

Pharmacy Data Model and Charging

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# Background

In general, pharmacy has two divisions: Inpatient and Retail.

## Retail / Ambulatory

A retail pharmacy is what most people are familiar with, such as CVS and Walgreens. These are intended for consumer-interaction to fill prescriptions issued by physicians, and to sell consumer-oriented medications (over the counter). Retail pharmacies may also exist within a hospital to serve the public and patients departing the hospital and needing prescriptions filled. In general, a retail pharmacy is intended to dispense medications that consumers can administer themselves. A retail pharmacy may not dispense medications without a physician order, and every prescription must be valid, on the order of a licensed physician, and verified by a licensed pharmacist. Pharmacies act as a control point for the dispensing of substances (medications) that are to be used under the supervision and direction of a physician, and that would otherwise might be harmful if consumer misused them or used them for conditions they don’t actually have.

Retail / Ambulatory pharmacy functions are handled by Cerner Millennium PharmNet Ambulatory / Retail solution, and is a separately-licensed and installed module. While it is not dependent on PharmNet Inpatient, there are ramifications to design and formulary management. The data model section (DM\_DATA\_MODEL\_SECTION) is PHARMNET AMBULATORY. Some tables are shared among both solutions. PharmNet Inpatient predated PharmNet Retail / Ambulatory so the primary tables for PharmNet will usually be found first in the inpatient dm section.

## Inpatient

An inpatient pharmacy handles the dispensing of medications within a hospital, and intended for administration to patients by healthcare providers (i.e. not directly by the patient). It’s important to note that an inpatient pharmacy is not merely the equivalent of a retail pharmacy serving the patients inside a hospital; it is substantially more complex and follows different workflows and rules.

Inpatient pharmacy functions are handled by Cerner Millennium PharmNet Inpatient solution, and is a separately-licensed and installed module. While it is not dependent on PharmNet Retail / Ambulatory, there are ramifications to design and formulary management. The data model section (DM\_DATA\_MODEL\_SECTION) is PHARMNET (note the common term with no “INPATIENT”). Some tables are shared among both solutions. PharmNet Inpatient predated PharmNet Retail / Ambulatory so the primary tables for PharmNet will usually be found first in the inpatient dm section.

## About Table and Object Names

* Table names and CCL program objects may begin with PHA\_, RX, or have no common prefix.
* Table PHA\_PRODUCT and tables ending with \_OBS\_ST refer to data warehouse tables for DA2 and original DA reporting products. These are managed by extract scripts and may not reflect current state information.
* Some tables have been retired but may still be documented in the DM meta data. They are either no longer in the database or they remain defined in Oracle but are not populated. Be sure to check the contents of a table before relying on it. Any table with 1 or 0 records is not being populated.
* Note that the term DISPENSE and PRODUCT is also used in the Blood Bank modules, so confusion may occur if you do not differentiate table names using the DM Section. (Blood Bank has product\_id’s and PharmNet has med\_product\_id’s).
* PharmNet has close integration with the Orders and Materials Management modules, so there will be crossover with their tables as well.
* Multum content is stored in separate DM sections.

**It will always be important to note first whether a particular scenario involves workflow process related to an *inpatient* or *retail* pharmacy.**

**The remainder of this document addresses only inpatient pharmacy charges.**

## Terminology

**Medications** (aka pharmaceuticals, or individually a “preparation”) are commercially-produced consumer products by pharmaceutical manufacturers, intended for use in humans for therapeutic or diagnostic effect. Medications contain one or many drugs. A **drug** is a chemical substance that can be identified and isolated to a single molecular substance, like acetylsalicylic acid, commonly known as aspirin, one of the oldest drugs still in use today. A medication might contain multiple drugs (such as cold remedies, anti-HIV medications, and blood pressure medications).

Each drug and medication must be approved by the US FDA for use in the United States. This approval process includes the classification of the medication by drug name(s), strength, form, legal status, packaging, labelling, prescribing information, and rules on advertisements to consumers and healthcare providers. Every drug/medication manufacturer and distributor in the US must also be approved by the FDA, and each medication product they produce is assigned a unique number called a National Drug Code, or NDC. The NDC has three parts: the manufacturer, the medication, and the outer package size. The NDC must be printed on the exterior of the outer package prior to sale and distribution. NDCs are public domain and can be referenced through a variety of sources, including the FDA website.

Every medication (based on its potential for harm in ordinary and unusual use) is classified by the FDA as either: over the counter (OTC), or prescription only (legend). Legend medications require a prescription to be dispensed by a pharmacy. OTC medications can be sold directly to consumers and may be sold in places other than pharmacies (vending machines, gift shops, etc).

In addition to OTC/legend status, the FDA also classifies every drug for its potential for addiction and misuse, and if such potential exists, then it is assigned a Control Schedule, numbers 1 through 5. If a medication has a Control Schedule, then it can only be sold and dispensed by a pharmacy staffed by a pharmacist. Most controlled medications are also legend, though some are OTC (cold remedies). Controlled medications require additional inventory tracking, counting, and limitations on amounts prescribed (length of prescription, total dose, total quantity, amount of refills). The FDA works with the US DEA to assign and enforce the control schedule numbers, and the US DEA works with each state’s drug enforcement agency and pharmacy board to ensure these laws are followed. Schedule 1 contains all medications of high addiction potential and no known therapeutic use (LSD, ecstasy, marijuana, heroin, etc). Schedule 2 is the most tightly controlled set of medications and contains medications of high addiction potential but with limited therapeutic uses (cocaine, opium, barbiturates, morphine, fentanyl, etc). Schedules 3 through 5 contains decreasing stringency with decreasing addiction and abuse potentials, with Schedule 5 containing drugs like codeine at low doses and morphine with adulterants that counteract an overdose and abuse.

When a drug is first approved by the FDA, its developer is offered the ability to provide the generic and brand names it will be sold under. A drug patent is good for 17 years, and begins when the drug is first applied for clinical trial. Since clinical trials may last 7-10 years, a brand drug usually has only 10-7 years left to be sold as brand only (when the price is usually much high allowing the drug company to recoup its development costs). After the patent expires, any drug manufacturer may apply to produce and sell the drug as the generic name only. The original drug manufacturer may continue to sell the brand name drug under either the brand or generic name. While the brand name may be any trademark-able word, the generic name is public domain. Generic drug names often follow certain conventions based on the drug’s class and category. For example: beta blockers (used for blood pressure control) end with the letters -olol, such as metoprolol, atenolol, propranolol. These drugs may also go by their brand name, Lopressor, Tenormin, Inderal, respectively, even if they have long since become generic. Brand names do not usually follow any naming convention, and sometimes have their roots in Latin or English root forms to describe their intended effect (e.g. Lopressor 🡪 low pressure).

For the remainder of this document, I may use the term medication or drug interchangeably. Generally speaking, most medications are only one drug. However, some medications contain multiple drugs. Multi-drug medications are frequently referred to by their brand name, even if they have become available as generic. When required, I will denote the specific use of ***drug*** or ***medication*** in bold italics.

A **formulary** is a list of medications that a pharmacy offers for sale and dispensing. Most formulary items are also kept in stock, but some high cost or high demand medications may be “on order” only. If a medication is not on formulary, this means the pharmacy may be unable to obtain it, lacks the capability to prepare / stock it, or otherwise must make an exception to obtain it as a one off special case. For example, halothane, an inhalable anesthetic gas used only in surgical settings under the direct care of an anesthetist, would be considered non-formulary at CVS and Walgreens. Both inpatient and ambulatory pharmacies maintain a formulary, with inpatient pharmacies having more extensive formularies.

Insurance plans also publish their own formulary, which refers to what medications are covered and how the insurance company will pay for them. This definition of formulary is separate from that of the pharmacy.

In Cerner Millennium PharmNet, a formulary item is called a product. A **product** is a stocked pharmaceutical item that can be either a commercially-available packaged medication, or a medication prepared / compounded in the pharmacy (e.g. magic mouthwash, GI cocktail). A product is individually dispensable and tracked as a unique inventory item. A product is also not divisible into its constituent components (e.g. each medication in a multi-medication product).

To differentiate the terminology of **drug**, **medication**, and **product**:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Term | Cerner Defined Term | Definition | Example:  Unit Dose Tablet | Example:  Unit Dose Injectable | Example:  IV Admixture | Example:  Continuous Infusion | Layman Analogy |
| Drug |  | a chemical compound denoted by a generic drug name only | acetaminophen | midazolam | ampicillin +  dextrose 5% in water (D5W) | 0.9% sodium chloride  (aka “normal saline”) | tea |
| Medication |  | a preparation of a drug into a consumable form, includes strength per volume unit | acetaminophen 325 tablet | midazolam 5 mg/mL injection | ampicillin powdered form for injection +  D5W solution | 0.9% sodium chloride solution | iced tea, unsweetened |
| Product | Yes | a stocked commercially-produced package of the medication, optionally including the package | acetaminophen 325 tablet 1 each | midazolam 5 mg/mL 2 mL vial | ampicillin 1 g in D5W 100 mL bag | 0.9% sodium chloride solution 1000 mL bag | iced tea, unsweetened, 32 oz w/ straw, no ice |
| Item | Yes | a product supplied from a specific manufacturer | Tylenol brand acetaminophen 325 tablet 1 each, 1000 count bottle, Johnson and Johnson Medical Inc, NDC 50580-0501-10 | midazolam 5 mg/mL 2 mL vial, Prescript Pharmaceuticals, 25 vials / case, NDC 00247-2344-02 | ampicillin 1 g vial, powdered, 10 vials/case, Novation Pharma, NDC 00781-9404-95 +  D5W 100 mL bag, 96 bags/case, Baxter, NDC 00338-0017-38 | 0.9% sodium chloride solution 1000 mL bag, 14 bags/case, Baxter, NDC 00338-0049-04 | iced tea, unsweetened, 32 oz w/ straw, no ice, single order, Starbucks |

**Notes**

* **A drug is a single chemical** known only by its generic name, and does not specify form, volume, or packaging. A drug is synonymous with an intended therapeutic or diagnostic effect. In some case, the form and route of admin affects the therapeutic effect (e.g. creams, ointments, eye drops). These are usually entirely different drugs, but in the case of common drug names, they are differentiated in the ordering process.
* **A medication is a drug in a prepared form**, such as a tablet, capsule, solution, elixir, injectable solution, topical (cream, ointment), suppository, etc. For tablets, capsules, and other individually-formed dose forms, the amount of drug per dose unit is indicated (e.g. 325 mg tablet, 50 mg suppository, etc). For solutions (injectables, elixirs, oral solutions, topical and irrigation solutions, etc), the strength (mass) of the drug per unit of volume is specified: 5 mg / mL, 100 mg / L. For multiple dose containers (e.g. ointments, creams, inhalers), the total amount of drug in the container may be specified (100 g), and optionally the number of doses (50 inhalations) or strength per unit of mass (e.g. 10 mg / 1 g). The important thing to note is that **a medication is a particular amount of the drug per volume unit** (concentration).
* A **product is a medication in its packaged form**. **A product will always include the package form the nurse can expect, and the dispensable unit the medication will be charged upon.** There are a few differences here in inpatient pharmacy:
  + Unit dose medications supplied in bulk will be individually dispensed and packaged by the inpatient pharmacy. This is often how a retail pharmacy dispenses medications, and you receive them an orange bottle.
  + Multi-dose containers, like inhalers or tubes of ointment, the entire package is dispensed and the label applied to the manufacturer’s package.
  + Prepared medications (like ampicillin in solution), the ampicillin comes to the pharmacy in a powered form in a vial, the pharmacy adds sterile solution to the vial to reconstitute into a liquid form, then withdraws it from the vial and mixes it into a larger bag of fluid. This bag is labelled for a patient as a single product. The pharmacy *could* dispense the vial and bag separately, but the mixing is part of the service the pharmacy performs, and ensures it is mixed properly. The ampicillin is manufactured in powdered form because it will last up to a year this way, but when reconstituted is stable only for 48-72 hours. These are commonly called IV admixtures, piggybacks, or “intermittents”. These are usually injected into the patient in a short period of time (< 30 minutes). This is similar to how a patient would take a pill by mouth, but the medication must be injected instead.
  + Continuous infusions are dispensed as a single bag of fluid similar to unit dose. Continuous infusions may sometimes have medications added. These are intended to be injected into the patient continuously over many hours to days.
* A product can be a single commercially-available packaged product, or it can one that is created by the pharmacy from several component other products. These are called **compound medications**. *This is not in the list of examples. However, consider that a compound medication / product functions the same as commercially-available product, except that the pharmacy must manufacture it to remain in inventory, and the compound product will be composed of several separate items. This will almost always be hidden to everyone except the inventory management and pharmacy compounding staff.*
* An IV order can specify a single infusion with multiple component medications to be mixed together. However, this is uncommon in practice. Most medications are mixed and administered in separate bags of solution. This is called an **IV Set**. Pharmacy may make available certain commonly requested IV Sets, and disallow custom-ordered sets (requiring a call to the pharmacy for exceptions).
* The term **item** refers to **an individual product from a specific manufacturer**. This is typically used at the inventory-tracking and purchasing level, but is always transparent to the physician and nurse, and to most pharmacy staff. It is important to note, however, that because the NDC number is used in many scenarios to identify a medication, and because the NDC is actually an attribute of an item (not a product), we must be aware of the item level of detail in order to retrieve the NDC. In most cases, the manufacturer noted in the NDC is ignored and the NDC is only used to determine the medication.
* A group of medication orders in a single grouping is called an **order set**. These are usually used at the time of admission when many medications must be ordered at once, with the order details already specified on each. This speeds order entry by the physician. An order set will “explode” into separate orders, with the order set itself remaining in the background to represent that it was originally ordered as a set. Order sets that remain unmodified are often pre-configured to auto-assign, auto-verify, and dispense immediately, provided the patient has no unusual circumstances. Special pharmacy-only order sets are also available to the pharmacist to speed special order requests phoned in by the physician so that the staff pharmacist does not need to contact pharmacy management for approval. *This is not in the list of examples. However, consider that an order set is merely several individual medication orders.*
* IV solutions like saline and D5W are technically drugs and must be ordered. Oxygen is also technically a drug and must be ordered by a physician but is one of the few drugs that pharmacy does not manage.

Physicians medication orders usually start with a medication, but can be as generic as the drug name only or as specific as a product. Generally, the physician is only concerned with the drug to be administered, how much, how often, and for how long. They may also be concerned with the route of administration. The medication term is usually the most common way to start. Pharmacies then attempt to fill the medication order with one or many products. Naturally, the list of medications a physician can order will be built by the pharmacy first, in consultation with physician’s most common medication orders and what is most readily filled by the available products on formulary.

### Need a Real World Example?

If you’re still having difficult with the concepts, think of the drug – medication – product relationships being similar to a trip to Home Depot: nails are a drug, 1 1/8” finish nails are a medication, and a 100 count box of the same nails is a product. When you begin a project at home, you may know you need nails (a drug), but you don’t know which kind or how many. As you determine more details about the project and the types of wood and the application, you begin to have an idea of what kind of nails (finish nails, not stud nails, or screw, or pipe fittings). This is now similar to the medication level. Once you arrive at Home Depot, you see what size finish nails they have and the available package sizes. It won’t matter to Home Depot that you need 13 nails: you can only buy them in packs of 10, 25, 50, or 100. You may choose to buy two of the 10 pack, one of the 25 pack, or perhaps the 100 pack knowing you might need more. Of course, buying two 10 packs lets you return one if you need less than 10, whereas buying a 100 pack commits you to the purchase even if you use only 1 nail. If you’re a professional or experienced handyman, you might already have your own supply, or you might know exactly what kind of nail you need before you even begin, and you probably have a general idea of what kind of nails and package sizes Home Depot stocks. On the other hand, if you’ve never done this project before, you may wind up buying many kinds of nails, in multiple trips to Home Depot, with lots of leftovers and returns. Most physicians placing inpatient medication orders are like the professional handyman. Unfamiliar physicians, or familiar physicians ordering unfamiliar medications, can use the search function in PowerChart Orders, or contact a pharmacist for assistance.

## Workflow Process – Inpatient

Within a hospital, every human being patient is given one person record (person\_id), and each visit they have with the healthcare system, whether inpatient or outpatient, will have an encounter record (encntr\_id). Within a single encounter, one physician (PRSNL.person\_id), the attending physician, is charged with the ultimate responsibility for the care of that patient and assumes the doctor-patient relationship. Other physicians (surgeons, specialists, consultants) may also be involved in the patients care as well. Each physician listed may have medication-ordering privileges at the hospital, and if so, may place orders (order\_id) for medications to be dispensed and administered to the patient.

Inpatient medication orders differ from prescriptions in that a prescription is something a patient can have filled at any retail pharmacy and can administer themselves. In the inpatient environment, physicians place orders for medications and the orders go directly to the inpatient pharmacy, and healthcare providers (nurses) manage and administer the medication to the patient. Prescriptions and inpatient medication orders are not legally interchangeable, though as part of the admit and discharge process the responsible nurse will usually review the medications list and convert them, with the physician endorsing the conversions. This process is called medication reconciliation (“med rec”).

In addition to the usual “by mouth” medications common in retail pharmacy, inpatient medication orders can also include more complex medications, such as injectable medications, IV fluids, anesthesia, chemotherapy, and IV feedings (TPN). Since inpatients tend to be more ill than outpatients, and usually need more specialized care, it follows that inpatient medications would also be more complex. An inpatient formulary usually has 2 - 4 times more medications in formulary than a retail pharmacy.

### Medication Ordering

When a medication order is entered by a physician, they usually do so by direct order entry into Cerner Millennium PowerChart, on the Orders tab. Here, the physician can select from many different medications, and each medication will require a start date/time, dose amount (strength, volume, or both), number of doses, frequency of dosing, drug form, route of administration, date when the medications order should end, whether the order is renewable (either soft stop or hard stop), and sometimes additional details. Since there are numerous detail for each medication, and a physician may place many medication orders on one patient, medication orders have **order sentences** which is a pre-defined set of values for the above fields, to speed order entry. The physician may then alter the details, or accept them as is. Once satisfied with all the orders, the physician signs the orders electronically and they proceed to the pharmacy.

Alternatively, the physician may physically write a medication order and send it to the pharmacy (by fax, courier, phone, or pneumatic tube). The pharmacy staff then enter the order into Cerner Millennium PharmNet, and this will appear equivalent to the above order entry process in PowerChart.

### Pharmacy Review

Once received by the pharmacy, a pharmacy staff person will review the order and if there are any issues, the pharmacy will contact the physician (usually by phone), and either person can then modify the order. Hence, using the order sentences is recommended to speed processing.

### Product Assignment

Next, the pharmacy staff person assigns products, which are the tangible items in formulary and in stock in the pharmacy. Product assignment ensures that the dose ordered by the physician is met with the fewest number of pills, least amount of items, or most expeditious process. This is similar to making change or purchasing appropriately sized ingredients for a recipe. Product assignment usually occurs automatically by Cerner Millennium PharmNet, but can be configured to be done manually, or otherwise when auto-product assignment fails for any reason.

### Order Verification

Next, after assignment has been performed, the order must be reviewed and verified by a licensed staff pharmacist before dispensing. This may occur prior to the actual physical dispense within the pharmacy, or after the physical product has been dispensed but before it has left the pharmacy. In any case, verification is a legal and regulatory requirement of the pharmacy before the product can leave the pharmacy. In Cerner Millennium PharmNet, verification can occur automatically (auto-verification) if the order meets certain minimum standards, the medication does not have any interaction alerts (to other medications), and the patient’s clinical record has no contraindications. Auto-verification is a complex process, and thus any outlier can cause the order to require manual verification by a pharmacist. Usually the most commonly and consistently ordered and least risk medications are auto-verified, such as saline IV fluid, palliative medications, and standard procedure medications. Also, if the medication will be administered by a licensed practitioner (physician, surgeon, anesthetist) then auto-verification will also be common since the administering practitioner holds substantially more liability in these situations.

### Dispense

After the order has been verified, it is eligible to be dispensed. This will often generate a label in the pharmacy for a pharmacy technician to retrieve the medication from the shelves, count / mix, label, and set aside for delivery to the patient location. If the medication must be counted, mixed, or labelled, then a pharmacist must again physically verify the medication has been prepared, counted, and labelled properly before it physically leaves the pharmacy. Pharmacy technicians in inpatient pharmacies often work in the same areas of the pharmacy (unit dose, IV admix, TPN, chemo, etc) and work with the same pharmacists, so that a working relationship of quality and trust is established. Pharmacies also establish standard operating procedures, including handling mistakes, quality checks and assurance, oversight, and audit.

## Robots

In higher volume pharmacies, a robotic dispenser and/or packager may be installed. The robotic dispenser may operate on a linear track, rotary axis, or rotating carousel. The robot will receive the dispense messages electronically after verification (or sometimes after assignment), physically retrieve the medication, label, and produce the medication on a conveyor belt for the pharmacy technician or pharmacist to verify. This reduces the time spent moving about the pharmacy, reduces waste, shrink, and errors, and improves inventory management. Additionally, a robotic packager will take large volumes of medications in bulk containers (e.g. 1000 count tablet bottles), and dispense medications in individual plastic pouches. These pouches can be labelled either generically as to the contents, or they can also be labelled specific to a patient’s medication order. The latter requires re-labelling if the medication is not eventually administered to the patient, so generic labelling is the most common allowing re-use.

## Dispensing Cabinets

Pharmacy dispensing cabinets, sometimes called point-of-use cabinets, or Pyxis or Omnicell machines, are physical cabinets located at a nurses station near the patient’s room. Commonly used medications are stored in these cabinets so that the central pharmacy need not physically retrieve, package, label, and send the medication. Instead, the pharmacy system will send an electronic dispense message to the cabinet that a particular patient is permitted a particular medication. When it is time for the nurse to administer the medication, she goes to the cabinet’s console, enters her user name, selects the patient and medication, and the cabinet will open the appropriate door or drawer to retrieve the medication. The cabinet tracks whether the medication was taken and/or returned. This mechanism can suffice as the dispense, since the cabinets are managed and stocked by the pharmacy staff. This is commonly referred to as decentralized dispensing. Cabinets are often used to manage controlled substances, since these must be counted and managed by at least two persons at all times, and because these are usually pain medications which are needed more rapidly than the pharmacy can deliver. Cabinets can also be configured to hold the centrally-dispensed medications by the pharmacy (see Cart Fill below). This substitutes the traditional medication cart.

## Cart Fill

Medications can be dispensed one at a time as needed, though this is problematic since a pharmacy may perform thousands of dispenses every day, and tens of thousands of dispenses when counting those performed by robots, cabinets, and central dispensing. Thus, pharmacies use a process called “cart fill” to dispense and send all the medications anticipated to be needed in the coming 24-36 hour period. This is usually done overnight for the coming 24 hour period. A large cart on wheels with lockable and labelled drawers, is configured to have each patient’s information printed on a label and applied to a drawer, and usually a nurse unit’s patients are assigned one cart. Every nurse unit has two carts: one at the nurse unit and filled with the current day’s meds, and a second one located in the pharmacy that is the prior day’s meds. Any meds not used by nurse on the prior day are returned to inventory, and the drawers refilled with the next day’s medications. At a designated time (usually between midnight and 5am), the carts are swapped on the nurse units and the process repeats.

## Manual Dispense

Specialty medication orders, large containers, chemo, TPN, and other unique requests are usually handled as one-offs and manually dispensed to the nurse unit. Also, stat orders (those intended for immediate dispense) are handled as manual dispenses and will be sent directly by a courier or by pneumatic tube system. These are the least preferred method since they require physical labor, and sometimes immediate response by pharmacy.

### Administration

Once the medication has been dispensed to the nurse unit (whether in a cart, pneumatic tube, or cabinet), the nurse gains possession next and at the appropriate time, she will administer the medication to the patient. With rare exception, patients are not permitted to manage or administer medications themselves, including those that they might otherwise take on their own while on their own. Of course, whenever a patient is able, they will be given the medication by the nurse to consume on their own. But, when this is not possible, or the medication is more complex (e.g. injectables, drips, implants), then the nurse or physician administers the medication directly on / into the patient.

All medication administration must be documented by the nurse or physician. This includes who administered it, how it was administered (the route), the dose, the date and time, and any comments. The nurse may alternatively document a different dose, a different date/time than was scheduled, or if the patient refused the medication or was unable to consume it. A nurse can also (depending on institutional policy) modify a previously documented administration, including dose, date/time, or whether it was given at all. Medication administration is documented in PowerChart eMAR. This is a grid of medications on the left and date/times across the top. When a medication is due to be given, a button will appear at the intersection with the dose amount. To document, the nurse clicks on it and a window captures the relevant information. Once given, the button becomes gray and the amount actually documented as given appears. This prevents the duplication of administration.

Newer installations involve the use of barcodes on the patient armband, the medication, and the nurse’s badge to confirm the right medication is being given to the right patient at the right time. This is called barcode medication administration (BCMA) and is a technological method of documenting administration.

With a few exceptions, documentation of administration triggers charging.

### Charging

Charging may occur at one of two times: on dispense, or on administration. This setting is determined by settings on the medication in the formulary, the pharmacy, and the patient location. Dispensed medications that are returned to the pharmacy unused and unopened are credited to the patient. Charges on administration are only credited if the documentation is cancelled / voided.

## Waste and Divisibility

It important to note that pharmacy charges consist of the total of all the items dispensed to meet the ordered dose. In some cases, products can be defined as divisible and in such cases the amount administered may fractionate the dispensed item. Divisibility is stored separately for administration (can a tablet be split by the nurse to meet the ordered dose?), and divisibility for inventory (can the half tab be returned to inventory?). In most cases a product is not divisible for inventory, and so the amount leftover is chargeable. This excess is referred to as “waste” and is legitimately chargeable according to a variety of rules.

## Dose Range

In a few other cases, the nurse is permitted to administer the medication in an ordered dose range. For example, pain medications or frequently ordered this way: give enough to reduce pain to a tolerable level, but not any more than is needed. In such cases, the nurse may administer 1-2 tablets, and if the nurse administers only 1 tablet, then the patient is charged for only 1 tablet even though 2 were dispensed. The nurse retains the other tablet for return to pharmacy or for a future dose. If a dose range has many dose events, the pharmacy will dispense the maximum number of medications to meet each dose (e.g. take 1-2 tablets every 6 hours for pain, the pharmacy will dispense 8 tablets for a 24 hour period). If the nurse splits a tablet (1.5 tablets for one dose), then the patient is charged for 2 tablets unless the pharmacy permits split tablets to be returned to pharmacy (uncommon).

The key elements to remember here are:

* Charges are based on what was dispensed, and
* Waste amounts are legitimately chargeable.

Since charges are based on what was dispensed, charge records will tie to the dispense event and its constituent products / items.

*Some stuff may repeat in the section following*

# Pharmacy Charges - Inpatient

Pharmacy charges generate from the use of tangible items. That is, when a medication is dispensed, the total of the tangible items required to meet the medication order are charged to the patient. A real-world analogy would be that of making a cake: you will need flour, water, eggs, sugar, baking soda, and flavoring. You proceed to the grocery store to obtain these items, and the total of all the items on the grocery store receipt would be the cost of one cake (even if you have some leftover ingredients). This is how pharmacy generates charges, where the cake is the medication and the dispensing of the medication is the package containing one baked cake. Therefore, pharmacy’s charges generate on the basis of how many tangible items were needed to fulfill the medication order.

While some medications may be given only once, most medication orders require a medication to be given to the patient many times at a recurring interval. For example: give one tablet once daily, or give two tablets every 6 hours. Each of these occurrences is called a dispense event, and each dispense event will correlates to an administration. The dispense event is when the pharmacy physically packages and sends the medication from the pharmacy to the nurse unit, destined for a specific patient, and a separate dispense event for each upcoming administration. The administration is when the nurse actually gives the medication to the patient.

Pharmacies will typically dispense all the medications expected for the next 24-hour period in an overnight process called “cart fill”. Medications may also be ordered during the day for immediate administration, and these are usually located at the nurse unit in a pharmacy cabinet (sometimes called a Pyxis or Omnicell machine). For drugs not stocked in the cabinet, the pharmacy can dispense medications immediately and send via courier or pneumatic tube transport. The pharmacy cabinet keeps track of what medications are stocked, and how many are left. The cabinets are interfaced to the pharmacy so that technicians can re-stock them when supply levels get low.

When the nurse administers a medication, the nurse documents this in PowerChart on the electronic medication administration record (eMAR).

## Pharmacy Items

The entirety of all medication items stocked by a pharmacy is called the formulary. Each pharmacy within a hospital will have an established formulary. Not all medications available on the market are stocked in a formulary. If a medication is ordered by the physician that is not on the formulary, the pharmacist will consult directly with the physician and, either the pharmacy will substitute an alternative medication (called therapeutic substitution) or the pharmacy will attempt to obtain the medication from their drug vendor.

There are 6 main categories of formulary items:

* **Unit Dose** – these are packages of medication that is enough for a single dose (administration). Examples include: tablets, capsules, suppositories, ampules, vials, and bags of solution. While tablets may be supplied to the hospital pharmacy in a large bottle of 1000 count, the pharmacy will subdivide these into single doses, depending on the number of tablets per dose, per patient. Some pharmacies have robotic packagers that put a specific number of tablets into a single plastic package, seal it, and print a barcode on it for the contents. Some manufacturers package their medications already in unit dose packaging, such as blister packs that can be separated into single doses.
* **Bulk Items** – these packages of medications that contain more than a single dose. Examples include: tubes of ointment, inhalers, creams, eye drops, bottles of medication like syrups and elixirs, and irrigation solutions. These will dispense once at the beginning of an order, and will be dispensed again when the nurse requests a refill.
* **IV Admixtures** – sometimes called IV piggyback (IVPB), these are a single package of IV fluid with one or more injectable medications mixed in by the pharmacy. These are often IV antibiotics, but they can be any injectable medication. What makes these different from unit dose is that they contain two or more unit dose items in a single dosage package (similar to a combo meal at a restaurant): one bag of IV solution and one vial of medication mixed in. These have a limited shelf life so they are usually made to order per patient, per dose. They are labelled with both the patient name and the medication.
* **IV Premix** - Some drug manufacturers have designed IV admixture packaging that has both the solution and vial physically connected together, allowing the nurse can mix the two at the time it is needed, and involving no preparation by the pharmacy. Although they sound like an IV Admixture, these are classified as Unit Dose because they are a single physical dose unit and cannot be subdivided into fluid and vial separately.
* **TPN (Total Parenteral Nutrition)** – these are packages of IV solution with many other ingredients, intended to supply necessary nutrients for patients who are unable to eat. Similar to an IV admixture, these are also IV fluids. However, TPNs are special large preparations that draw from a bulk supply of various ingredients (a single TPN bag may have 5-20 ingredients, and may include multiple bags of different fluids). Every TPN bag is prepared unique to each patient, per day. A special group of technicians in a pharmacy prepares TPNs each day, and the patient is charged only for the amounts used to prepare the TPN bag. This differs from IV Admixtures in that IV Admixtures are a combination of other unit dose items whereas a TPN is combination of unit dose and bulk supply items.
* **TNF (Template Non Formulary)** – these are placeholders for medications that must be charged for that are not on formulary. When a special medication must be obtained by the pharmacy to give a patient on a one-off basis (that is, the pharmacy doesn’t plan to add the medication to the formulary), a placeholder medication is used called a TNF. The TNF looks like a regular medication on the formulary, except that the fields must be filled out when dispensing it (e.g. drug name, strength, form, dose, cost, etc). The TNF will trigger a manual charge in Cerner if the cost / price is not known at the time it is dispensed.

The pharmacy also stocks various supply items, such as syringes, bottles, labels, etc. These are usually tracked for inventory, but are not charged to a patient when requested by a nurse or physician.

## Other Charges from Pharmacy

With a few exceptions, pharmacy typically does not have service charges (e.g. professional fees, service fees), or otherwise charging on the basis of work being performed. The vast majority of charges the pharmacy generates are on tangible items. Service fees may be allowed and chargeable for certain kinds of services like stat fees, compounding of medications, consultation, or preparation of medications in unconventional ways. These are not usually covered by Medicare or insurance.

## When Charges Generate

A pharmacy charge can generate at only one of two points in time:

* on dispense, or
* on administration.

Charging on administration (COA) requires that the hospital use Millennium Orders, PharmNet, and the eMAR. This is called “closed loop” meaning that all of the ordering, dispensing, administering, and charging occur in the same system. A charge event is generated every time a nurse documents that she administered the medication. This includes an additional charge when giving an extra dose (e.g. more pain medication), and *not* charging when a dose is missed or skipped. This is a more accurate means of charging a patient, however it can result in more difficulty for inventory control. Medications are usually dispensed to the nurse unit in advance, and if the medication is never given nor returned to the pharmacy (or the item cannot be returned to inventory), then the pharmacy loses money on the cost of the item. Some medications are very expensive so a pharmacy will be judicious on how far in advance it will dispense a medication and/or whether it will maintain the medication in a pharmacy cabinet.

Charging on dispense (COD) is the older method of charging: when the pharmacy dispenses medication to a nurse unit for a patient, the patient is charged (e.g. at cart fill overnight). Later when the cart is returned, whatever medications remain are credited back to the patient. This works well for inventory control for a pharmacy, but assumes the patient received a medication. There is no reconciliation with the eMAR, and the patient may be charged for a medication they did not receive. This method is in contrast to the “closed loop” since the chain between ordering, dispensing, administering, and charging is not continuous.

Bulk items must always charge on dispense. A refill of a bulk item will trigger another dispense and charge. Bulk items returned unopened can be credited to the patient, or the patient will be charged and sent home with the bulk item. This varies by institutional policy.

Patient-supplied medications (those the patient brings with them into the hospital) are usually inventoried, labelled, and dispensed by the pharmacy. This ensures proper medication handling and dispensing. The patient-supplied medications are returned to the patient at discharge. Patients are not charged for their own medications, nor are they charged for this service.

# Pharmacy Charge Events

## Order-level Charge Events

When a medication order is placed, an order-level charge event is generated. These are never set to charge. If so, this would charge the patient one-time on either the initiation or completion of a medication order. Since a medication order may contain one or many doses, and whether the patient actually receives the medication cannot be assumed at the time of order, these charge events are not used for charge generation. Nevertheless, like all other orderables these charge events *do* generate. Order-level charge events contain the catalog\_cd of the orderable, usually representing the drug name only (may also contain the preparation, form, strength). An order-level charge event will only contain what the physician ordered, and will not indicate if the order was ever verified or modified by the pharmacist, dispensed by the pharmacy, or administered by a nurse.

## Order-level Bill Items

The bill item tree will have the pharmacy orderables listed in the Pharmacy activity type. Be careful *not* to build charges on these bill items. These can be commonly identified by having drug name only, and not the strength / form, in the description. Definitively, they have a Parent Contributor of ORD CAT and no child contributor.

## Task-Level Charge Events

When a medication order is verified by a pharmacist, this will trigger tasks to generate according to the dose schedule. Each task represents an administration on the eMAR. For example: **acetaminophen 325 mg tablet, one tablet every 4 hours** will generate a task every 4 hours on the eMAR. There will be only one order but there will be many tasks. Each task reaches a terminal status when it is either documented as complete (administered) or cancelled (not given). If an additional dose is given, this generates an ad hoc task that is immediately completed. Each task will generate an order-task charge event. At first glance, this may seem like the logical place to charge for “charge on administration” however the task lacks information about the tangible components of the medication. The task is only there for the nurse to document she did something, and does not tie to the tangible units dispensed by the pharmacy for that dose. Tasks appear the same as the parent orderable and have a one-to-one relationship.

## Task-level Bill Items

The bill item tree will have the pharmacy tasks listed in the Task activity type, with each task having only a drug name (similar to orderable bill items). The parent contributor is TASK CAT and no child contributor. Be careful when looking at these bill items because there are numerous other tasks that may have very similar task names that represent actual work to be performed and may be chargeable (e.g. if the task of administering a drug is chargeable, like a breathing treatment). Medication tasks usually have no child bill items, whereas tasks that include documentation will usually have child bill items (for DTAs).

## Dispense Event Charge Events

Every medication in a pharmacy’s formulary must be set to either charge on dispense, charge on admin, or do not charge.

* If the medication is set to charge on dispense, a Dispense Event Charge Event is created the moment the pharmacy dispenses the medication (typically bulk items). Another Dispense Event Charge Event will be created if the pharmacy dispenses another (e.g. refill request).
* If the medication is set to charge on administration, a Dispense Event Charge Event is created the moment the nurse completes eMAR administration task as given.
  + If the nurse documents they gave an extra dose, this will generate an additional Dispense Event Charge Event.
  + If the nurse documents that she did *not* give a dose (the patient refused, patient unavailable, etc), this will not generate a charge event.
  + If the nurse voids or cancels the documentation (documented on wrong patient), this will generate a credit charge event.
  + If the nurse is allowed to give a medication within a range of dosages (e.g. give 1-2 tablets), then the patient will be charged for the total units needed to fulfill the dose, rounded up. That is, giving 1 tablet will charge for 1, giving 2 tablets will charge for 2, and giving 1.5 tablets will charge for 2.

Dispense Event Charge Events are the way pharmacy generates all of the charges and revenue for pharmacy. Unlike the order and task charge events, Dispense Event Charge Events are generated from the pharmacy server directly to the charge server. The pharmacy server has access to additional information not present in the Charge Services module, such as cost, price, and NDC. This data is supplied to the charge server with each and every charge event. Thus, if the price of a medication changes during the life of a medication order, the new price will be sent on every charge event generated after the price change. This allows pharmacy to manage their formulary, inventory, cost, and supply in just the PharmNet apps.

## Item-level Bill Items

The bill item tree will show each and every formulary item from each pharmacy in the Pharmacy activity type. These will have a child reference to either a Med Def Flex Id (a specific pharmacy formulary) or to a Med Def Id (the master formulary). The master formulary is created first for *all* pharmacies in a Cerner domain, and then each item is “flexed” to either be on / off formulary per pharmacy. Note that each bill item represents a single component stocked in the pharmacy, including bulk items, unit dose, components to IV admixtures, TPN ingredients, and 1 or more generic TNF items. Unlike their orderable counterparts, these bill items are readily identified by their NDC number prefix followed by the drug name, form, and strength.

From here out, when referring to a pharmacy charge or charge event, we will only be referring to Dispense Event Charge Events.

# Pharmacy Charge Structure

Every dispense event that is chargeable will create a parent charge record on the CHARGE table with charge\_type\_cd = NO CHARGE. This represents the dispense event itself, and the charge description will represent the combination of items needed to fulfill the dose. This parent “no charge” record corresponds to either ad administration event, or a charge on dispense event.

Each child charge record beneath the parent represents a unique formulary item used to prepare the dose. For example, administering 2 acetaminophen tabs will create one parent “no charge” and one child charge for acetaminophen with quantity of 2. A tube of ointment will have one child charge for the tube. An IV admixture will have two children: one for the bag of IV solution and one for the vial of medication. A TPN will have many children, one for each component ingredient.

The parent charge records are never chargeable. They are only there to act as a placeholder for each Dispense Event Charge Event. The children are always what is actually charged.

## Other Topics

**Waste:** when the pharmacy must use part of a unit dose package to fulfill a request, some may be leftover. While a pharmacy should strive to use only what is necessary, the pharmacy is allowed to charge for the amount required to meet the dosage including any waste amounts. However, the pharmacy may *not* re-use the wasted amount on any other patient, even if it has been maintained in a sterile form. For example: if an order specifies 1.5 tablets, the pharmacy may either: break the tablets in half and dispense exactly 1.5 tablets (keeping the other half tablet in inventory), or they can dispense 2 tablets (allowing the nurse to split one of the tablets, give 1.5 and throw the other half tab away). In the former scenario, the hospital can bill only 1.5 tablets. In the later scenario, the hospital can bill for 2 tablets. This always applies “per dose” so an order for 1.5 tablets every 6 hours means the pharmacy would dispense (for a 24 hour period) either: four 1.5 tablet doses (four whole tablets + four half tablets), or four 2 tablet doses (eight tablets). In the latter scenario, the pharmacy cannot tell the nurse to save a half tablet from one dose to hold over to the next dose. Doing so would be considered fraud. Which rule to follow is set by institutional policy and may vary from drug to drug. The same scenario can also occur on injectables.

**Multi-Use Vials:** Some injectable medications are supplied as bulk supply injectable medications. These are intended for a high volume pharmacy that makes many of the same IV admixture, and can more easily make many IV admixtures from a single source high strength vial, than individual unit dose vials. In these cases, a fractional quantity of the multi-dose vial may be charged, and potentially at a lower price.

**QCF (Quantity Conversion Factor):** Some medications are supplied in one unit of measure (e.g. vial) but must be billed in another unit of measure (e.g. milligrams). There are not many of these, but they usually apply to high cost medications. This began when drug manufacturers would supply a particular medication in only a large volume vial with a higher cost, and thus increasing the revenue on that drug solely via the packaging. Medicare issued rules stating that certain drugs must be billed using only specific units of measure, thereby putting more onus on the ordering, supply, and usage of smaller dose vials. While a pharmacy may legitimately bill for amounts wasted in the preparation of a dose, using a QCF puts more focus on being good stewards of high cost medications. A QCF is a floating point number that is a conversion factor to be applied to the quantity of the item to convert the quantity to the units of measure for billing. For example: if a vial contains 500 milligrams of a drug, and the billing quantity is 10 milligrams, then a QCF of 0.02 is applied to the quantity. That is, if 1 vial (500 mg) is used for a dose, and the quantity on the claim must be in 10 mg increments, the quantity of 1 [vial] must be converted to 50 which requires a QCF of 0.02 (1 divided by 0.02 = 50). Of course, before a QCF can be determined, both the billing unit and the supply unit must be known. A QCF is specified on the bill item.

**HCPCS Codes:**  some medications must be identified by a code number when billed on a claim. These code numbers are called HCPCS (“hick-picks”) numbers, and are often the letter J or S followed by a number. These are used to identify high cost drugs on a claim. HCPCS codes are assigned per drug formulation and published for public use by CMS.

**NDC numbers:** every medication approved by the FDA receives an NDC, or National Drug Code, number. The NDC can be found on every medication outer package sold in the US (including over the counter medications). The NDC number has three components: a drug manufacturer number, a drug number, and an outer package number, separated by dashes. The FDA determines the drug manufacturer number; the drug manufacturer selects the drug number and outer package number, and notifies the FDA of its assignments. NDC numbers are published by the FDA for public use, and there are roughly 60,000 NDC numbers active at any one time. While not its original intended use, NDC numbers are often used to identify a unique drug formulation. NDC numbers are supplied to secondary systems such as billing, inventory control, and purchasing to indicate a particular drug formulation. It is important to note that acetaminophen 325 mg tablet, 1000 count bottle, by drug manufacturer A may be NDC 1234-3001-01 and by drug manufacturer B may be NDC 9876-1234-99. Note that other than memorizing NDC numbers, there is no way to determine what a drug is by looking at a number. Drug identification is typically done by using only the first two components, since the outer package size does not affect the drug formulation. Additionally, when used for this purpose, a common NDC is usually selected (arbitrarily selected at the time the formulary is created) and may not reflect the actual manufacturer of the drug the pharmacy purchased or supplied at a particular point in time. For example: acetaminophen 325 tablets is a common medication and manufactured by many companies. At the time the formulary is built in Cerner, the client may have selected the NDC number by Wyeth Drug Company, even though the hospital actually sources acetaminophen 325 mg tablets from many different manufacturers and the NDC number of those other manufacturers are probably different. The end result however is just the common identification of the drug: acetaminophen 325 mg tablet. Any system using NDC for this purpose must maintain an up to date reference of NDC numbers.

# Pharmacy Charge Data Model

\_CD columns use CDF meanings, \_ID columns show the reference in *italics*.

## Order-Level Bill Item

Activity Type = PHARMACY

| Parent | | | Child | | | Notes |
| --- | --- | --- | --- | --- | --- | --- |
| Event Contributor | Entity Name | Ref ID | Event Contributor | Entity Name | Ref ID |
| ORD CAT | CODE\_VALUE | *ORDER\_CATALOG.*  *catalog\_cd* | 0 | *NOMENCLATURE*  *null* | *0* | Unknown NOMENCLATURE reference. |
|  |  |  |  |  |  |  |

## Order-Level Charge Event

Activity Type = PHARMACY

| Master | | | | Parent | | | | Item | | | | Notes |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Event Contr | ID | Ref Contr | ID | Event Contr | ID | Ref Contr | ID | Event Contr | ID | Ref Contr | ID |
| ORD ID | *ORDERS.*  *order\_id* | ORD CAT | *ORDER\_CATALOG.*  *catalog\_cd* | *null* | *0* | *null* | *0* | ORD ID | *ORDERS.*  *order\_id* | ORD CAT | *ORDER\_CATALOG.*  *catalog\_cd* |  |
| DISP ID | DISPENSE\_HX.  dispense\_hx\_id | ORD CAT | *ORDER\_CATALOG.*  *catalog\_cd* | *null* | *0* | *null* | *0* | DISP ID | DISPENSE\_HX.  dispense\_hx\_id | ORD CAT | *ORDER\_CATALOG.*  *catalog\_cd* | Creates the parent “NO CHARGE” charge record. |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

## Task-Level Bill Item

Activity Type = PHARMACY

| Parent | | | Child | | | Notes |
| --- | --- | --- | --- | --- | --- | --- |
| Event Contributor | Entity Name | Ref ID | Event Contributor | Entity Name | Ref ID |
| TASKCAT | ORDER\_TASK | *ORDER\_TASK.*  *reference\_task\_id* | 0 | NOMENCLATURE  *null* | *0* | Unknown NOMENCLATURE reference. |
|  |  |  |  |  |  |  |

## Task-Level Charge Event

Activity Type = PHARMACY

| Master | | | | Parent | | | | Item | | | | Notes |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Event Contr | ID | Ref Contr | ID | Event Contr | ID | Ref Contr | ID | Event Contr | ID | Ref Contr | ID |  |
| ORD ID | *ORDERS.*  *order\_id* | ORD CAT | *ORDER\_CATALOG.*  *catalog\_cd* | ORD ID | *ORDERS.*  *order\_id* | ORD CAT | *ORDER\_CATALOG.*  *catalog\_cd* | TASK ID | *TASK\_ACTIVITY.*  *task\_id* | TASKCAT | *ORDER\_TASK.*  *reference\_task\_id* |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

## Item-Level Bill Item

Activity Type = PHARMACY

| Parent | | | Child | | | Notes |
| --- | --- | --- | --- | --- | --- | --- |
| Event Contributor | Entity Name | Ref ID | Event Contributor | Entity Name | Ref ID |
| MED DEF FLEX | CODE\_VALUE | MED\_DEF\_FLEX.  med\_def\_flex\_id | 0 | NOMENCLATURE  *null* | *0* | Unknown CODE\_VALUE reference (catalog\_cd on MFOI?). |
| TNF\_MED | CODE\_VALUE | 1 | 0 | *null* | *0* | Generic bill item for all TNF meds. |
|  |  |  |  |  |  |  |

## Dispense Event Charge Event

Activity Type = PHARMACY

| Master | | | | Parent | | | | Item | | | | Notes |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Event Contr | ID | Ref Contr | ID | Event Contr | ID | Ref Contr | ID | Event Contr | ID | Ref Contr | ID |
| DISP ID | DISPENSE\_HX.  dispense\_hx\_id | ORD CAT | *ORDER\_*  *CATALOG.*  *catalog\_cd* | DISP ID | DISPENSE\_HX.  dispense\_hx\_id | ORD CAT | *ORDER\_*  *CATALOG.*  *catalog\_cd* | MED DEF | MEDICATION\_  DEFINITION.  item\_id | MED DEF FLEX | *MED\_DEF\_FLEX.*  *med\_def\_flex\_id* | Generates the child charge records (one per item). Uses the 600 / SYSTEM flex type. |
| DISP ID | DISPENSE\_HX.  dispense\_hx\_id | ORD CAT | *ORDER\_*  *CATALOG.*  *catalog\_cd* | DISP ID | DISPENSE\_HX.  dispense\_hx\_id | ORD CAT | *ORDER\_*  *CATALOG.*  *catalog\_cd* | TNF\_MED | TEMPLATE\_  NONFORMULARY.  tnf\_id | TNF\_MED | 1 | Used to generate TNF charges (manual charge for special order items). |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

## About the ORD CAT link:

The ORDER\_CATALOG.catalog\_cd (ORD CAT) represents the orderable medication, and appears in all charge events: the order charge event, each task charge event, and each dispense charge event (both parents and children).

## About the ORD ID link:

The ORDERS.order\_id (ORD ID) represents the individual order the medication was ordered in, and appears in only the order charge event, and each task charge event. It does *not* appear in the dispense charge events; instead the DISP ID is used.

## About the DISP ID link:

The DISPENSE\_HX.dispense\_hx\_id (DISP ID) represents the individual dispense event that the medication was dispensed, related to the order, and appears at the parent charge / charge event (the pharmacy “NO CHARGE” placeholder) and in each child charge / charge event with the MED DEF / MED DEF FLEX links. Note that the DISP ID occurs in place of the ORD ID, and can be used to differentiate the charge events for order actions (ORD ID) vs. the charge events for dispense actions (DISP ID).

Note that the DISPENSE\_HX record represents a single dispense event on the order, and could include multiple doses (e.g. cart fill) and could include multiple items per product (e.g. IV admixtures, TPNs). The detail level is in the PROD\_DISPENSE\_HX table, a 1:M relationship to DISPENSE\_HX.

## About the TASKCAT / TASK ID link:

The TASKCAT and TASKID represent the ORDER\_TASK.reference\_task\_id and TASK\_ACTIVITY.task\_id respectively for the task completion charge event from the eMAR. While the completion of the task is the trigger to generate the charge, this actually sends a message back to the pharmacy server to generate the dispense charge events.

Reasons charging does not occur on the task are: a) charging is based on the quantities dispensed, and not the quantities actually administered, which only the pharmacy module would have; b) tasks represent completion of nursing work performed, and this action itself is not chargeable (the administration of medication); only the tangible items actually given to the patient are chargeable; c) aside from the medication details (i.e. amount given, cancelling tasks, modifying tasks, documenting med not given, and ad hoc doses), the other details of the task (capturing patient temp, blood pressure, etc) are not relevant to the charge.

Note that the task charge events do not use the Pharmacy activity type; they use the Task activity type instead. These bill items and tasks are usually maintained by the clin doc analyst, not pharmacy.

## About the MED DEF FLEX link:

The MED\_DEF\_FLEX.med\_def\_flex\_id (MDF) is found in BILL\_ITEM.ext\_parent\_reference\_id and the CHARGE\_EVENT.ext\_i\_reference\_id when the contributor code is MED DEF FLEX (respectively). This id value always points to the MDF record of SYSTEM flex type, flex sort flag 600, pharmacy type INPATIENT, and there will be no values in the other columns of MDF table. The MDF table can be joined on to MED\_FLEX\_OBJECT\_IDX (MFOI) to obtain the MED\_PRODUCT link to the primary supply item for the NDC.

## About the MED DEF link:

The MEDICATION\_DEFINITION.item\_id (MD) is found in CHARGE\_EVENT.ext\_i\_event\_id when the contributor code is MED DEF. This occurs on the same event as the MED DEF FLEX. This id value always points to the MD record for the formulary product. This can be used to link to the MED\_IDENTIFIER table for product-level identifiers (charge code, HCPCS, etc). When joining to MI, be sure to qualify on med\_product\_id = 0, and pharmacy\_type\_cd = INPATIENT, and active = 1. If needed, the MDF flex sort 600 / SYSTEM value is on this table.

# Pharmacy Data Model

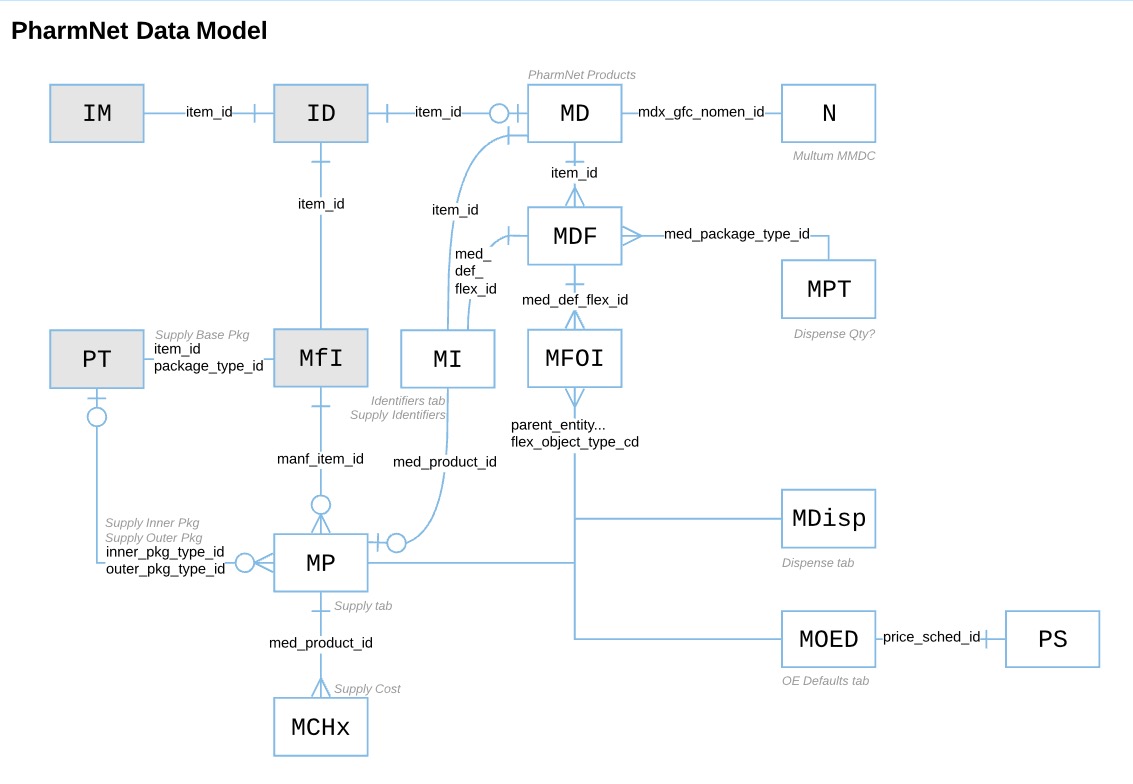
Information provided here is primarily as it relates to pharmacy charging, and is not intended to be a complete review of the pharmacy data model. Supplementary information will be provided where helpful. A background on PharmNet workflow, terms, and concepts is required.

| Table Name |  | Description |
| --- | --- | --- |
| ORDERS Data Model | | |
| ORDERS | O | Contains one record for each medication order, and one subsequent child record for each dose (child orders). The child orders are used to generate the tasks necessary for medication administration. The pharmacy assigns products, verifies, and dispenses on the parent order. The child orders are not used for individual dispenses. |
| ORDER\_INGREDIENT | OI | Contains one record for each ordered ingredient that has been requested by the ordering personnel. This table stores what has been ordered *prior* to assignment and verification. |
| ORDER\_INGREDIENT\_DOSE | OID | Contains one record for each ordered ingredient and dose sequence when the ordering personnel indicates a varying dose schedule (e.g. tapering meds like prednisone, opiate withdrawal, etc). |
| PHARMNET / PHARMNET AMBULATORY Data Model | | |
| ORDER\_DISPENSE | ODs | Contains one record for each order that has had a dispense. (0:1 with ORDERS table)  This is the only table in PharmNet that contains the ENCNTR\_ID. |
| ORDER\_PRODUCT | OP | Contains one record for each order and each product item that has been dispensed. (0:M with ORDERS table, and 1:M with ORDERS when 1:M on ORDER\_DISPENSE) |
| DISPENSE\_HX | DHx | Contains one record for each dispense event. Includes order\_id, [order] action\_sequence, event\_id, fill\_hx\_id as foreign keys, and numerous useful attributes about the dispense action. |
| PROD\_DISPENSE\_HX | PDHx | Contains one record for each product dispensed in a DISPENSE\_HX record. Does this contain the item level, or the product level, or both? |
| MEDICATION\_DEFINITION | MD | Contains one record for each product on the master formulary in this Cerner domain.  Note that in most new installations of Cerner domain, formulary flexing is in effect (I think this is referred to as Enhanced Inpatient Formulary). This is where a master formulary is created that contains all possible medication products on the open market (stored on MEDICATION\_DEFINITION), then each inpatient pharmacy is created as a location, and then items from the MEDICATION\_DEFINITION table are flexed (or virtual viewed) to be available per pharmacy location. This gives each pharmacy the ability to stock and dispense (or not) a medication from a master formulary. The master formulary is used for identifying and classifying medications in a standardized way. The master formulary can also be easily updated with new medication content from Multum without having to do this in each pharmacy. Also, new drugs can be released and stocked one pharmacy at a time, instead of all at once. The flexes are stored in the MED\_DEF\_FLEX and MED\_FLEX\_OBJECT\_IDX tables. Multiple aspects of a medication are separately flexible (Example: you can dispense a product as 1 mL at pharmacies A, B, C and dispense as 1 vial at pharmacies D, E. However, you can have different order entry default flexes for the same product for pharmacies A, E, and a different set of defaults at B, C, D. This would entail two kinds of flexes, each operating independent of the other.) |
| item\_id |  | primary key, inherited from ITEM\_MASTER table (all medications are items on the master, but have an additional record on MEDICATION\_DEFINITION. ITEM\_MASTER🡪 ITEM\_DEFINITION where item\_type\_cd = MED\_DEF) |
| mdx\_gfc\_nomen\_id |  | NOMENCLATURE.nomenclature\_id for generic drug / medication name. |
| inv\_master\_id |  | 0 (unless inventory managed by Cerner; no known clients who do this) |
| parent\_item\_id |  | 0 (unsure the purpose of this; no known client examples; may have been used in older PharmNet data model [IV Sets?]) |
| primary\_manf\_item\_id |  | 0 on new installations. May be populated on old PharmNet model, or possibly just for retail or shared items. Relevance: unknown. |
| *other columns* |  | form\_cd, strength/UOM, volume/UOM, given strength (perhaps from the top level of PhaDBPRoductMgr.exe?), Comment1 and comment2 (but not cd) are populated.  **All other columns empty.**  New installs only. |
| MED\_DEF\_FLEX | MDF |  |
| flex\_sort\_flag / flex\_type\_cd (4062) |  | Appears to correlate together (except that flex\_type\_cd has a 7th value: Set Item). Possibly flex\_sort\_flag is numeric to permit sorting / processing? |
| *other columns* |  |  |
| MED\_FLEX\_OBJECT\_IDX |  | Stores the flex objects. Consider that each tab in PhaDBProductMgr.exe is an MFOI flex object. |
| *see table below* |  |  |
| MED\_IDENTIFIER | MI | stores identifiers unique to MED\_DEF products (brand, generic, charge number, HCPCS, NDC, etc). These identifiers are managed in PhaDBProductMgr.exe, Identifier tab. This table also stores the identifiers unique to each manufacturer supply item (MED\_PRODUCT).  MED\_DEF uses item\_id and med\_def\_flex\_id.  MED\_PRODUCT uses med\_product\_id, and the related med\_def\_Flex\_id and item\_id of the associated MD product.  MED\_IDENTIFIER table is frequently used to bypass the MDF and MFOI tables, and go directly from MD to the flexed tables (e.g. MED\_DISPENSE, MED\_PRODUCT, etc). This is because every product and supply item will have at least one primary, active description. Supply items will (almost) always have an NDC. |
| med\_def\_flex\_id |  | always populated |
| med\_product\_id |  | 0 for MED\_DEF items (product description)  > 0 for manufacturer-level items (also provides the litany of supply items on the Supply tab, but does not provide sequence; must get seq from MFOI with MED\_PRODUCT flex object). |
| flex\_sort\_flag / flex\_type\_cd (4062) |  | Always 600 / SYSTEM |
| med\_identifier\_type\_cd (11000) |  | describes the kind of identifier (brand, generic, charge number, HCPCS, NDC, etc). Every item will (should) have at least a description. |
| primary\_ind |  | indicates whether this is the primary identifier among a single identifier type. |
| sequence |  | indicates the sequence of multiple identifiers of the same type. |
| *SAMPLE* |  | MD, MDF, MIS, MPT, MP, PARENT\_ENTITY\_ID: IF ...\_id > 0 then 1 else 0.  PARENT\_ENTITY\_NAME, FLEX\_SORT\_FLAG, FLEX\_SORT\_TYPE, PRI: as is  MI\_SEQ: IF > 1 then “1+” else if 1 then 1 else 0.  ITEM\_TYPE, ITEM\_LEVEL, PHA\_TYPE: from ITEM\_DEFINITION on item\_id [confirms the kind of item is only a med\_def item\_id, not manf\_item or any other kind of item] |
| *query* |  | SELECT INTO MINE  MI\_ACTIVE = evaluate2(IF(MI.active\_ind = 1) "" ELSE "Inactive" ENDIF),  MD = evaluate2(IF(MI.item\_id = 0.0) "" ELSE "1" ENDIF),  MDF = evaluate2(IF(MI.med\_def\_flex\_id = 0.0) "" ELSE "1" ENDIF),  MIS = evaluate2(IF(MI.med\_ingred\_set\_id = 0.0) "" ELSE "1" ENDIF),  MPT = evaluate2(IF(MI.med\_package\_type\_id = 0.0) "" ELSE "1" ENDIF),  MP = evaluate2(IF(MI.med\_product\_id = 0.0) "" ELSE "1" ENDIF),  PARENT\_ENTITY = trim(concat(trim(MI.parent\_entity\_name, 3), " / ",  evaluate2(IF(MI.parent\_entity\_id = 0.0) "" ELSE "1" ENDIF)), 3),  FLEX\_SORT = MI.flex\_sort\_flag,  FLEX\_TYPE = uar\_get\_code\_display(MI.flex\_type\_cd),  PHARM\_TYPE = uar\_Get\_code\_display(MI.pharmacy\_type\_cd),  MI\_SEQ = evaluate2(IF(MI.sequence > 1) "1+" ELSEIF (MI.sequence = 1) "1" ELSE "0" ENDIF),  PRI = MI.primary\_ind,  ITEM\_TYPE = uar\_get\_code\_display(ID.item\_type\_cd),  ITEM\_LEVEL = DF.description,  PHA\_TYPE = DF2.description,  CNT = trim(format(count(MI.rowid), ";,;i"),3)  FROM MED\_IDENTIFIER MI,  (LEFT JOIN ITEM\_DEFINITION ID  ON ( ID.item\_id = MI.item\_id)),  (LEFT JOIN DM\_FLAGS DF  ON ( DF.table\_name = "ITEM\_DEFINITION"  AND DF.column\_name = "ITEM\_LEVEL\_FLAG"  AND DF.flag\_value = ID.item\_level\_flag)),  (LEFT JOIN DM\_FLAGS DF2  ON ( DF2.table\_name = "ITEM\_DEFINITION"  AND DF2.column\_name = "PHA\_TYPE\_FLAG"  AND DF2.flag\_value = ID.pha\_type\_flag))  WHERE MI.med\_identifier\_id > 0.0  GROUP BY MI.active\_ind,  evaluate2(IF(MI.item\_id = 0.0) "" ELSE "1" ENDIF),  evaluate2(IF(MI.med\_def\_flex\_id = 0.0) "" ELSE "1" ENDIF),  evaluate2(IF(MI.med\_ingred\_set\_id = 0.0) "" ELSE "1" ENDIF),  evaluate2(IF(MI.med\_package\_type\_id = 0.0) "" ELSE "1" ENDIF),  evaluate2(IF(MI.med\_product\_id = 0.0) "" ELSE "1" ENDIF),  MI.parent\_entity\_name,  evaluate2(IF(MI.parent\_entity\_id = 0.0) "" ELSE "1" ENDIF),  MI.pharmacy\_type\_cd,  MI.flex\_sort\_flag,  MI.flex\_type\_cd,  evaluate2(IF(MI.sequence > 1) "1+" ELSEIF (MI.sequence = 1) "1" ELSE "0" ENDIF),  MI.primary\_ind,  ID.item\_type\_cd,  DF.description,  DF2.description  ORDER BY MI.active\_ind DESC,  CNT DESC  WITH TIME = 30 |
| MED\_PRODUCT | MP | Stores one record for each supply item related to a MED\_DEF. |
| manf\_item\_id |  | FK to the MfI table for manufacturer info. |
| inner\_pkg\_type\_id / outer\_pkg\_type\_id |  | FK to MED\_PACKAGE\_TYPE for package info. |
| MED\_COST\_HX |  |  |
| med\_product\_id |  | FK to MP table for cost info (cost1, cost2, awp) |
| MATERIALS MANAGEMENT Data Model | | |
| ITEM\_DEFINITION | ID | Origination of all item\_id’s. When an item is first created, its existence and identity is placed on this table. This table acts as a dictionary to all possible items (tangible goods) in the universe, both those procurable from external vendors (manufacturers) and those produced internally in the organization (formulated / compounded products, IV mixtures, bespoke implant items, etc). This table does *not* indicate whether the item is purchased, inventoried, or dispensed by the organization. This table just acts as a master lookup of all tangible object definitions, including medications. If the item is a medication, it will also have a single 1:1 record on MEDICATION\_DEFINITION.  Note that every record on this table has a level: manufacturer item (something a vendor packages and provides to the organization) or drug formulations (medication products dispensed by the organization).  Example: A manufacturer item would be a case of beef patties from McDonald’s supplier. A drug formulation would be a single Big Mac that contains two beef patties (among other ingredients). |
| item\_level\_flag |  | Indicates whether an item\_id is a MED\_DEF (something stocked in formulary; a product) or a MANF\_ITEM (something pharmacy could procure from a vendor; a vendor’s list of purchasable items). |
| item\_type\_cd (11001) |  | Broadly indicates if this ITEM\_DEFINITION is for pharmacy, materials management, equipment, or vendor item. |
| pha\_type\_flag |  | Indicates if the manf\_item or med \_def item is for inpatient, retail, or shared. |
| *SAMPLE* |  |  |
| *query* |  | ;\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  ; ID - MD / MI / IM Check  ; All MD's have 0:M OCIR records.  ; All MD's have no primary\_manf\_it, parent\_item\_id, or inv\_master\_id.  ;\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  SELECT ITEM\_DEF\_CNT = format(count(ID.rowid), ";,;i"),  MED\_DEF\_CNT = format(count(MD.rowid), ";,;i"),  MANF\_ITEM\_CNT = format(count(MI.rowid), ";,;i"),  ITEM\_MASTER\_CNT = format(count(IM.rowid), ";,;i"),  ITEM\_TYPE = uar\_get\_code\_display(ID.item\_type\_cd),  ID.item\_type\_cd,  ID\_ITEM\_LEVEL\_FLAG = DF.description,  ID\_PHA\_TYPE\_FLAG = DF2.description  FROm ITEM\_DEFINITION ID,  (LEFT JOIN MEDICATION\_DEFINITION MD  ON ( MD.item\_id = ID.item\_id)),  (LEFT JOIN MANUFACTURER\_ITEM MI  ON ( MI.item\_id = ID.item\_id)),  (LEFT JOIN ITEM\_MASTER IM  ON ( ID.item\_id = IM.item\_id)),  (LEFT JOIN DM\_FLAGS DF  ON ( DF.table\_name = "ITEM\_DEFINITION"  AND DF.column\_name = "ITEM\_LEVEL\_FLAG"  AND DF.flag\_value = ID.item\_level\_flag)),  (LEFT JOIN DM\_FLAGS DF2  ON ( DF2.table\_name = "ITEM\_DEFINITION"  AND DF2.column\_name = "PHA\_TYPE\_FLAG"  AND DF2.flag\_value = ID.pha\_type\_flag))  WHERE ID.item\_id > 0  GROUP BY ID.item\_type\_cd,  ID.item\_level\_flag,  DF.description,  DF2.description  ORDER BY ID.item\_type\_cd,  DF.description,  DF2.description  WITH TIME = 30 |
| ITEM\_MASTER | IM | Contains one record for every item being tracked for inventory purposes. Not all items from ITEM\_DEFINITION will appear on this table (manufacturer items are not on ITEM\_MASTER because manf\_item’s are somethign that *can* be ordered / purchased form a vendor, but may have never been procured or need to be tracked). All MED\_DEF’s are on ITEM\_MASTER, but the MANF\_ITEMS located beneath MED\_DEFS are *not* on ITEM\_MASTER.  This is important to note: MED\_DEF’s are “products” which are a medication that is provided and dispensed by the organization. This creates a MED\_DEF, ITEM\_MASTER, and ITEM\_DEF record. If the product is procured from one or more manufacturers, those manufacturer supply item(s) are stored as separate MANF\_ITEM and ITEM\_DEF records (but *not* MANF\_ITEM, unless perhaps the client uses Cerner Materials Management; no known example). The relationship of MED\_DEF products and their MANF\_ITEM supply item(s) are found on the MED\_PRODUCT table. |
| MANUFACTURER\_ITEM | MfI | Contains one record for every item that could be purchased from an external vendor. For example, Vendor A has a catalog of 4,000 items. Vendor B has a catalog of 200 items. If both vendors’ catalogs were stored in Materials Management for procurement (though none have ever been purchased or inventoried), then MANUFACTURER\_ITEM would have 4,200 records. |
| awp, cost1, cost2 |  | Not used for medications. Stored on MED\_COST\_HX instead.  *May* be populated on non-medication items (unknown). |

## Additional Notes

* Bill codes and descriptions in Charge Services will override values sent from PharmNet.
* Each charge will use the description in the primary CDM bill code, but if blank / not present, will use the bill item description.
* MED DEF FLEX bill item descriptions are created with or without the NDC prefix based on a preference setting in PhaDBTools.exe.
* New formulary items should automatically create a bill item, but if missing then run RXA\_LOAD\_PHARMACY.
* JW modifiers will be applied to those pharmacy charging have legitimately chargeable waste amounts. These are generated by PharmNet and sent to Charge Services.
* New 340B rules enacted Nov 2017, and effective Jan 2018, require the application of JG and TB CPT modifiers on affected medications at affected facilities. This is handled by tiering logic for the fin class, admit type, and facility, to use a special CPT-4 Modifier schedule.

## Data Model



## MD – MDF – MFOI Relationships

**NMHS\_NE** / For every MD.Item\_id…

| MDF |  |  |  |  |  |  | MFOI |  |  |  | Incid |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Flex Sort Type | Flex Type (4062) | Parent Name | Parent CS | Pkg Type | Pharm Type (4500) | Seq | Flex Object Type (4063) | Parent Name | Parent CS | Seq |  |
| 0 | 0 | null |  | 0 | 0 | 0 | 0 | null |  | 0 |  |
| 100 | Pharmacy | CODE\_VALUE | 220 Location | 0 | Retail | 0 | Med Product | MED\_PRODUCT |  | 0, 1, 3 |  |
| 400 | Facility | CODE\_VALUE | 220 Location | 0 | Inpatient, Retail | 0 | Dispense | MED\_DISPENSE |  | 1 | few |
| 500 | System Package Type | null |  | 0 | Inpatient | 0 | Dispense | MED\_DISPENSE |  | 1 |  |
| 500 | System Package Type | null |  | 0 | Inpatient | 0 | Orderable | CODE\_VALUE | 220 Location | 0 |  |
| 500 | System Package Type | null |  | 0 | Inpatient | 1+ | Dispense | MED\_DISPENSE |  | 1 |  |
| 500 | System Package Type | null |  | 0 | Inpatient | 1+ | OE Default | MED\_OE\_DEFAULTS | 220 Location | 0, 1 |  |
| 500 | System Package Type | null |  | 1+ | Inpatient | 0 | Dispense | MED\_DISPENSE |  | 1 |  |
| 500 | System Package Type | null |  | 1+ | Inpatient | 0 | Orderable | CODE\_VALUE | 220 Location | 0 |  |
| 500 | System Package Type | null |  | 1+ | Inpatient | 0 | Orderable | CODE\_VALUE | 0 | 0 | few |
| 500 | System Package Type | null |  | 1+ | Retail | 0 | Dispense | MED\_DISPENSE |  | 1 |  |
| 500 | System Package Type | null |  | 1+ | Retail | 0 | Orderable | CODE\_VALUE | 220 Location | 0 |  |
| 500 | System Package Type | null |  | 1+ | Retail | 0 | Orderable | null | 0 | 0 | few |
| 600 | System | null |  | 0 | null | 0 | null | null | 0 | 0 | 2 of 100k |
| 600 | System | null |  | 0 | null | 0 | OE Defaults | MED\_OE\_DEFAULTS | 0 | 1 | few |
| 600 | System | null |  | 0 | Inpatient | 0 | Med Product | MED\_PRODUCT | 0 | 1+ |  |
| 600 | System | null |  | 0 | Inpatient | 0 | OE Defaults | MED\_OE\_DEFAULTS | 0 | 1 |  |
| 600 | System | null |  | 0 | Inpatient | 0 | Order Alert | CODE\_VALUE | 4029 Order Alerts | 0 |  |
| 600 | System | null |  | 0 | Retail | 0 | Med Product | MED\_PRODUCT | 0 | 1+ |  |
| 600 | System | null |  | 0 | Retail | 0 | OE Defaults | MED\_OE\_DEFAULTS | 0 | 1 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |

**STDO\_MS** / For every MD.Item\_id…

| MDF |  |  |  |  |  |  | MFOI |  |  |  | Incid |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Flex Sort Type | Flex Type (4062) | Parent Name | Parent CS | Med Pkg Type | Pharm Type (4500) | Seq | Flex Object Type (4063) | Parent Name | Parent CS | Seq |  |
| 500 | System Package Type | null |  | 0 | Inpatient | 1+ | OE Default | MED\_OE\_DEFAULTS |  | 1 |  |
| Dispense | MED\_DISPENSE | 91% |
| >0 | 0 | 9% |
| Orderable | CODE\_VALUE | 220 Location | 0 | > formulary count, most flexed to locations. |
| null | 0 | few |
| 600 | System | null |  | 0 | Inpatient | 0 | Ingredient Group | CODE\_VALUE | 0 | 0 | 1 |
| Med Product | MED\_PRODUCT | 1+ |  |
| OE Defaults | MED\_OE\_DEFAULTS | 1 |  |
| Order Alert | CODE\_VALUE | 4029 Order Alerts | 0 |  |
| Substance Attribute | 4700 Ingredient Attributes | few |
|  |  |  |  |  |  |  |  |  |  |  |  |

Highlighted flexes are the ones to follow.

# References

Overview of Charge Services and PharmNet Integration

<https://wiki.ucern.com/display/public/reference/Overview+of+Charge+Services+and+PharmNet+Integration>

Configure PharmNet Inpatient Database – HCPCS Identifiers and QCF Values

<https://wiki.ucern.com/display/public/reference/Configure+PharmNet+Inpatient+Database+-+HCPCS+Identifiers+and+QCF+Values>

Understand QCF Calculations in Charge Services

<https://wiki.ucern.com/display/public/reference/Understand+Quality+Conversion+Factor+Calculations+in+Charge+Services>

Design Charging HCPCS and QCF

<https://wiki.ucern.com/display/public/reference/Design+Charging+HCPCS+and+QCF?bookId=1417>

Charge Services Reference Pages

<https://wiki.ucern.com/display/reference/Charge+Services+Reference+Pages>

Charge Services Data Model Activity Tables

<https://wiki.ucern.com/display/public/reference/Charge+Services+Data+Model+Activity+Tables>

Charge Services Data Model Reference Tables

<https://wiki.ucern.com/display/public/reference/Charge+Services+Data+Model+Reference+Tables>

Bill Item Modifier Field Map

<https://wiki.ucern.com/display/public/reference/Charge+Services+Bill+Item+Modifier+Field+Map>

Charge Services BIM1\_INT Binary Conversion Table

<https://wiki.ucern.com/display/public/reference/Charge+Services+BIM1_INT+Binary+Conversion+Table>

Use Charge Services Charge Creation Logic

<https://wiki.ucern.com/display/public/reference/Use+Charge+Services+Charge+Creation+Logic>

Charge Services Troubleshooting

*Includes diagram of charge creation process.*

<https://wiki.ucern.com/display/public/reference/Charge+Services+Troubleshooting>

Charge Services Bill Items

*Includes diagram of bill item hierarchy and icons*

<https://wiki.ucern.com/display/public/reference/Charge+Services+Bill+Items>

Implement Charge Services Charge Processing

*Includes list of charge points and their definitions.*

<https://wiki.ucern.com/display/public/reference/Implement+Charge+Services+Charge+Processing>

Overview / Understand / Design / Configure Waste Charge Management

*Effective on HNAM 2015.01.20 service release.*

<https://wiki.ucern.com/display/public/reference/Overview+of+Waste+Charge+Management>

<https://wiki.ucern.com/display/public/reference/Understand+Waste+Charge+Management>

<https://wiki.ucern.com/display/public/reference/Design+Waste+Charge+Management>

<https://wiki.ucern.com/display/public/reference/Configure+Waste+Charge+Management>

PharmNet Glossary

<https://wiki.ucern.com/display/public/reference/PharmNet+Glossary>

Design PharmNet Charge Credit Capture Process

*Includes good discussion on how PharmNet charges are triggered.*

<https://wiki.ucern.com/display/public/reference/Design+PharmNet+Charge+Credit+Capture+Process>

Overview of Bill Item Not Found Resolution

<https://wiki.ucern.com/display/public/reference/Overview+of+Charge+Services+Bill+Item+Not+Found+Resolution>

Helpful uCern Connect articles

<https://connect.ucern.com/docs/DOC-337431>

<https://connect.ucern.com/thread/2455597>

<https://connect.ucern.com/thread/182985>