dose, route, or frequency include a pain assessment (e.g., severity, chronicity, quality of pain; prior response to analgesics), a functional status assessment (e.g., impact on activities of daily living), nothing by mouth (NPO) status, and ability to tolerate oral medication.

24. Build prescribing platforms with required designated order component fields to promote complete and clear prescriptions and limit the need for free-text entry.

25. Display any "special instructions" and/or "note to pharmacy" fields in a prominent location where they are noticeable. To promote standardization, prebuild common precautions for specific drugs.

26. Provide a mechanism to facilitate safe order entry of complex medication regimens (e.g., chemotherapy, electrolyte solutions, parenteral nutrition), medications that require loading doses, or medications that require a tapering dosing schedule (e.g., steroids) so that the orders appear clearly, in a logical concise sequence, and include all required elements (which may be different than for routine medications).

27. Provide a mechanism to place a dose or doses of a medication on hold under specified conditions (e.g., heart rate less than 50 beats/min, international normalized ratio [INR] above 3.6). Provide a mechanism to document an anticipated end date and time, if known, and/or criteria for when to resume a medication on hold (e.g., hold doses until daily INR below 3.6).

28. Provide users with ways to emphasize medication- or patient-related warnings or other important clinical notes related to prescribed medications (e.g., upper- and lowercase letters, contrasting color, bolding, italicizing, choice of fonts, audible and visible alerts). When appropriate, warning statements should be presented in the active voice using affirmative statements (e.g., IV use only) instead of negative statements (e.g., Not for intrathecal use). This helps ensure that people understand the meaning of the hazard even if they do not read every word, thus avoiding errors (e.g., missing "Not" but seeing "for intrathecal use").

29. Provide users with the ability to clearly communicate directions for medications prescribed for specific, non-routine administration times or under certain conditions (e.g., after dialysis on dialysis days, start first dose now, after a missed or delayed dose).

30. Provide prescribers with the ability to electronically communicate the cancellation or discontinuation of outpatient prescriptions that have been previously transmitted (i.e., CancelRx transaction from NCPDP SCRIPT). Provide pharmacists with the ability to easily identify and manage prescription cancellations as well as transmit approval or denial of the request back to the prescriber to close the loop on the message.

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31. Vendors should provide users with the ability to link certain medications to ONLY the appropriate routes of administration and not present other routes of administration for selection. Users have to ensure that the functionality is enabled for that specific drug. For example, vin**CRIS**tine injection should link only to the IV route of administration.

Comment: Off-label use of some medications may allow for safe administration by an alternate route of administration (e.g., ophthalmic drops administered in the ear).

32. Provide users with the ability to prescribe or enter certain medications at ONLY the appropriate frequencies of administration. For example, fenta**NYL** transdermal patches should only be permitted every 48 or 72 hours, not daily.

Electronic System Design Features: Patient Information Associated with Medication Safety

33. To ensure automatic screening of patient allergies against prescribed medications, provide fields that require electronic documentation of known patient allergies (including medication, environmental, and food allergies) and previous adverse drug reactions (ADRs)/sensitivities, paired with a description of the type of reaction for each allergy and/or ADR/sensitivity, prior to the entry of medication orders. If no known allergy exists for a patient, ensure that this is noted and confirmed.

34. Prominently display all allergy, ADR, and sensitivity information, including the type of reaction, in a consistent location so it is viewable by the user immediately before or during order entry, order verification, and medication administration. Allergy alerts do not replace the need to visualize this information prior to entering and verifying orders or administering medications. Clear documentation of no known allergies should also be displayed in a standard location.

35. Allow the entry and display of ONLY metric measurements of actual patient height (in cm only) and actual patient weight (in kg only [or g for low-birth-weight infants]), and provide a field to document the date the height and weight were collected.

36. Provide users with a system that alerts if the patient's documented weight or height exceeds an age-based weight/height comparison threshold that suggests the possibility of an error (e.g., entering weight in pounds instead of kg, switching height and weight entries, entering an erroneous weight that exceeds a facility-defined percent gained or lost).

37. Display patient identification information containing at least two unique identifiers in a prominent area (e.g., upper lefthand corner) of all screens/windows, patient lists, and work queues in a consistent order so that users can efficiently and accurately find and verify patient identity. The information should continue to be displayed in the same location regardless of scrolling or other navigational mechanisms to move the screen/window.

38. Provide a mechanism that enables users to enter information or orders on only one patient's electronic record at a time. Users should be able to maintain only one record in input mode (unrestricted access to input information) at a time, along with one other record in view-only mode to coordinate care between two patients (e.g., mother and newborn). A deliberate and visually distinguishable action should be required to transition from one record to another record.

39. Allow clinicians to print a copy of all medications prescribed at discharge, or at the end of an outpatient or office visit, in a format that includes the drug name (generic, and brand if prescribed), patient-specific dose, dosage form, concentration/strength (if applicable), route, frequency, purpose/indication, and special instructions or precautions. If being discharged from an inpatient setting, include the date and time that any prior doses were given before discharge or the date and time the next dose is due. The list of medications prescribed at discharge, or at the end of an office visit, that are given to the patient should include medications taken previously that have been discontinued or modified, with a clear indication that these medications should be stopped or changed.