**Technician Tutorial:**
Calculating Days’ Supply

Calculating days’ supply of “fixed quantity medications,” such as inhalers, insulin, creams or ointments, or eye or ear drops that come in container sizes with specific amounts, can be tricky. At the same time, it’s a critical skill for pharmacy technicians to have. An incorrect days’ supply can lead to a number of problems such as the patient getting the wrong amount of a medication (i.e., too much or too little for the specified amount of time), rejected insurance claims, and insurance audit flags. This PL Technician Tutorial reviews strategies for calculating days’ supply of fixed quantity medications, along with special considerations for different types of fixed quantity medications and example calculations. We have additional information about billing in our PL Special Report, Preparing for Pharmacy Audits, and our PL Technician Tutorial, Billing for Rx Drugs.

**How is calculating days’ supply of fixed quantity meds different from calculating days’ supply of tablets or capsules?**

For meds that come as tablets or capsules, it’s relatively easy to calculate days’ supply since you can generally choose a specific quantity to dispense. You can simply calculate the exact number of doses to dispense based on the prescribed days’ supply if it’s indicated on the Rx.

**Example:** A patient comes in with an Rx for cephalexin 500 mg caps, one cap PO three times daily x 10 days. You would dispense the number of caps to last for 10 days:

3 caps/day x 10 days = x caps  
**x** = 30 caps

On the other hand, if only a quantity and not a days’ supply is written on the Rx, you can calculate the days’ supply by dividing the total number of doses to be dispensed by the number of doses used per day.

**Example:** A patient has an Rx for Plavix 75 mg tabs, one tab PO once daily #30. You would divide the number of doses to be dispensed by the number of doses used per day:

30 caps x day/1 cap = x days  
**x** = 30 days

The calculation of days’ supply for fixed quantity meds is most similar to the second example. The quantity to dispense usually won’t be written on the prescription, but instead you will need to choose the most appropriate container size and calculate days’ supply from that quantity. In most cases, the trick is to convert both the prescribed dose and the amount of drug in the whole container into the same unit of measure (e.g., drops, mL, puffs, units, etc).

**Is there one single method for calculating days’ supply for fixed quantity meds, or does it differ by the type of med?**

The basic idea for calculating days’ supply of fixed quantity meds is the same. You need to figure out how much of the med the patient will use each day, and then figure out how many days the container of med will last. **Do this by dividing the total amount in the container by the total amount used each day.** Once again, the trick is getting both the total amount in the container and the amount used each day into the same unit of measure. However, you will see that there are nuances to be taken into consideration for different types of meds.
Inhalers. Check to see how many “puffs” there are in one inhaler. This information can usually be found on the box or outer wrapping of the inhaler. If it is not on the box or outer wrapping, it can be found in the package insert.

Example: A patient brings in a prescription for an albuterol inhaler 2 puffs four times daily. You figure that this is 8 puffs per day. The inhaler has 200 puffs. What is the days’ supply?

200 puffs x 1 day/8 puffs = x days
x = 25 days

Note that some inhalers have a beyond-use date once the outer wrapping is removed. Do not enter a days’ supply for longer than this number of days.

Nebulized meds. For nebulized meds, you need to know how many vials are contained in each box. (A patient might need to use more than one vial for a dose. However, partial vials are generally discarded after use and so each vial can’t be counted more than once toward the days’ supply.)

Example: A patient has an Rx for levalbuterol 0.63 mg nebulized TID. This is three doses of 0.63 mg/vial per day. One box of levalbuterol 0.63 mg/vial has 24 vials. What is the days’ supply for one box?

24 vials x 1 day/3 vials = x days
x = 8 days

Insulin. For insulin, you need to know how many units are in one vial. There are usually 1000 units/vial (100 units/mL x 10 mL = 1000 units) unless you are dispensing U-500, in which case there are 5000 units/vial (500 units/mL x 10 mL = 5000 units).

Example: A patient brings in a prescription for Lantus insulin 10 units subQ once daily. There are 100 units/mL of Lantus insulin and 10 mL of Lantus insulin per vial, so 100 units/mL x 10 mL = 1000 units. What is the days’ supply for one vial of Lantus?

1000 units x 1 day/10 units = x days
x = 100 days

Note that the vial of Lantus is only good for 28 days once opened or stored out of the fridge. So in this case, you will need to default to a days’ supply of 28 days since the patient should discard any remaining med after this time.

The same calculation can be used for insulin pens, cartridges, etc. Just figure out the total number of units in the amount of insulin to be dispensed. For example, the Lantus pen device still has 100 units/mL, but the device and cartridges only have 3 mL of insulin instead of 10 mL like the vials. Each box of cartridges contains five cartridges, so the total number of units in a box of cartridges is 100 units/mL x 3 mL/cartridge x 5 cartridges/box = 1500 units.

Rarely, a patient will be ordered what’s called sliding scale insulin, where variable amounts of insulin can be used throughout the day depending on the patient’s blood sugar. Figuring out the days’ supply in this case seems complicated. But it can be quite simple if you follow these steps. Look for the maximum number of units that could be administered per dose and the maximum number of times a dose could be given per day to determine how long a vial of insulin will last for a sliding scale Rx. Some prescriptions for sliding scale insulin may say to “use as directed.” If this is the case, check with the pharmacist for clarification on the dose and frequency that you should use to calculate the days’ supply.
Example: A patient comes in with a prescription for sliding scale insulin that instructs him to check his blood sugar every six hours and administer 2 units of U-100 regular insulin for blood sugar 151-200 mg/dL; 4 units for blood sugar 201-250 mg/dL, 6 units for blood sugar 251-300 mg/dL, and 8 units for blood sugar 301-350 mg/dL. (Note in Canada the units for blood sugar levels are mmol/L, but the calculation process is the same as above.)

In this case, the maximum dose that could be administered per day would be 8 units of regular insulin four times per day, or 8 units/dose x 4 doses = 32 units.

Since a vial of U-100 regular insulin contains 1000 units,
1000 units x 1 day/32 units = x days
x = 31 days

Note that the vial of regular insulin is only good for 31 days (U.S.) or 28 days (Canada) once opened or stored out of the fridge. As such, you would need to default to the appropriate days’ supply, which would be 31 days in the U.S. and 28 days in Canada. (Some additional considerations for sliding scale insulin include making sure that the directions are spelled out on the label and also referring the patient to the pharmacist to make sure that he or she understands the directions for use.)

Eye drops and ear drops. For eye drops and ear drops, check how many mL are contained in a bottle. (This will be on the label on the bottle, or on the box if the bottle is contained in a box.) Then, figure out how many drops are in the bottle. Usually, the conversion factor is 20 drops/mL. However, some insurers use 15 drops/mL or 12 drops/mL. Check with the pharmacist to find out which one to use.

Example: A patient has an Rx for Cortisporin Otic four drops in the left ear TID x 10 days. This is 12 drops/day (4 drops/dose x 3 doses/day = 12 drops). Cortisporin Otic comes in 10 mL bottles, which is equal to 200 drops (10 mL x 20 drops/mL = 200 drops). What is the days’ supply per bottle of Cortisporin for this patient?

200 drops x 1 day/12 drops = x days
x = 17 days

Note that even though the Rx for eye drops or ear drops might specify the number of days the patient is to use the drug, it is best to enter the actual days’ supply into the computer. If there are multiple container sizes, be sure to pick the closest container size that will have enough drug to last for the entire course of therapy.

Oral liquids. While some oral liquids can be dispensed in exact amounts from stock bottles, others, such as antibiotic suspensions, come as fixed quantities. You’ll need to convert doses to mL if they aren’t already ordered that way.

Example: A patient has an Rx for amoxicillin suspension 400 mg/5 mL, 1/2 tsp PO Q8H x 10 days. You know that one teaspoon = 5 mL, so you calculate that the patient will be taking 7.5 mL total per day (5 mL/tsp x 0.5 tsp/dose x 3 doses/day = 7.5 mL). Amoxicillin 400 mg/5 mL comes in 50 mL, 75 mL, and 100 mL bottles. However, you only have the 100 mL bottles in stock. What is the days’ supply?

100 mL x 1 day/7.5 mL = 13 days

You double check how long the drug is good after it’s reconstituted and label it accordingly (14 days). You enter a days’ supply of 13 days. However, if the calculated days’ supply was more than 14 days, you would default to 14 days, similar to the insulin examples. (If you had a 75 mL bottle in stock, you can see it would have been perfect for a 10-day supply [75 mL/bottle x day/7.5 mL = 10 days].)
Topical creams and ointments. For topical meds, you will need to find out the general size of the area being treated. Then you can use the “Rule of Hand” to calculate days’ supply. One gram will cover the area of about four flat hands, wrist to fingertips with fingers together (i.e., four handprints).

Example: A patient has an Rx for fluticasone 0.05% cream, apply BID to left forearm x 14 days. You look at the patient, and see that the surface of your hand is roughly half of his forearm. So according to the “Rule of Hand” you will need about 0.5 grams (two flat hands) to cover his forearm one time. This will mean he will need about one gram per day, or a minimum of 14 grams to fill the Rx. Fluticasone 0.05% cream comes in 15 g, 30 g, and 60 g tubes. You pick the 15 g tube and figure out days’ supply.

\[ 15 \text{ g/tube} \times \text{ day/1 g} = 15 \text{ days} \]

Is there anything special that should be taken into consideration with fixed quantity meds in the hospital setting?
In the hospital setting, dispensing fixed quantity meds is a little simpler than in the community pharmacy setting. Often, just one container size of a med is stocked, and when a patient’s supply is depleted, a nurse will reorder a new supply. For example, if a vial of insulin is dispensed to a patient, the vial will be used until it is gone or the beyond-use date is reached (whichever comes first), and then a new one will be reordered by the nurse so that a new vial is sent to the patient care unit for the patient.

Keep an eye out for fixed quantity meds that are reordered more frequently than expected. These meds can be misplaced, the labels with patients’ names can fall off the containers, and they can be left behind when patients are transferred. Do your best to troubleshoot so that extra vials, bottles, inhalers, etc. don’t clutter patient care units. Affix labels with patients’ names according to your pharmacy’s policy, so they aren’t discarded with the outer wrapping of these meds. Also, make sure to label fixed quantity meds such as inhalers and insulin vials with beyond-use dates as appropriate.

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---Please continue to the next page for a handy Cheat Sheet to help calculate days’ supply---
### “Cheat Sheet” for Calculating Days’ Supply of Fixed Quantity Meds

<table>
<thead>
<tr>
<th>Type of Med</th>
<th>Figure out total amount per container</th>
<th>Divide the total amount per container by the amount used per day to get days’ supply</th>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear drops</td>
<td>Total number of <strong>drops</strong> per bottle</td>
<td>Total number of <strong>drops</strong> used per day</td>
<td>• Convert drops to mL using a conversion of 20 drops/mL (most commonly).</td>
</tr>
<tr>
<td>Eye drops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhalers</td>
<td>Total number of <strong>puffs</strong> per inhaler</td>
<td>Total number of <strong>puffs</strong> used per day</td>
<td>• Some inhalers have a beyond-use date once the outer wrapping is removed. Do not enter a days’ supply for longer than this number of days.</td>
</tr>
<tr>
<td>Insulin</td>
<td>Total number of <strong>units</strong> per container (vial, box of cartridges, pen, etc)</td>
<td>Total number of <strong>units</strong> used per day</td>
<td>• Do not assign a days’ supply longer than the beyond-use date once the vial is opened or stored at room temperature (typically 28 days). • Ask the pharmacist for help with days’ supply for sliding scale insulin if needed. This will depend on how much the patient is typically using per day.</td>
</tr>
<tr>
<td>Nebulized meds</td>
<td>Total number of <strong>vials</strong> per box</td>
<td>Total number of <strong>vials</strong> used per day</td>
<td>• One vial generally cannot be counted twice, because partials may be discarded. If a dose requires use of a partial vial, round up to the nearest whole number of vials.</td>
</tr>
<tr>
<td>Oral liquids</td>
<td>Total number of <strong>mL</strong> per bottle</td>
<td>Total number of <strong>mL</strong> used per day</td>
<td>• Conversions: 1 teaspoon = 5 mL; 1 tablespoon = 15 mL. • Do not enter a days’ supply for longer than the beyond-use date once the bottle is reconstituted.</td>
</tr>
<tr>
<td>Topical creams</td>
<td>Total <strong>grams</strong> per container</td>
<td>Total number of <strong>grams</strong> used per day</td>
<td>• Estimate the number of grams to be used daily using the “Rule of Hand.” The amount needed to cover one side of your hand (i.e., handprint with fingers together) four times is 1 g. Find out the area that the patient needs to cover and use this to guide the amount you dispense.</td>
</tr>
<tr>
<td>Topical ointments</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Technician Tutorial: Mastering Medication Lists and Histories

There’s a big focus on keeping track of the meds that patients are supposed to be taking. Typically, a patient’s medication list is a record they maintain for their own use, and for communication with their health care providers. A medication history refers to a compilation of the patient’s current meds used by health care professionals. However, some people may use the terms interchangeably, which is okay. The main point is that these lists and histories can help prevent problems like dosing or scheduling errors (i.e., taking a med twice a day that was prescribed to be taken once daily), duplications of therapy (i.e., not stopping a med that was supposed to be discontinued when a new med was started), and continuing unneeded drug therapies (i.e., not stopping a med that was originally prescribed for treatment of a temporary condition). In fact, acquiring accurate medication lists and histories is necessary for medication reconciliation, which includes reviewing a patient’s meds at transitions of care (e.g., into and out of the hospital, from one hospital unit to another). It is known that medication reconciliation can help reduce problems with medications and ultimately reduce hospital admissions. This Technician Tutorial will provide information about creating medication lists and histories for pharmacy technicians.

What are some other differences between medication lists and medication histories?
In addition to the slight differences mentioned above, medication list is a term that may be used more frequently in the outpatient setting, while the term medication history may be used more frequently in the inpatient setting. We’ll stick with that convention in this Technician Tutorial, although you may interchange the terms according to what’s used in your practice setting.

What benefits do med lists and histories offer over the info already available in providers’ computer systems?
It may seem unnecessary for a patient to keep a comprehensive and up-to-date list of the medications they’re taking since pharmacies and prescribers generally have lists in the form of patient profiles and such. But in reality, health care providers’ lists are not always complete, correct, or current, and they don’t necessarily include all of the nonprescription products a patient is taking.

Likewise, a medication history, such as on admission to a hospital, helps pull all the patient’s medication information together into one place. This can help ensure that treatments for chronic problems such as diabetes or high blood pressure are appropriate and are adjusted if needed through a patient’s hospitalization for an acute problem such as an infection. As an added benefit, problems with a patient’s medication regimen may come to light during a hospitalization and can be addressed at that time.

And in the outpatient setting, med lists can help patients get the most out of a comprehensive medication review (CMR). For more information about CMRs, go to our PL Toolbox, Medication Therapy Management.

What are some helpful tips for communicating with patients when gathering med info?
It is worth noting that pharmacy technicians in the hospital setting may be less accustomed to talking with patients in comparison to pharmacy technicians in the retail setting where communicating with patients is commonplace. Keep in mind that you may encounter patients in different settings when taking admission medication histories, including the emergency department, general medicine floors, etc. Here are some important rules of thumb to keep in mind for communicating with patients in any practice setting:

- Always introduce yourself, state your purpose, and let the patient/caregiver know what to expect. Here is an example: “Hi, my name is Lindsey. I work in the pharmacy, and I’m here to get a list of
the medications that you take at home. I’ll need to ask you some questions, and it will take about 15 minutes.”

- Make eye contact as appropriate, and speak clearly and not too fast. Many older patients may have some degree of hearing loss and may be hesitant to ask you to repeat what you’ve already said.
- Look for info about whether a patient is hearing-impaired or does not speak English (or French, in Canada) before meeting with them. That way you can have necessary resources such as an interpreter at the ready.
- Access any available information about the patient’s medications, such as their profile or a list of discharge meds from their last admission, if possible. You can use this list as a starting point to identify any potential issues, such as unclear directions, that will need to be clarified during the interview. If you identify any discrepancies during the patient interview, be sure to note these as well.
- Refer to meds by brand or generic name, whichever the patient recognizes most easily.
- Ask open-ended questions as appropriate to get the best information. Patients will be able to answer “yes” or “no” questions, even if they don’t understand the question. For example, ask “What over-the-counter medications do you use?” rather than “Do you use any over-the-counter medications?” Or ask “How do you take this medication?” rather than “Do you take this medication twice daily?”
- If you don’t understand a patient’s response, ask questions to clarify rather than documenting unclear information.
- Avoid the use of medical jargon, since it may confuse patients. For example, say “as-needed” or “as necessary” instead of “PRN,” “blood pressure” instead of “hypertension,” and “twice a day” instead of “BID.”
- When you are finished, let the patient know, ask if they have any questions, and thank them for their time.

**What is a “best possible” med list or history?**

In your practice setting you will probably have guidance in the form of policies or procedures about what info you need to collect. You may have forms, or even a computer template, to use. The following are general guidelines about the information that should be included in a patient’s med list or history.

A complete med list or history includes **all of the medications a patient is taking.** This includes medications that are taken or used by any route: orally (capsules, liquids/suspensions, tablets, etc); topically (creams, ointments, transdermal patches, etc); in the eyes or ears (drops, ointments, etc); injected (heparin, insulin, etc); inhaled (inhalers, nebulizers), and so on. It also includes products that don’t require a prescription: supplements (e.g., glucosamine, fish oil, etc), vitamins (e.g., multivitamin products, vitamin C, etc), and over-the-counter (OTC) medications (e.g., acetaminophen, ibuprofen, cough and cold preps, etc).

Plenty of folks don’t consider supplements, vitamins, and OTCs as “real” drugs. But they are. These products can cause drug interactions with each other and with Rx drugs. They can also cause side effects, which are sometimes serious. With this in mind, it’s easy to see why it’s important for health care providers to know what nonprescription products their patients are taking.

If you’re taking an admission medication history, a patient probably won’t be continued on their OTCs, such as supplements, during their hospital stay. But it’s important to know about these meds because they might actually contribute to the cause of an admission such as ginkgo biloba, which can increase the risk of bleeding with blood thinners.

Don’t forget to ask about immunization history. Patients who need vaccines, such as influenza or pneumococcal vaccine, can get these while they’re in the hospital. Asking about immunization can also flag patients who need to receive vaccines in the outpatient setting.
You may need to ask if the patient uses any recreational drugs such as alcohol or marijuana. Similar to Rx and nonprescription drugs, record how much the patient uses and how often. For example, two beers per day or weekly use of marijuana. This information may be important due to possible effects on meds and certain medical conditions. Smoking history is useful as well, so smoking cessation strategies can be recommended if appropriate and also because smoking tobacco can interact with some medications. Be sure to ask these questions in a clinical and nonjudgmental manner.

**What other details should be included on a med list or history?**

For each medication a patient is taking, the **correct strength and regimen** (dose and dosing schedule) should be included. The **indication or reason for use** should also be included. For example: metoprolol 50 mg tablets, one by mouth every 12 hours, for high blood pressure. This is sometimes referred to as a “complete pharmaceutical sentence.”

The benefits to having this information include the fact that dosing errors might be caught. Errors can stem from a number of different sources including a prescriber error, a pharmacy error, or a misunderstanding on the patient’s part. For example, if a patient’s list has metoprolol 50 mg tablets, one by mouth three times a day, a pharmacist or prescriber would be able to question the regimen. (This med is typically given twice a day.)

The **date each medication was started (or stopped)** is helpful as well. This can help clarify whether a therapy is being duplicated. For example, if a patient gets switched from metoprolol 50 mg PO twice a day to metoprolol extended-release PO once a day, the old regimen should be crossed out with the stop date, and the new regimen should be added with the start date. Including both of these meds, with no start or stop dates, could lead a pharmacist or provider to believe that the patient is taking double metoprolol therapy.

If a patient tells you that he or she has recently stopped or started a medication, ask them about the **reason for the change**. This could range from “because I started on a different medication and my doctor told me to stop taking it” to “it gave me stomach upset” to “I couldn’t afford it.” This information will be very helpful for the pharmacist and prescriber.

For hospital admission med histories, the **last time the patient took a dose of each medication** should also be recorded if possible. This can help prevent late or early doses of meds that are continued in-house. For example, if a patient taking clopidogrel 75 mg PO once a day is admitted to the hospital mid-morning due to a case of community-acquired pneumonia, it will be important to know whether he or she already took a dose of clopidogrel since an admission med order would likely schedule a dose to be given the same day.

Physical characteristics of a medication, such as the **color, shape, and markings** on a tablet, can be very helpful. If there is a question about a dose, identifying the medication from its physical characteristics can solve the mystery. For example, if a patient says that he or she is taking Synthroid 250 mcg by mouth once daily (a relatively high dose) and you suspect that the patient is actually taking Synthroid 25 mcg by mouth once daily, the tablet can be used to double-check. The Synthroid 25 mcg tabs are orange. A Synthroid 250 mcg dose would require that the patient take more than one tablet per dose, since Synthroid does not come in a strength of 250 mcg. Checking the patient’s prescription bottles can be helpful as well.

A complete list of a patient’s **allergies** should also be included on a med list or history. This includes drug allergies such as sulfa drugs, aspirin, and opioids; food allergies such as shellfish, eggs, and strawberries; and environmental allergies such as bee stings, medical tape, and latex. The patient’s reactions should also be listed. Sometimes patients mistake reactions that are simply side effects, such as nausea or sedation, for actual allergies. These types of reactions aren’t unimportant. A patient who throws up when he or she takes codeine doesn’t want to keep on taking it. On the other hand, it’s important that reactions that aren’t true
allergies don’t prevent a prescriber or pharmacist from providing the patient with an important therapy, such as a particular antibiotic.

Any adverse drug reactions a patient is experiencing should be documented, in addition to any problems a patient is having taking their meds.

Other information that is good to have on the med list or history is the contact information for the patient’s providers. For example, if a patient sees a family practitioner as well as an ophthalmologist and an orthopedic surgeon, it’s good to have info for all of them on the list. This is especially true if all of these providers are prescribing medications for the patient. Contact info for the patient’s pharmacy or pharmacies can be included as well. Ideally, a patient would use a single pharmacy for all of his or her meds. But sometimes, this isn’t the case.

**What other steps are important in creating a med list or history?**

As mentioned, policies and procedures in your practice setting will likely provide a framework for the process you will follow in creating med lists and histories. One of the key components is that the information is gathered in a systematic fashion. So it’s not a willy-nilly situation, but rather a routine list of questions wherein each necessary piece of information is addressed. In addition, verifying a med history with a second reliable source might also be required in the hospital setting and is a good idea in outpatient settings too, especially to fill in any gaps in information. These sources may include a family member or caregiver (make sure there are no issues with HIPAA) or the patient’s community pharmacy. It’s also likely that a pharmacist will be required to review the patient’s medication history or list for correctness and to follow up on any potential issues.

In the hospital setting, be sure to follow proper procedures for contact with patients, such as washing your hands after you exit the patient’s room.

**When should a patient’s med lists be updated?**

Recommend that patients update their med lists at least after every visit to a prescriber and after being discharged from the hospital. This way, changes can be incorporated as soon as they happen. When patients bring in new prescriptions, or come in for a CMR appointment or other pharmacy service, help them add new medications, along with the start date, and cross off old ones if necessary, along with the stop date.

**How can patients use their med lists?**

Recommend that patients keep their med lists handy in case of an emergency. In addition, the med list should be shown at every office visit, when visiting the pharmacy, or on admission to the hospital. This can help prevent errors and keep all the patient’s providers on the same page.

**What’s the best way for a patient to keep their med list?**

A med list can be as simple as a handwritten list on a piece of paper. We have an easy-to-use form you can print out and offer to patients, *My Medication List*. For patients who are more tech savvy, there are a number of other options. A med list can be stored as a simple electronic document (e.g., Microsoft Word document, PDF). The FDA has such a form that can be found at http://www.fda.gov/downloads/AboutFDA/ReportsManualsForms/Forms/UCM095018.pdf. This form provides very detailed instructions for patients. The Institute for Safe Medication Practices (ISMP) also has a form, at www.ismp.org/newsletters/consumer/alerts/ISMP_Med_Form_PDF.pdf. Patients can save medication lists that are stored as electronic documents on their computers to USB devices, which are small, lightweight, and easy to carry or wear on a bracelet, necklace, etc. In fact, some USB devices are made and marketed especially for this purpose. There are also smartphone apps such as *My Medications* from the
American Medical Association and electronic health records such as HealthVault. Some of these have handy features, such as the capability of sharing the list with providers electronically.

Regardless of the mechanism or form used for keeping a med list, it’s important for patients to make sure their med lists are complete, correct, and current.

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Technician Tutorial:
Preventing Med Errors

The role of the pharmacy technician can encompass a variety of functions. Depending on the setting, technicians can process prescriptions, prepare IV admixtures, order medications and manage inventory, work with billing, etc. Through all of this, preventing medication errors is vital. In fact, it’s a responsibility shared by ALL health care professionals.

In order to help prevent medication errors, it’s important to understand what a medication error is, and how medication errors occur.

You get a prescription for Ms. Bee, a 52-year-old female patient. As you enter the prescription into the computer, you notice that Ms. Bee has not had this drug before. In the past, she has only filled prescriptions for oral contraceptives (but not for a few years), and now she gets Premarin. She also gets a water pill, hydrochlorothiazide. Once, after a minor car accident, she filled a prescription for Percocet.

What is a medication error?
A medication error is defined as “any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedure, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use.”

In the U.S., two people are injured every minute because of a medication error. Medical errors (including medication errors) are the third leading cause of death in the U.S. Fortunately, medication errors are preventable and health care is in a constant state of evolution to improve patient safety.

How do medication errors happen?
You might be surprised to find out that medication errors are generally not considered to be the “fault” of individuals, or to occur because a person was negligent or unintelligent. Experts say that medication errors usually happen because of “system failures.” This means that multiple people
(e.g., prescribers, nurses, pharmacists, pharmacy technicians, respiratory therapists, etc) might miss opportunities to catch an error. Or the error might even go undetected by computer software.

Often, the “system” will fail in several different places, which results in a medication error. This is sometimes called the “Swiss cheese model.” Picture the holes in several pieces of Swiss cheese lining up, so the error can slip right through multiple layers of protection.

Because system failures are often to blame for errors, rather than a specific person, it’s important for pharmacy technicians to let a pharmacist know if a system-based process isn’t working. Then, the process can be examined and changed, hopefully before an error actually occurs.

Say, for example, there’s a new drug on the market. It’s getting a lot of hype and you’ve already filled several prescriptions for it. You notice that when you’ve reached for it on the shelf, you’ve picked the wrong product, with very similar packaging, more than once. You should discuss this with a pharmacist, to figure out how to prevent this potential error from happening in the future. If it’s happened to you, other technicians and pharmacists are probably running into the same problem.

On the other hand, if an error has already occurred, it’s very important for processes to be examined and corrected, so that the same error doesn’t happen again. Don’t ever feel like you are “tattling” if you report an error. Reporting errors and “near-misses” is a key part of improving patient safety.

**How can I help prevent medication errors?**

The Institute for Safe Medication Practices (ISMP) emphasizes different points in the dispensing process where pharmacy technicians might have the opportunity to prevent errors.

**Prescription drop-off.** Good communication is key. The more information you have, the better positioned you are to catch an error. Of course, date-of-birth and current allergy information should always be obtained from every patient.

Date-of-birth gives you another identifier, besides name, to help avoid mix-ups between patients with the same or similar names. In the hospital setting, a medical record number (MRN) or date-of-birth can be used as a second identifier to prevent mix-ups with same or similar names.

Current allergy information is important because a patient may have experienced a reaction since the last time he or she had a prescription filled. This should include both the cause of the reaction and the reaction. For example, if a patient had a reaction to amoxicillin, you would want to ask for the reaction, such as hives, and document that information as well.

You’ll also want to get information about a patient’s food allergies because some drugs shouldn’t be used in patients with certain food allergies. For example, most flu vaccines can cause problems in people with severe allergy to eggs. If your computer system doesn’t allow food allergies to be entered in the same way as drug allergies, try to make a note in the patient’s profile about the food allergy.
For patients in the hospital, no medication should be dispensed before allergy information is obtained. An exception to this might be for a patient with a life-threatening condition, who is unable to communicate. However, any allergies should be recorded as soon as the information is available.

Consider asking patients for basic information about medical conditions, and recording these in their profiles. Having this information can be very important. For example, if a patient is pregnant, certain medications should NOT be used, and the pharmacist can determine this. Also, knowing a patient’s medical conditions can help the pharmacist double-check the appropriateness of prescriptions. The pharmacist can ask the patient for more information if necessary.

When Ms. Bee handed you her prescription, you asked for her allergies. She verified that she has no drug or food allergies. You ask about medical information, and she says that she is completely fine, except for occasional hot flashes and a pesky nail fungus.

**Order entry.** When you are processing prescriptions, it’s best to minimize distractions. Keep personal business, like conversations and phone calls, to a minimum. Focus on the task at hand. It’s easy to get caught up in the “buzz” of things. But when an error happens, reality can quickly set in. Stay present and keep your mind on your work. Encourage others to do the same.

At order entry, familiarity with drug names, especially new drug names, is very important. We have a list of new drugs hitting the market in the U.S. and in Canada. The lists have a short description of each agent. It’s a good thing to stay on top of what’s new, so that you know to expect prescriptions for these new products.

Plus, look-alike, sound-alike drug names can be problematic. Some examples of look-alike, sound-alike drug names are atomoxetine and atorvastatin; Farxiga (U.S.) and Fetzima (U.S.); methadone and methylphenidate; risperidone and ropinirole; Topamax, Toprol-XL (U.S.), Tegretol, Tegretol-XR (U.S.), and Tegretol-CR (Canada); and Ultram and lithium. More examples are Celebrex, Ceflexa, and Cerebyx (U.S.). It’s easy to see how these drug names could be confused with each other. To add to the confusion, some of the available strengths of these drugs overlap.

Drug name suffixes, like XL, CD, SR, etc, can also lead to errors. There’s not a uniform meaning for most suffixes. Common errors with drug names with suffixes include incorrect dosing interval and mistakenly omitting a suffix. For example, a prescription for immediate-release metoprolol given once daily (which should normally be given twice daily), or a prescription for the long-acting Toprol-XL given twice daily (which should normally be given just once daily) should be questioned. These drugs may sometimes be dosed in this manner, but it’s always a good idea to double-check. Another common mix-up is with the long-acting bupropion products, Wellbutrin XL and Wellbutrin SR, and their respective generics. Pay close attention to a prescription for any drug with a special suffix to ensure that you are selecting the right form.

Drugs that come in different salt forms are also prone to errors. For example, oral doxycycline comes as both a hyclate salt and a monohydrate salt. Nasal fluticasone comes as either furoate or propionate. Different salts of drugs might have differences such as dosing or side effects. If you have questions about which salt form of a drug to choose, double-check with the pharmacist.
In addition to mix-ups between drug names, abbreviations can be problematic. There’s a long list of abbreviations that should not be used in health care. They are known to increase the risk for errors, often because they can be misread. The following list gives a few examples of dangerous abbreviations:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Intended Meaning</th>
<th>Common Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>Units</td>
<td>Mistaken as a zero or as a “4” Can also be mistaken for “cc”</td>
</tr>
<tr>
<td>µg</td>
<td>Micrograms</td>
<td>Mistaken for “mg”</td>
</tr>
<tr>
<td>Q.D.</td>
<td>Every day</td>
<td>The period after “Q” can be mistaken for an “1,” so that the abbreviation is misread as “QID” or four times daily.</td>
</tr>
<tr>
<td>Q.O.D.</td>
<td>Every other day</td>
<td>Mistaken for “QD” or “QID”</td>
</tr>
<tr>
<td>SQ or SC</td>
<td>Subcutaneous</td>
<td>Mistaken as “SL”</td>
</tr>
<tr>
<td>TIW</td>
<td>Three times a week</td>
<td>Misinterpreted as “three times a day” or “twice a week”</td>
</tr>
<tr>
<td>HS</td>
<td>Half-strength</td>
<td>Misinterpreted to mean “at bedtime”</td>
</tr>
<tr>
<td>cc</td>
<td>Cubic centimeters (same as mL)</td>
<td>Mistaken as “U” for units</td>
</tr>
<tr>
<td>AU, AS, AD</td>
<td>Both ears; left ear; right ear</td>
<td>Misinterpreted as “OU” (both eyes), “OS” (left eye), or “OD” (right eye)</td>
</tr>
<tr>
<td>IU</td>
<td>International unit</td>
<td>Mistaken as “IV” or “10”</td>
</tr>
<tr>
<td>MS, MSO4, MgSO4</td>
<td>MS and MSO4 = Morphine sulfate MgSO4 = Magnesium sulfate</td>
<td>Can be confused for one another</td>
</tr>
<tr>
<td>APAP</td>
<td>Acetaminophen</td>
<td>May not be recognized as meaning acetaminophen</td>
</tr>
</tbody>
</table>

If you run into an ambiguous abbreviation (for example, is it a “U” or is it a “0”?)), always alert the pharmacist so that he or she can clarify the prescription with the prescriber if needed.

Be alert for instructions requiring a patient to split or crush a tablet (or open a capsule or crush its contents). Many tablets and capsules must be taken without any kind of alteration. Some reasons for this include:

- Splitting or crushing a tablet, or opening a capsule would destroy a controlled-release mechanism. If a controlled-release mechanism is destroyed, a large portion of the dose can be “dumped” all at once, which could result in an overdose.
- Some medications taste very bad.
- Some medications might be irritating to mucous membranes in the GI tract. Destroying a coating that is meant to protect the gastrointestinal tract can result in GI irritation.
- Some medications might be harmful to the person administering them if they are not administered intact.

Most of the time, single-ingredient tablets that aren’t coated and aren’t controlled-release can be split or crushed. If a tablet is scored, then you know it can be split. Some capsules can be opened,
and the contents administered with a beverage or mixed with a food such as applesauce. Examples of these include Depakote Sprinkle and Adderall XR.

It’s not always possible to determine if a tablet can be split or crushed or if a capsule can be opened by simply looking at it. This information may be found in the package insert. Alert the pharmacist if you have a concern.

It’s important to be extra cautious when processing prescriptions for “high-alert” medications. The reason that certain medicines are designated as high-alert isn’t because they are more likely to be involved in errors. It’s because patients are more likely to have very serious harm if these medications are misused and patients get too much or too little of the medication. For example, medication errors with oral hypoglycemics or insulins can be deadly because hypoglycemia, or low blood sugar, can cause patients to lose consciousness. Be vigilant when dispensing high-alert medications and question any part of an order or prescription that seems inappropriate or ambiguous.

Here’s a list of “high-alert” medications:

- Chemotherapy drugs (e.g., capecitabine [Xeloda], cyclophosphamide, methotrexate)
- Oral hypoglycemics for diabetes (e.g., chlorpropamide, glyburide)
- Insulins (e.g., Humulin, Lantus, Novolin)
- Methotrexate (for noncancer use)
- Opioids for pain (e.g., codeine, fentanyl, hydrocodone, methadone, morphine, oxycodone)
- Opium tincture
- Anticoagulants used to thin the blood (e.g., warfarin, heparin, enoxaparin [Lovenox], dabigatran [Pradaxa])
- Injectable electrolytes (e.g., potassium chloride, potassium phosphate, hypertonic sodium chloride, magnesium sulfate)
- Sedative agents (e.g., chloral hydrate, midazolam, dexmedetomidine [Precedex])
- Paralyzing agents (e.g., cisatracurium, rocuronium, succinylcholine)
- Injectable vasopressin

A good rule of thumb is to question any dose that requires more than three or four dosing units. For example, if four tablets are needed to make up one dose, alert the pharmacist to double-check the dose. If you are in the hospital setting and mixing up an IV medication that requires more than three or four vials, have the pharmacist double-check the dose.

Unclear prescriptions and medication orders should always be clarified. We know handwritten prescriptions may be especially prone to errors due to poor legibility. But keep in mind that errors can still happen even with electronic prescriptions. Watch out for common errors such as mismatches between drug and dosage form (e.g., a medication that comes as a tablet ordered as a capsule or liquid). If you encounter an unclear medication order or prescription, don’t ever guess. Let the pharmacist know so that he or she can check with the prescriber.
If your computer allows you to use shortcut sig codes, such as entering “PAX20” for Paxil 20 mg, make sure and match up the drug, strength, and directions on the prescription label to the hard copy of the prescription as a double check.

You might feel bombarded by drug alerts from your computer system. But don’t ignore them. Always alert the pharmacist. Some drug alerts are very serious, while others may not be a problem. The pharmacist can decide what action needs to be taken to avoid a potential problem.

As you start to enter Ms. Bee’s Rx into the computer, your initial impression is that it reads “Lamictal” with some suffix, at a dose of 50 mg. Because the script isn’t clear, you ask the pharmacist to take a look. The pharmacist is puzzled as well, but asks “what’s new with Ms. Bee?” You tell him nothing, except the nail infection. Then, you both realize that the prescription is actually written for Lamisil, at a dose of 250 mg once daily. The pharmacist takes a moment to speak with Ms. Bee to verify that this new Rx is intended to treat her nail infection.

**Filling/dispensing.** Choosing the wrong product can happen for a variety of reasons, including look-alike packaging or labels and the location of a product on the shelf. It’s best to keep look-alike, sound-alike products, such as Toprol-XL and Tegretol-XR, physically separated from one another on pharmacy shelves. Shelf tags are also a good strategy.

In some cases, it may be helpful to place a “spacer” or other marker on the correct shelf spot to indicate that a product has been relocated, and point to its new location. This will help ensure that products are stocked in the correct location, and also prevent other staff from incorrectly assuming a product is not in stock if it’s not immediately located on the pharmacy shelves. Some pharmacists or technicians use an empty Rx bottle with a note on the label, like “Tegretol-XR stocked on shelf 12.” A small plastic bin can be turned upside down in the refrigerator to indicate a relocation of refrigerated products, such as insulin.

In the hospital setting, it’s important to remember that products with look-alike labels and packaging should be separated not only in the pharmacy, but also when they’re stocked on patient care units or in automated dispensing machines.

**Barcode technology** is another way to help make sure that the right products are chosen. Barcoding technology only works to improve patient safety if you use it correctly and avoid shortcuts and workarounds. If scanning is problematic, troubleshoot before you resort to manual override. If multiple doses, bottles, vials, etc need to be scanned, make sure and scan each one. Don’t scan the same one multiple times.

Also avoid using shortcuts and workarounds with automated dispensing devices (Parata, Pyxis, ScriptPro, etc). Bypassing necessary steps can increase the risk for med errors and inventory issues. Make sure you fill these with the correct drug. Use barcoding as a double check if possible. Don’t forget to double-check expiration dates of meds before filling these devices.

As you go to the shelf to pull the Lamisil 250 mg tablets (which you rarely dispense), you are aware that the Lamictal tablets (which are more frequently used) are in such close
proximity. You alert the pharmacist that these should be physically separated. Unfortunately, you have limited space in your pharmacy, so there’s really no way to move the Lamictal tablets. Instead, you place a look-alike sound-alike alert on the shelf for both drugs.

**Distributing meds to patients.** Errors can also occur after the dispensing process is complete and a patient is picking up their medicine from the pharmacy. One example of an error at point-of-sale is handing a filled and bagged prescription to the wrong patient. To prevent this from happening, always ask the person picking up the prescription for a second identifier such as an address or date-of-birth to avoid mix-ups with same or similar patient names. You can also use barcoding technology to prevent these types of errors. Either way, pay close attention, even if you personally know the patient.

Be extra careful when combining multiple meds into one bag. Match the name and address for all the meds. Also, take extra steps to make sure nothing is missing from a patient’s order by matching up the number of receipts and filled prescriptions.

Another example of an error at point-of-sale is handing out an oral suspension that hasn’t been reconstituted. This error has been reported multiple times in pediatric patients with liquid products like amoxicillin and Augmentin (Clavulin [Canada]). In some cases, parents have administered the prescribed amount of powder instead of the reconstituted liquid, resulting in a trip to the emergency room. Consider the current system in your pharmacy for dispensing drug products that require reconstitution. Is there a double check before the drug is handed to the patient to be sure that it got mixed?

Be sure to include an appropriate calibrated measuring device when you dispense oral liquids. Patients shouldn’t be using household spoons to measure out doses because they can be very inaccurate. Try to choose a measuring device that’s a correct size for the patient to measure the dose just once. For example if a dose is 15 mL, dispense a measuring device that holds at least 15 mL. If you dispense one that holds only 5 mL, the patient will need to pull up doses three separate times for each 15 mL dose. Or the patient could mistakenly think that the 5 mL device holds the full dose of 15 mL and could actually be underdosed.

To be safe, pharmacists should personally hand patients prescriptions for high-alert medications if at all possible. Note on the outside of the prescription bag that there’s a high-alert medication inside. Other things that might be noted on the outside of a prescription bag to prompt referral of the patient to the pharmacist include new patients and major changes in medications or doses.

Finally, keep the will-call bin tidy by removing discontinued or unclaimed meds.

In the hospital you should also watch for similar or duplicate patient names when delivering meds to patient care units. Double-check date-of-birth or MRN to make sure you are delivering to the right patient. Don’t depend on room numbers as a double check since these can change and aren’t foolproof. Also, be sure to remove meds from patient care units if they have been discontinued or if the patient has been discharged or transferred, according to your pharmacy’s policies and procedures.
**Encourage patients to ask questions.** If there are questions, don’t hesitate to alert the pharmacist. There’s movement toward empowering patients to share in the responsibility for their care. Plus, with availability of medical information on the internet, patients have access to more information than ever before. Also help facilitate routine counseling of patients. This is the last chance the pharmacist will have to check a patient’s prescription and make sure that the patient understands any special techniques required such as using an inhaler or injecting a medication.

**Pay attention to anything that seems odd or off.** For example, in the hospital setting, if you notice that a particular item is being used up very quickly from floor stock, or from an automated dispensing cabinet, let the pharmacist know. The use could be totally legitimate, but it could also indicate that there’s a problem somewhere. For example, a nurse called the pharmacy twice in one shift to ask for more IV magnesium for floor stock. The pharmacist asked why the magnesium had been used up twice during one shift. The nurse responded that she was using a dose every hour for one particular patient. It turned out that the order for magnesium supplementation had been entered into the computer incorrectly. The patient should have received two doses, but had instead received eight doses! Too much magnesium could cause the patient to have very serious heart problems. The nurse stopped giving magnesium, the prescriber was called, blood levels of magnesium were checked, and the patient’s heart rhythm was monitored for a period of time to watch for problems.

**What’s the bottom line?**
Pharmacy technicians are an important part of the team providing medication therapy to patients. Establishing an awareness of things that can increase the risk for medication errors is important. Be on the lookout for areas that can use improvement, and help strategize to minimize the risk for errors. Always question anything that looks “fishy.” And remember that cutting corners to save time or guessing is ALWAYS a bad idea.

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