

Community/Ambulatory Care

ISMP Medication Safety Alert!®

Educating the Healthcare Community About Safe Medication Practices

Draft Guidelines for the Safe Communication of Electronic Medication Information

Electronic health records (EHRs), computerized prescriber order entry (CPOE) systems, electronic medication administration records (eMARs), and electronic prescribing (e-prescribing) systems are health information technologies (HIT) being widely adopted by healthcare providers in a national effort to improve the quality and safety of healthcare.¹ According to a 2014 national survey, more than 80% of US hospitals have implemented inpatient CPOE systems with clinical decision support, 93% have implemented eMARs, and 94% have partially (60%) or fully (34%) implemented EHRs.² In the outpatient setting, more than 94% of US pharmacies are accepting electronic prescriptions (eRx) from more than half of prescribers who are using these systems.^{3,4} The most substantial increases in implementation have occurred during the past 3 to 4 years due to federal incentives. As of July 2015, more than \$20.9 billion in incentives have been paid to Medicare and Medicaid providers for HIT implementation that demonstrates meaningful use.⁵

Examples of hazards

While EHRs, CPOE, eMARs, and e-prescribing systems have quickly become a mainstay in healthcare, their introduction has brought about significant changes in how medications are prescribed, dispensed, and administered. If the conventions used to communicate this information electronically are not carefully considered, these forms of HIT and others may actually contribute to medication errors rather than mitigate the risk.

In our newsletters, we have often detailed how poorly conceived abbreviations or dose expressions used in HIT software can make it difficult to differentiate between 100U and 1000, 1.0 and 10, or look-alike drug names. We have described the misidentification of alphanumeric symbols with electronic communication and provided a table with dozens of examples, including how the lowercase letter l looks exactly like the numeral 1 or the uppercase letter I, and the uppercase letter O looks just like the numeral 0.

We have described electronic communication errors caused by restricted character spaces or truncated listings that made it impossible to communicate the full name and dose of a medication (e.g., an order for Novo**LOG** Mix 70/30 FlexPen appeared as "NovoLog Mix FlexPen 70" due to a limited number of characters per field). We have tied the size limitation of drug inventory fields with forcing the use of unsafe drug name abbreviations (e.g., APAP, HCTZ) or truncated names for investigational drug name codes. We have also reported errors associated with a failure to maintain a space between the drug name, dose, and units of measure. For example, Amaryl2 mg has been misread as 12 mg.

We have reported that some HIT software platforms do not allow the use of tall man letters for dissimilar parts of drug name pairs with look-alike names. We have provided numerous examples of unsafe HIT defaults that are used to prepopulate fields or to populate fields with missing data—a default to teaspoons rather than mL for oral liquid medications is an example. We have pointed out that large doses without properly placed

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SAFETY briefs



Name change needed to prevent more Brintellix-Brilinta mix-ups?

We recently received a report about an elderly patient who was harmed as a result of a mix-up between **BRINTELLIX** (vortioxetine), used for major depressive disorders, and **BRILINTA** (ticagrelor), an antiplatelet agent that's used in patients with acute coronary syndrome. The patient was given a prescription for Brilinta 90 mg, but Brintellix 10 mg was dispensed. The patient fell and was admitted to a hospital after taking Brintellix for 9 days. The fall resulted in a periorbital hematoma (black eye) but no fractures. The dispensing error apparently happened in a pharmacy where the two drugs were stored side-by-side, and the wrong container was selected. It is not clear if barcode scanning was available. If it was, then had the prescription been entered into the pharmacy computer system accurately, it is likely that scanning would have prevented the mix-up. However, errors can also happen when selecting medications during order entry/verification. Typing the first few letters of the brand name into the computer may lead to either one name or both appearing on the screen, which has led to the wrong item being selected.

We added this name pair to the *ISMP List of Confused Drug Names*, which is on our website (www.ismp.org/Tools/confuseddrugnames.pdf), in February 2015. The US Food and Drug Administration (FDA) also warned healthcare professionals and patients about Brintellix and Brilinta errors on July 30, 2015 (www.ismp.org/sc?id=600), noting that over 50 reports had been received, almost all of which were sent by the manufacturer. In addition, Takeda, continued on page 2—[SAFETY briefs](#) >

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commas have been confused—for example, 100000 has been mistaken as 10000 (10,000) or 1000000 (1,000,000). We have provided examples of misinterpretations of symbols, dose designations, and abbreviations known to be error-prone (e.g., QD, tPA, > and <, IT) when used in electronic communications. Some of these errors have led to patient harm.

Guidelines for electronic medication information

To avoid errors, HIT vendors and users need a set of accepted guidelines related to the safe presentation of electronic data associated with medication information. There are quite a few standards already promulgated for various aspects of HIT, particularly related to the exchange, integration, interoperability, sharing, security, and retrieval of HIT. These standards have arisen from various national-level sources, including Health Level Seven International (HL7), Digital Imaging and Communications in Medicine (DICOM), National Uniform Billing Committee (NUBC), The Accredited Standards Committee (ASC) X12, National Council for Prescription Drug Programs (NCPDP), National Committee on Vital and Health Statistics (NCVHS), the Health Insurance Portability and Accountability Act (HIPAA), the federal EHR Incentive Program, and Healthcare Information and Management Systems Society (HIMSS) Electronic Health Record Association (EHRA).^{6,7} However, these and other standards-setting sources have not compiled a robust list of guidelines to promote the safe communication of electronic medication-related information.

To address this need, ISMP has compiled a set of **Draft Guidelines for the Safe Electronic Communication of Medication Information** (pages 4-6). We examined the literature and other credible sources to identify potential confusion that is unique to electronic communication or that affects both paper and electronic records, and then developed the draft guidelines. The scope of the draft guidelines is narrow and covers only issues that deal with how information about medications is communicated in electronic formats, including EHRs, CPOE systems, eMARs, pharmacy computer systems, e-prescribing systems, and other displays of electronic health information when using barcode scanning systems, smart infusion pumps, and automated dispensing cabinets. We encourage you to share your comments about the draft guidelines with us by **October 16** via email at: ismpinfo@ismp.org, or by visiting: www.ismp.org/tools/guidelines/SCEMI.

After the comment period, we plan to finalize the guidelines and submit them to The Office of the National Coordinator for Health Information Technology (ONC HIT), which has been given responsibility for the harmonization of standards for HIT from multiple sources. We also plan to share the guidelines with HIT vendors, standards-setting organizations such as The Joint Commission and the Centers for Medicare & Medicaid Services, and HIT-related professional organizations. We hope vendors will work cooperatively with their user facilities to improve the safety of the electronic communication of medications.

References can be found at the end of the **Guidelines** on page 6 >

Don't miss important **computer alerts** seen by technicians and office staff

PROBLEM: In many community pharmacy settings, pharmacy technicians or pharmacy interns enter prescriptions into the pharmacy computer system. A pharmacist later verifies that the prescription has been entered correctly, ensures the appropriateness of the medication, and verifies that the proper drug and dose has been prepared. The verification process is typically accomplished by comparing the prescription, pharmacy label, and the final product. In many locations, barcode scanning is employed to increase accuracy. As long as the original prescription is included in the verification process, this may

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the company that sells Brintellix, told us that it has initiated electronic messaging to pharmacists about the potential for mix-ups. But given the large number of ongoing reports, and in light of the potential for patient harm, it may be time for a name change for one of these products. Brintellix was approved in 2013. Brilinta was approved in 2011. Usually, when a name is changed, it is by the company whose product was approved most recently.



Auvi-Q ticking sound normal, but can be scary. AUVI-Q is the EPINEPHrine autoinjector that gives voice instructions to “talk” people through the injection process when they are having an anaphylactic reaction. You may recall an article that we published in our May 2014 issue about the ticking sound it can make if it isn't properly disposed after use. That sound has caused some frightening moments in hospital emergency departments (ED). To use the injector, the case along with the needle guard must be removed (view the Auvi-Q demonstration at: www.auvi-q.com/auvi-q-demo). The needle automatically retracts after use. However, if the case isn't replaced, the battery will continue to drain until eventually it emits a “ticking” sound as it dies out.

Recently, a hospital employee heard a ticking sound from a sharps container in the utility room of an adult emergency department. A “suspicious package” code was quickly initiated and appropriate officials, including local police and fire departments, were contacted for further assistance during the investigation. The ED was temporarily closed until the Auvi-Q autoinjector was identified as the ticking device and the area deemed safe for patients, families, and staff. The device had been brought to the hospital, presumably by a patient, and discarded in the sharps container. The outer case was not attached to the device and the battery died, thus resulting in the ominous ticking sound.

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seem to be a perfectly acceptable way to verify technician or pharmacy intern order entry and preparation of medications. However, the pharmacist may be unknowingly allowing the computer and the technician to perform the required drug utilization review. The checking pharmacists may not be aware of alerts that may have been displayed during the order-entry process unless the technician or intern notifies them. As a result, important drug interactions, allergies, duplicate therapies, excessive or subtherapeutic doses, or other identified contraindications may be missed.

While bypassing certain alerts can be clinically appropriate, the technician or intern (or office staff in physician offices) is not in a position to make this clinical decision, and important warnings sometimes are inappropriately overridden. For example, in a recent case reported to ISMP, a patient had a cephalosporin allergy documented in the pharmacy computer system. During order entry, the technician overrode the allergy alert that popped up while entering an order for cephalexin 500 mg; the technician also did not notify the pharmacist about the alert. The pharmacist checked the prescription but did not catch that the patient had an allergy to the medication. The patient ingested one capsule before catching the error. Thankfully the patient did not experience any adverse effects.

SAFE PRACTICE RECOMMENDATIONS: The pharmacist's ability to view and assess alerts that may have been bypassed by other staff during order entry and drug utilization review may not be available in some pharmacy computer systems. However, it is critically important that the pharmacist has the opportunity to review and react to these warnings. This same scenario is commonplace in physician offices where office staff (e.g., medical assistants) are allowed to send orders to pharmacies. Consider the following strategies to improve the verification processes when prescriptions are generated and dispensed.

Require pharmacist and prescriber review of clinically significant alerts. It should be impossible for order-entry technicians or pharmacy interns to bypass a clinically significant alert. Instead, these orders should remain in a queue for release by a pharmacist after responding to the associated alert. If a pharmacist eventually bypasses a clinically significant alert, require documentation of the reason so it can be used for improvement activities. The same process should be used by prescribers to review any alerts that appear before the prescription is sent to the pharmacy or printed for the patient.

Alerts printed along with labels. Some health information technology systems have the ability to print out significant alerts along with the other product labels that are produced. This way, the pharmacist or prescriber will be able to view the bypassed alerts when checking the final product before sending or dispensing the prescription.

Print a daily report of bypassed alerts. Most computer systems will allow users to print out a daily report of bypassed alerts for a pharmacist or prescriber to review. Review can take place during the nighttime hours, or there may be other recognized periods when workload is lower, staffing is better, or a pharmacist or prescriber is scheduled for this purpose. This is much more achievable if the reports are organized first by clinically significant alerts that have been bypassed. Otherwise, the length of the report may prohibit review and follow up. The process for follow up with problematic prescriptions will also need to be described, especially if the review occurs at night. While retrospective review of bypassed alerts is not optimal and should not replace concurrent verification and drug utilization review, many drug-drug interactions are unlikely to harm patients until at least a few days after concomitant administration, so there is often time to take action before harm occurs. The same may not be true for some duplicate therapy, allergy, and dosing errors, but harm could be mitigated if the problem is discovered quickly.

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Sanofi, which markets Auvi-Q, is aware of the issue. A similar product, **EVZIO** (naloxone injection, autoinjector) does not share this problem because a design change was made prior to marketing to prevent any beeping or ticking while the battery dies out. Hopefully, Sanofi will make a similar change to Auvi-Q.

It is important for users and healthcare practitioners who prescribe and dispense these devices to be aware of this issue. Patients should be made aware of this too. If the device is used at home or in public settings (e.g., school), the ticking of the used device without the case attached could cause a panic that is not warranted.

 Special Announcements**External job postings**

Did you know that ISMP has a job posting site for external medication safety career opportunities? Employers can submit job opportunities to ISMP to be posted on the site. The latest postings for jobs can be found at: www.ismp.org/jobline/joblist.asp?mode=E.

ISMP Cheers Awards

Each year, ISMP celebrates individuals and organizations that have set a standard of excellence in the prevention of medication errors during the previous 12 months. **Nominations for this year's Cheers Awards will be accepted through September 11.** We also invite you to join us for a gala dinner at The Chicory in New Orleans on **December 8** (during the American Society of Health-System Pharmacists Midyear Clinical Meeting) as we celebrate this year's winners! Visit www.ismp.org/Cheers/ to submit a nomination, register for the gala (click on Support), or make a donation to support ISMP medication safety efforts.

Draft Guidelines

for the

Safe Electronic Communication of Medication Information

Safe presentation of drug nomenclature and dose expressions

1 List all medication-related products by generic name using all lowercase letters (unless using tall man letters as mentioned in item #8) as the primary expression of drug nomenclature, ensuring that each matches US Food and Drug Administration (FDA)-approved nomenclature so that electronic medication records agree with all package labels.

2 Do not include the salt of the chemical when expressing a generic drug name unless there are multiple salts available (e.g., hydroXYzine hydrochloride and hydroXYzine pamoate). If the salt is used as part of the name (e.g., US Pharmacopeial Convention [USP]-approved abbreviations such as K [potassium], Na [sodium], HBr [hydrobromic acid], and HCl [hydrochloric acid]), it should follow the drug name, not precede it.

3 As appropriate, list associated brand names in a requisite field using an uppercase first letter (unless using tall man letters). Although the use of all uppercase letters is a standard convention for trademarks, mixed-case and lowercase letters are more unique and distinguishable than all block-like uppercase letters, which look similar especially in low lighting.⁸ Trademark symbols (e.g., TM, ®) should not be used.

4 Express suffixes that are part of the drug name (e.g., SR, CD, CR) within both the generic name field and the brand name field (e.g., diltiazem CD, Cardizem CD).

5 Do not abbreviate drug names (e.g., MTX for methotrexate has been misunderstood as mitoXANtrone; MSO₄ for morphine sulfate has been misinterpreted as magnesium sulfate).

6 Do not use outdated terminology when referring to medications or solutions (e.g., “heparin lock flush” for saline lock) or medical jargon that may not be as clear as familiar lay terms (e.g., “ophthalmic” and “otic” can be more clearly expressed as “eye” and “ear”).

7 Avoid using drug protocol acronyms (e.g., CVP) without defining the protocol (cyclophosphamide, vinCRISTine, predniSONE) at least once within the electronic communication.

8 Use tall man bolded letters (e.g., DOBUTamine and DOPamine) to help distinguish look-alike products on screens to minimize the risk of selecting the wrong product when medication names appear alphabetically in look-up lists. See www.ismp.org/Tools/tallmanletters.pdf for *FDA and ISMP Lists of Look-Alike Drug Names with Recommended Tall Man Letters*. Pharmaceutical manufacturers are required to use tall

man lettering for drug names on the FDA list.

9 Avoid the use of known error-prone abbreviations, symbols, and dose designations, including those on the *ISMP List of Error-Prone Abbreviations, Symbols, and Dose Designations* (www.ismp.org/Tools/errorproneabbreviations.pdf) that may cause confusion in electronic formats. Examples include:

a Do not use trailing zeros when expressing medication/solution doses (e.g., use 5 mg, never 5.0 mg).

b Use leading zeros for doses less than 1 measurement unit (e.g., 0.3 mg, never .3 mg).

c Spell out the word “units.” Never use the abbreviation U, which easily can be mistaken as a zero, causing a 10-fold overdose. Never abbreviate international units as IU, which has been confused as IV (intravenous); this measure can be expressed as “units” alone.

d Include properly spaced commas for dose numbers expressed in thousands or millions (e.g., 5,000 units).

e Express weights and measures in a standard fashion and use USP standard abbreviations for dosage units as follows:

(1) cm = centimeter

(2) m (lowercase) = meter

(3) kg = kilogram

(4) g = gram

(5) mg = milligram

(6) mcg = microgram

(do not use the Greek letter mu [μ], which has been misread as mg)

(7) L (uppercase) = liter

(8) mL (lower-/uppercase) = milliliter

(do not use cc which has been misread as U or the number 4)

(9) mEq = milliequivalent

(10) mmol = millimole

f Do not include a period after dose designation abbreviations (e.g., mg.).

g Do not use apothecary system designations or symbols (e.g., grains, drams, minims), or household measurements (e.g., teaspoon, ounces).

h Do not use IN as an abbreviation for intranasal (may be confused with IV or IM); use “intranasal” or “NAS.”

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i Do not use IT as an abbreviation for intrathecal (may be confused with other routes such as, intratracheal, intratumor, inhalation therapy, intratympanic); always spell out “intrathecal.”

i Do not use the abbreviations o.d., OD, q.d., QD, or q1d for daily; spell out the word “daily.”

k Do not use the abbreviations AD, AS, AU, OD, OS, and OU, to direct into which ear(s) or eye(s) to instill a medication; write out left ear, right eye, and so on.

l Do not use the abbreviations q.o.d. or QOD for every other day; spell out “every other day.”

m Do not use < or > signs; spell out the intended terms “less than” or “more than.”

See item #16 for a recommendation to provide adequate space in corresponding fields so these abbreviations do not need to be used.

10 Use the typical smaller font for fractions (i.e., ½ not 1/2) to express a partial tablet.

11 When the drug name, strength, dosage form, and dosage units appear together, list the generic name first, followed by brand name, strength, dose (if different than strength), and the dosage form (e.g., timolol [Timoptic if brand dispensed] 0.5% ophthalmic solution; diazepam 5 mg tablet). When the strength and dose differ, also list the amount needed for the dose (e.g., propranolol 5 mg [½ x 10 mg] tablet) on the eMAR.

12 When the drug name, strength/dose, and the unit of measure appear together, require a space between the drug name and strength/dose (e.g., propranolol20 mg has been misread as 120 mg), and between the dose and unit of measure (10Units has been misread as 100 Units).

13 Include the name(s) of the drug and the patient-specific dose (not just the strength dispensed) on the same line/entry on eMARs. Avoid entries where the name of the drug and available dosage strength are on the first line, and the patient-specific dose is on the next line.

14 List the most commonly used or preferred drug, strength, and dose first, if multiple drugs, strengths, and doses are available from which to choose.

 Design features that support safe communication

15 Use easy-to-read, larger size fonts not densely compressed when expressing electronic text.⁸ Familiar sans serif fonts without embellishments are preferred. However, serifs do not matter as long as the font style is not extreme or unusual.

16 Provide adequate space for items in data fields used to communicate drug names, dosing units, routes of administration, and frequencies. Two or three character fields force the use of potentially dangerous abbreviations.

17 If numbers are needed to sequence medication orders, provide adequate space between the numbers and the drug name to prevent misinterpretation of the sequencing number as the medication dose.

18 Provide a field to enter the purpose/indication for all medications communicated electronically. Require entry of the purpose/indication for the following types of medication orders: all as needed (PRN) medications; look-alike products (www.ismp.org/Tools/confuseddrugnames.pdf) that are known to be problematic (few look-alike name pairs are used for the same purpose); and medications that have different dosing based on the indication (e.g., desmopressin for hemophilia or diabetes insipidus) or have multiple indications not included in the approved labeling (e.g., most prescriptions for gabapentin are for off-label uses such as neuropathic pain syndrome, generalized anxiety, social phobia, migraine therapy). Communicating the drug's indication reduces the risk of improper drug selection and offers clues to proper dosing when a medication has an indication-specific dosing algorithm.

19 Require entry of the minimum components of a complete medication order or prescription (drug name, metric dose, frequency, route, indication). Do not allow doses prescribed only by volume, number of tablets, or number of vials/ampuls (exceptions include combination liquid medications available in a single concentration, eye and ear drops, creams and ointments, liquid multivitamins). Do not permit entry of range orders without objective measures to determine the correct dose.

20 To prevent the risk of misinterpretation, do not allow the components of a complete medication order or prescription to be created using a combination of both discrete fields and free-text fields (which could conflict or lead to misinterpretation). Limit the need for free-text entries in e-prescribing and CPOE systems by providing a “special instructions” field with a menu of choices related to common precautions for specific drugs (e.g., patient assessments, antidotes, avoidance of concomitant medications). Allow full capability of free-text entries in the pharmacy computer system to facilitate communication of important information among pharmacists (via pharmacy computer screens) and nurses (via eMARs).

21 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 alerts). When appropriate, warning statements should be presented in the active voice using affirmative statements instead of negative statements to ensure people understand the meaning of the hazard even if they don't read every word.⁸ For example, “For Oral Use Only” should be used instead of “Not for IV Use,” which a practitioner could misread as “IV Use” if viewing just a portion of the warning.

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22 Provide users with the ability to search by brand name, generic name, short name, or mnemonic, and link all means of accessing a name to default to a generic name. Also, organize generic and brand names by dosage form in look-up tables (e.g., multiple gentamicin products should be organized by parenteral injection, ophthalmic solution, cream, and other dosage forms).

23 Provide the ability to clearly communicate medications prescribed for specific, non-routine administration times or under certain conditions (e.g., with dialysis, while NPO, until tolerating liquids, prior to surgery).

24 Provide the capability to link all closely associated drug therapies so that they appear sequentially together on profile screens and eMARs (e.g., orders for PCA should be linked to corresponding orders for nausea, itching, and breakthrough pain), and also to facilitate discontinuation of associated therapies when the primary therapy is discontinued.

25 Provide the capability for users to link medications only to the appropriate routes of administration available for each drug. For example, vinCRistine injection should link only to the intravenous (IV) route of administration.

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

27 For weight-based/body surface area-based pediatric medication orders, include required fields for both the mg/kg dose (or mg/kg/hour, mcg/kg/min, mg/m², or similar dosing formula) and the total calculated dose.

28 Provide a mechanism to place medication orders on hold under specified conditions, and to alert users at specified times to remind them that doses have been held.

29 See ISMP guidelines for designing medication labels generated from electronic systems for use in the acute care and community pharmacy settings (www.ismp.org/Tools/guidelines/default.asp).

Prompts for patient information closely related to medication use

30 Provide fields that require electronic documentation of patient allergies (including food allergies) and associated reaction in a format where the allergy and reaction appear next to one another, prior to the entry of medication orders (except in emergencies).

31 Allow only metric measurements of patient height (in cm only) and weight (in kg only [or grams for low birth weight infants]), and include a field to document the date the weight was collected.

Other topics for which further investigation and standards are needed

32 If mnemonics or short names continue to be used, standards are needed that allow practitioners to access a particular medication list without entering the full name.

33 Use human factors data to select the appropriate character, text, and colors to use with electronic displays of information. For example, the contrast ratio for alphanumeric characters/text to the self-luminous computer screens or displays should not be below 7:1. Never display pure red text on a pure blue background or vice versa; never use pure blue or red text on a black background; and never use pure blue for text or fine details on electronic displays.⁹

34 A standard process is needed for expressing combination and compounded products, including products that are often referred to by coined names (e.g., banana bag, magic mouthwash). Currently, coined names can be used if the contents of the product are standardized and available for reference to prescribers, pharmacists, and nurses.

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