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ISMP

Long-Term Care Advise ERR™

Educating the Healthcare Community About Safe Medication Practices

Recommendations to prevent vaccine errors

Part 2: Analysis of ISMP Vaccine Errors Reporting Program

While the risk of adverse reactions to vaccines has been given considerable attention in recent years, the study of adverse events associated with vaccine errors has been much less extensive. Despite this, the World Health Organization (WHO) emphasizes that adverse events due to vaccine errors are more common than adverse events due to the properties of the vaccines themselves.[1,2]

To collect the details needed to understand vaccine errors and their causes, ISMP partnered with the California Department of Public Health in September 2012 to develop the ISMP National Vaccine Errors Reporting Program (VERP). Last month, we published **Part 1** of a 2-year analysis of nearly 1,000 vaccine error reports submitted to the ISMP VERP. From that analysis, the vaccines most frequently implicated in errors in elderly patients and residents included the following, listed in descending order:

- Influenza
- Hepatitis A (HepA)
- Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis adsorbed (Tdap)
- Diphtheria and tetanus toxoids, and acellular pertussis adsorbed (DTaP)
- Hepatitis B (HepB)
- Meningococcal Vaccine
- Pneumococcal Vaccine
- Varicella
- Zoster

Among all vaccine errors in the 2-year VERP data set, the most common contributing factors were as follows:

- Mistakes in choosing age-specific formulations of vaccines intended to prevent the same diseases
- Unfamiliarity with the vaccine, particularly its dose, dosing schedule, age specifications, route of administration, and a vaccine's components (e.g., combination vaccines; diluent and powder)
- Failure to check or verify the vaccination schedule and the patient's/resident's age, health record, or immunization records to avoid invalid doses administered too soon, or missed opportunities to vaccinate
- Confusion due to similar vaccine names and abbreviations
- Confusion due to similar or ambiguous vaccine labeling and packaging
- Administering diluents without vaccines, and/or just one component of two-component vaccines
- Using the wrong vaccine diluent
- Unsafe storage (e.g., too close to similar-looking vaccines, temperature excursions, expired vaccines)
- Giving a vaccine to the wrong patient or resident

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SAFETY wires

Misread handwritten orders. We recently received a report from a long-term care (LTC) facility about an order for clonazePAM 1 mg PO TID that was misinterpreted as LORazepam 1 mg PO TID (**Figure 1**) in the pharmacy. Fortunately, a nurse caught the error before the resident received the wrong drug. While nurses may be familiar with residents and know which benzodiazepine the physician has prescribed, the pharmacist filling the prescription may not. Be sure the medication dispensed by the pharmacy is the correct medication for the resident, particularly with handwritten orders. Clarify any unclear or illegible orders before sending them to the pharmacy (although, in this case, the nurse likely thought the order was legible and clear). Transitioning to a fully utilized electronic health record (EHR) can help eliminate the risk of misinterpreting handwritten orders.

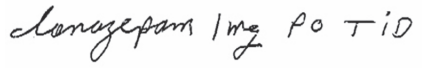

Figure 1. Handwritten order for clonaze**PAM** misread as **LOR**azepam.

Inappropriate use of the comment field. ISMP has received numerous error reports when the field for "comments" in the electronic prescribing (e-prescribing) system was used to clarify a medication order. According to a recent error report, a resident was supposed to receive 2,500 mcg of vitamin B12 every other day. The nurse entered the electronic order incorrectly as "Q3D" instead of "every other day." The nurse tried to clarify the order by entering the correct directions, "every other day," in the comment field. Even though the comment was on the bottom of the electronic medication administration record (eMAR), the clarification went unnoticed, and the resident received the B12 every 3 days.

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In **Part 2**, we provide recommendations to reduce the risk of vaccine errors based on the contributing factors identified in the 2-year data set. The contributing factors are highlighted in **green**, and the recommendations are listed under each contributing factor. Some recommendations will reduce the risk of errors associated with several different contributing factors. To avoid duplication, these recommendations appear under a single contributing factor but are highlighted with an asterisk (*) to note their ability to also address other causative factors.

Errors with age-specific formulations

- Prior to prescribing, dispensing, or administering a vaccine, verify the resident's age by asking the birth date (if the resident is available and mentally alert) while referencing the resident's health record, immunization record, and/or medication administration record (MAR).
- Compare the resident's current age with information on the applicable immunization schedule and Vaccine Information Statement (VIS) from the Centers for Disease Control and Prevention (CDC).

Wrong resident errors

- If multiple residents are being vaccinated at the same time in the same immediate vicinity, structure the vaccination to occur one resident at a time. Bring only one resident's vaccines into the treatment area at a time, labeled with the vaccine name and intended resident's name on each container. If more than one vaccine must be administered to a resident, keep them separate (e.g., separate trays).*
- Verify the intended resident's identity using two unique identifiers (e.g., name and birth date) before administering each vaccine. Directly compare this information to the MAR. Consider having the resident's picture posted at the bedside to help with identity verification.

Invalid doses (given too soon) or missed opportunities to vaccinate

- Prior to vaccination, verify the resident's current immunization status by checking the resident's health record and vaccination record to avoid omissions, duplicate vaccine doses, and/or administration of one live vaccine within 28 days of another. If possible, build an alert into the MAR or electronic MAR (eMAR) vaccination record to remind staff to review the resident's immunization record or discuss prior immunizations with the resident.
- Locate missing vaccination records whenever possible by contacting previous healthcare providers and reviewing state or local immunization information systems. If records cannot be located, residents should be started on an age-appropriate vaccination schedule.
- Post up-to-date, easy-to-read immunization schedules that staff can quickly reference in clinical areas where vaccinations may be prescribed and administered.[3] If possible, link the immunization schedule to an eMAR and/or vaccination record.*
- For frequently administered vaccines, establish standard order sets or protocols, which include:[4]*
  - ☐ The full generic name, brand name (if applicable), and standard abbreviation[5]
  - ☐ Criteria for screening residents to determine the need for vaccination, indications, contraindications, and precautions
  - ☐ Directions for administering the vaccine, including the route and any special procedures required to enhance safety
  - ☐ Information regarding any required follow-up doses

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In another reported case, a medication was ordered with directions to take 1 capsule every morning, which was the standard default directions in the computer. But a nurse, who did not know how to change the dose in the e-prescribing system, entered the correct dose as "2 capsules per dose" in the comment field. Unfortunately, the resident received only one capsule for more than a week before a family member noticed the error.

In yet a third reported case, a nurse received a telephone order for a resident to receive warfarin 1.5 mg daily. During order entry, the nurse chose warfarin 3 mg tablets, intending to include directions to administer a ½ tablet daily. However, the nurse accidentally selected 1.5 tablets instead of 0.5 (½) tablets, and the final entry of the order read "warfarin 3 mg—Administer 1.5 tablets daily." In the special instructions section of the entry, the nurse tried to clarify the order by entering, "Administer 1.5 mg daily." Unfortunately, the pharmacy dispensed 4.5 mg per dose, and the resident received 2 days of the threefold overdose (4.5 mg), resulting in an elevated INR and risk of bleeding.

Using the comment field to correct electronic orders is problematic. Often, the pharmacy does not see the information in the comment field because the interface may not properly transmit it to the pharmacy system. Also, nurses can easily overlook comments on the eMAR when administering medications, and in some cases, the information may not appear on the eMAR.

Staff and prescribers should seek assistance if they cannot enter the correct dose or frequency into the e-prescribing system, rather than relying on the comment field to correct the problem. Access to a "superuser" who can help on a 24/7 basis to assist staff with problems is recommended.

CDC issues core elements for antibiotic prescriptions in nursing homes. The Centers for Disease Control and Prevention (CDC) states that 4.1 million Americans are admitted to or reside in nursing homes during a given year. Up to 70 percent of nursing home residents received antibiotics in one year, and up to 75 percent of the antibiotics

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- ☐ Details regarding what (e.g., lot number, expiration date) and where (e.g., vaccination record, immunization registries) to document vaccine administration
- ☐ An emergency protocol to follow if the resident develops an adverse reaction

Wrong route errors caused by unfamiliarity with the vaccine

- Post an up-to-date, quick reference chart for staff to verify the route of administration for all vaccines. An excellent chart is available from the Immunization Action Coalition (IAC).[6]
- Highlight the route of administration on MARs/eMARs by using boldface type.
- Templates for electronic prescribing (e-prescribing) systems should only allow the correct route of administration to be listed and selected.

Errors with combination vaccines or vaccines with diluents

- On order sets, MARs, eMARs, and vaccination records, list the brand names and all components of combination vaccines and directions for mixing.
- Only use the vaccine diluents supplied and packaged by the manufacturer with vaccines that require reconstitution. Vaccine diluents are not interchangeable, and stock vials of sterile water or normal saline should not be used as a substitute.
- Establish a process to keep two-component vaccines together, and to keep diluents and their corresponding vaccines together if storage requirements do not differ.
- Document the NDC number, lot number, and expiration date of each vial in the vaccination record or log *before* administration to confirm selection or preparation of both components of two-component vaccines. Documentation of actual vaccine administration should occur *immediately* as part of the administration process, along with the injection site location.*
- Establish ongoing education of staff who might dispense and administer vaccines,* which includes discussion of safety issues with two-component vaccines and vaccines with specific diluents. Staff should understand the differences between two-component vaccines and vaccines packaged with specific diluents.

Wrong vaccine errors related to vaccine nomenclature

- Differentiate the appearance of similar vaccine names on computer screens and MARs/eMARs by highlighting dissimilarities and including full product names, starting with the brand name (if applicable) first, followed by the generic name, especially for multi-component vaccines (e.g., **PENTACEL** [DTap-IPV/Hib]).*
- Encourage prescribers (e.g., through order sets and forms) to order vaccines with look-alike generic names by using the brand name of the vaccine, and not by the CDC-approved abbreviation alone.*
- If vaccine abbreviations are permitted, allow only current, standard, CDC-approved abbreviations to be used.[6] Follow the CDC recommendations to list both the full generic name (and brand name) along with the approved abbreviation on all electronic and preprinted forms to reinforce the product identity and the correct use of abbreviations.
- Use resident vaccination records with enough space to list full vaccine names.
- Review immunization record templates and update any vaccine abbreviations to the current CDC recommendations.
- Use the brand name of polysaccharide vaccines on order entry and automated dispensing cabinet (ADC) computer screens, pharmacy labels, MARs, eMARs,

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were prescribed incorrectly. On September 15, CDC released a resource designed to help nursing homes improve antibiotic prescribing practices and reduce inappropriate use to protect residents from antibiotic-resistant infections, such as *C. difficile*. ***The Core Elements of Antibiotic Stewardship in Nursing Homes*** (www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html) provides examples of how antibiotic use can be monitored and improved by nursing home leadership and staff, as well as a companion checklist to help nursing homes assess policies and practices already in place.

Dose-checking software is important. Clinical decision support (CDS) systems are software systems that provide pertinent, organized, clinical knowledge and patient/resident information for enhancing health-related decisions. These systems are important medication safety components of an electronic health record (EHR) and electronic prescribing (e-prescribing) system. One of the key features of a CDS system is a dose-checking feature to alert the person entering a medication order to doses that would typically be too high or too low for the patient/resident. Without this safeguard, medication errors when prescribing or transcribing orders can reach patients/residents and lead to harm.

We recently learned about an order for insulin detemir (**LEVEMIR**) 8 units that was accidentally entered into an e-prescribing system as Levemir 80 units. This is a very large dose for a long-acting insulin. Had the e-prescribing system issued a warning during order entry, the mistaken entry might have been detected and the error corrected before completing the order. Unfortunately, the error was discovered a few days later by nursing staff after the resident already received a number of doses. The 90-year-old resident died shortly thereafter, but it is uncertain if the mistake resulted in her death.

As we reported in the March 2015 issue of this newsletter, respondents to our survey on e-prescribing indicated that about 1 in 5 long-term care (LTC) facilities have e-prescribing systems that do **not** warn staff about any potentially unsafe orders. Of those with an alert system, only about one-

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vaccination records, and shelf/storage area labels. Avoid listing the conjugate, which may be mistaken as the vaccine type. For example, do not include "tetanus toxoid conjugate" when referring to the *Haemophilus b* conjugate vaccine, Pentacel, as staff could confuse this vaccine with a tetanus toxoid vaccine.

- Prohibit the use of coined or informal names for vaccines.
- Read back verbal orders to the prescriber for clarification.

Wrong vaccine and dose errors related to labeling and packaging

- Store vaccines with similar packaging or names on different refrigerator shelves to lessen the risk of errors.*
- Unless the vaccine is prepared in front of the resident and administered immediately, vaccines prepared in syringes must be labeled. *Peel-off* labels to use for this purpose may be available on some, but not all, manufacturer's vaccine vials. So it is difficult to standardize a process that includes them. The *peel-off* labels can also be used to document administration of a vaccine on vaccination records. Ask your pharmacy provider if they have these available.*

Errors related to unsafe vaccine storage

- Consult the CDC *Vaccine Storage and Handling Toolkit* to ensure the use of proper vaccine storage units and equipment (i.e., not all refrigerators are acceptable), temperature ranges, temperature monitoring, placement of vaccines in storage units, and recommended actions.[7] This will help to minimize conditions that could compromise proper handling.
- Separate vials and syringes into bins or other containers according to vaccine type and formulation. Never store different vaccines in the same containers.
- Do not store vaccines with similar labels, names, abbreviations, or overlapping components (e.g.,Tdap,Td) immediately next to each other or on the same shelf.*
- Label the specific locations where vaccines are stored to facilitate correct, age-specific selection and to remind staff to combine the contents of vials. Examples of vaccine labels for storage areas are provided by the CDC.[8]
- Do **not** draw a single vaccine or batches of vaccines into syringes in advance of immunizations. Draw up vaccines only at the time of administration. As a safer alternative, use commercially available, prefilled and labeled syringes of vaccines from manufacturers whenever possible.
- Never prepare a vaccine in an unlabeled syringe for another person to administer later. The person preparing the vaccine should label the syringe and administer the vaccine (exceptions include prefilled and labeled vaccines prepared by the pharmacy or from manufacturers).
- If not using manufacturer's prefilled syringes, the pharmacy should prepare each vaccine in a clearly labeled syringe and dispense it on a resident-specific basis when possible. If vaccines are prepared in the facility, each dose should be prepared in a syringe immediately prior to administration.*

Administration of an expired drug

- Be aware of the short shelf life of live, attenuated influenza vaccine, and implement measures to avoid administering an expired vaccine.
- Remove expired vaccines from units and storage areas/refrigerators/freezers where viable vaccines are stored. Label the vaccines as expired and sequester them away from in-date medications and drug preparation areas.
- If an expired vaccine has been administered in error, revaccination with a valid dose is advised.[9]

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third warned that a dose was too high. The inability to customize the display of information on screens, require entry into certain fields, or build or alter alerts was also widespread among LTC e-prescribing systems.

While a LTC facility cannot change the capabilities of their EHR system, they can encourage their vendors to incorporate such features into their systems. Also, there are facilities that have EHRs and order entry systems with CDS capabilities, but don't use them. Those facilities need to ensure that these features are "turned on" and that their system is customized appropriately to maximize the error-reduction potential of the system. For those facilities that are looking to acquire a new EHR or order entry system, such capabilities should be a required feature of any system under consideration. It may also be helpful to include the topic of insulin in staff educational offerings to communicate typical, safe dosage ranges for the various types of insulin (rapid-acting, intermediate-acting, long-acting).

Look-alike dose and dosage form designations can cause errors, too. Many are aware that some drugs have look-alike and sound-alike names, but look-alike doses and confusing dosage form designations can be just as error-prone. In a recent error reported to ISMP from a long-term care (LTC) facility, a prescriber called in a verbal order for "vitamin D3 1,000 units." The nurse wrote the verbal order as "Vitamin D3 10000 IU" (extra zero) on an order sheet and faxed a copy of it to the pharmacy. The pharmacy dispensed vitamin D3 10,000 unit capsules. No harm came to the resident as a result of this error. Besides not using the error-prone, unapproved abbreviation of IU, the use of a comma for dose designations of 1,000 or more can reduce errors when writing or transcribing verbal orders or interpreting doses on forms/lists.

A look-alike dose error was reported when **HYDRO**codone-acetaminophen 10/325 mg was incorrectly dispensed and administered instead of the ordered **HYDRO**codone-acetaminophen 5/325 mg. The resident received 12 doses before the error was caught. The nurses may have seen the drug name and the 325 mg acetaminophen dose and overlooked the difference

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Involve the resident in the verification process

- Provide all residents with a VIS in their native language prior to vaccination. Time to read the VIS before vaccination should be provided. In the resident's record, document the publication date of the VIS and the date it was given to the resident.*
- Link the VIS (in the most predominant languages of the population served) to the eMAR or vaccination record so they are readily accessible.
- Hold discussions with residents about the vaccines being administered and answer any questions. The VISs are not a substitute for direct conversation between the staff and resident regarding the risks and benefits of vaccination.
- When possible, ask residents to participate in the verification process prior to vaccine administration by reading the VIS and verifying that the resident is within the specific ages for the intended vaccine, and by simultaneously comparing the name of the vaccine on the VIS to the vaccine name stated by the staff and listed on the vaccine label. Immunization records and/or vaccine logs in which the vaccine name, dose, lot number, and expiration date have been recorded immediately before vaccination can also be verified by the resident as the information on the vaccine label is read aloud by the staff.*

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- **American Pharmacists Month** (October)
- **National Hospital & Health-System Pharmacy Week** (October 18-24)
- **National Pharmacy Technician Day** (October 20)!

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in the **HYDRO**codone dose (10 mg vs. 5 mg). Again, no resident harm resulted.

Finally, an error involving a look-alike dosage form designation occurred when oxybutynin IR 5 mg tablets were ordered by the physician but oxybutynin ER 5 mg tablets were entered by the nurse into the electronic health record (EHR). The order from the EHR was electronically sent to the pharmacy without a copy of the original physician's order. The dose designation of IR for immediate release is unnecessary, and can be easily confused with ER (extended release) and SR (sustained release), and thus, should be avoided. Furthermore, ISMP recommends that prescribers enter orders directly into EHR order entry systems. However, if a nurse must enter the order, a copy of the original physician's order should be faxed/scanned and sent to the pharmacy at the same time so that the pharmacist can independently double check the order to prevent such transcription/order entry errors.

Clarify confusing orders. We recently received an error report from a long-term care (LTC) pharmacy when an intended order for cef**TRIAX**one (**ROCEPHIN**) 1 gram today, and repeat in 24 hours, was sent from the LTC electronic prescribing (e-prescribing) system as "Rocephin 1 gm qd7 and repeat in 24 hrs." In the e-prescribing system, the unclear dose designation of "qd7" was meant to indicate "once a day on day 7 (Sunday)." Unfortunately, the pharmacist misinterpreted the abbreviation and thought cef**TRIAX**one 1 gm daily for 7 days had been ordered. The resident received 3 doses before the error was discovered. If an order is unclear or confusing, clarification with the prescriber should always occur. If the dose designation cannot be changed in the e-prescribing system, having a listing or chart of the e-prescribing system's dose designations available for reference can help.

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Editors: Darryl Rich, PharmD, MBA, FASHP; Mary Knapp, MSN, RN, GNP, NHA, FAAN; Ann Shastay, MSN, RN, AOCN; Judy Smetzer, BSN, RN, FISMP; Jon Schwartz, MD, CMD. ISMP, 200 Lakeside Drive, Suite 200, Horsham, PA 19044. Email: ismpinfo@ismp.org; Tel: 215-947-7797; Fax: 215-914-1492.