

Drug Recognition

Drug Recognition by Charles McLeskey, MD

In a graphic that appeared in the Chicago Tribune a little while ago, there was a series of articles that focused the public's attention on all of the disasters that happen in the hospital. With that kind of information out there, the public is obviously getting more concerned about this issue. This is a very simple definition, "Safety is a freedom from injury" whereas "Error can be defined and there are two basic kinds of error, the error of planning where we plan the wrong action." It's evident that we've planned the right action, but there's been some error in the execution. Drug recognition falls into that area. If we misrecognize an ampoule, for example, that contributes potentially to a breakdown of safety which is, of course, what APSF stands for. This is just a very brief review of some of these medical errors and supporting newspaper and journal articles, the OR-based adverse drug events; some about their cause and prevention; and then a brief look at the systems approach toward identifying those problems; and then at the end, two new technologies that we might consider as advances in this area of potential solutions.

Now, I'm surprised nobody has highlighted these, and I know the APSF members are highly attuned to this, but some of the folks in the room may not be sophisticated about this area. The Institute of Medicine Report suggested that there are 44,000 to 98,000 hospital deaths annually, an event rate that causes injury and death even greater than motor vehicle accidents, breast cancer or AIDS with an impact nationally in the \$20-30 billion range. They go further to say that 7,000 deaths are due to medication errors both inside and outside the hospital. Again the Chicago Tribune picked up on this. On the front page they say, "Lethal Drugs, Lax Rules: A Deadly Mix in Hospitals." The subtitle says, "An estimated 7,000 patients die each year because they are given medications that weren't ordered for them yet there are virtually no regulations that govern how medicines are stored or dispensed. This knowledge is no longer specific to the medical population, but to the public as well. We're not necessarily the leaders in its exploration anymore although I looked at APSF years ago as setting the stage. From my perspective, anesthesiology has really benefited from positive publicity that we have received for being the movers and shakers in all the medical field. And I think it's in large part due to some of the advances that this particular organization has made. Two patients per 100 admissions into the hospital experienced an ADE (adverse drug event). \$4700 a patient, an annual hospital bill resulting in about the \$2 billion range. What are the factors that contribute to adverse events in the operation room? Incomplete patient information, problems with communication, medication information, problems with the packaging of medication, and now that I work at Abbott Labs, this is particularly sensitive to us as a corporate entity, our packaging, labeling, and nomenclature and so forth, medication device uses, infusion pumps, those kinds of things, and environmental stress—all are contributing factors. Let's talk about a few of these.

Communicating medication information. An article from Cornan Smetzer Institute for Safe Medical Practice suggests, because verbal orders are necessary in the OR, they should be repeated back. Just like pilots and air traffic controllers do. Is repeating back information appropriate for us? Could we see that work in the OR? For example, the surgeon says, "Give a couple grams of Ancef." Reply "Couple grams of Ancef." Can we see ourselves doing that? Think about it. What about sloppy order writing? It had gotten to the point, right before I left, that we were all concerned about medication errors that we were contributing to at our own location. Some of the nomenclature and some of our writing was being scrutinized and we were being educated. For example, if you're writing a drug order that says, 1 mg per something or other. Many people would write 1.0 mg per something or other. And we're being educated by the pharmacists that the ".(decimal)" might be lost in transmission. Leave it. If it's misread or left out, the pharmacist could potentially interpret it as 10 mg. So, if you're going to write 1, don't put 1.0, just 1. And vice versa. If it's 0.1, don't just write .1 because again the period might be lost and a miscommunication resulting. So communication is a problem with medication packaging, nomenclature and labeling, and problems with look-alike medications or sound-alike medications. In one article, they describe the fact that 29% of pharmacy errors, medication errors that occurred in the pharmacy, 25% of them resulted from this cause. Ten percent of errors that nurses make result from this

particular cause.

Those of you who are academic anesthesiologists in the room today will probably recognize what I've seen, year in and year out. About July, maybe August, every year, we have an M&M conference. The conference would usually go along the lines of "this patient got hypotensive and intervention was performed and so the blood pressure's off the ceiling and if we were lucky, no CNS event resulted from that." When the cause was determined, it turned out that a new resident picked up an epinephrine ampoule thinking it was an ephedrine ampoule. Who among us, the skilled senior clinicians in the room has not done that?

What about solutions to the problem? Pre-filled labeled unit doses, drugs that have already been pre-filled and labeled for us so we don't have to be fooling with a labeling issue is one solution. Another solution is separation of potential look-alike or sound-alike medications in storage and so you have to make a distinctive effort to get one versus the other. Again, proper labeling of syringes and basins. Now, I know this is the APSF, but we're thinking perioperatively now. What other influence might we be able to produce that would be beneficial to patient care? A publication of the Institute of Safe Medical Practice says, "Unsafe practices, for example, unlabeled syringes and basins on the sterile surgical field, can lead to administering the wrong medication or solution." In one case, hydrogen peroxide was drawn into a syringe from an unlabeled basin on the surgical field instead of lidocaine, which obviously had a bad result. In another case in the cath lab, lidocaine 2% instead of contrast media was injected during angiography with a seizure as a result. Even when basins are labeled, tragic errors can and do occur. One tragic error occurred when a child died after having received a "massive dose of epinephrine." The medication was first poured into a sterile cup and then drawn into a syringe from that cup. In this case, epinephrine 1-1000 was accidentally poured into a cup, which had been labeled "lidocaine with epinephrine." Then, subsequently when the syringe was drawn up and handed to the surgeon who thought it was lidocaine with epinephrine in a diluted form ♦ in fact it was concentrated epinephrine ♦ it was injected into the ear of a small child who subsequently died. So, the errors as a result of drug recognition or drug mismanagement extend even beyond our OR anesthesia area across the field in other areas as well.

According to one article, the second most frequent cause of medication errors is the misuse of infusion pumps. Here's another factor that contributes to errors in the OR. And there is a close analogy here in our environment in the OR to cockpit resource management in the aeronautic industry. What are some of those environmental stressors? What about faulty interaction? For example, intimidation in an OR impairs the performances of those who are intimidated causing failure to communicate in that environment. In one particular article, 10% of errors that occurred during medical administration was thought to be due to a faulty interaction in that kind of environment. Another example is if somebody orders something, for example, a surgeon suggests we give something and we differ with that, what is the frequent result of that? It's been my experience in those kinds of environments that we do as we're told, but write down that we were told by the surgeon to do "such and such." We think we're protected that way and as a result in spite of that, maybe it was the wrong thing to do. And does somebody have the skill and the wherewithal to stand up to that kind of challenge? This article suggests that those kinds of things should be reviewed by neither of the antagonists but by some peer review multidisciplinary approach later on. And maybe we can have max doses of selected medications that we all agree will not be exceeded. They go on to say that learning about these potential weaknesses and factors, rather than looking at individuals, looking at the system is probably what we ought to be placing most of our attention. OR staff members should focus on the systems before an error occurs. Let's move on that.

Another article right now is by Lucien Leap in JAMA where an examination was made of system errors that might have caused adverse drug events. Some of those errors were lack of medication knowledge, lack of patient information, faulty drug identification recognition along with faulty check of the dose to be administered, and faulty interaction with other services. We just heard the concept of doorknockers. Now what about the transfer of a patient from the ICU to the OR? What about our transfer of the patient back to

the recovery room? What about those interactions with other services? Is that a possible system error that can cause a problem with adverse drug events? When we go to the PACU and we write down some order, are we transmitting that information properly? Or are we potentially a part of the problem in causing these drug errors? Then again, they also pointed out problems with infusion pumps. The analogy there was that the major cause of the problem was failure of dissemination of drug information, potentially to us, the physicians, causing maybe 1/3 of the problems. The other major cause was the inadequate availability of timely patient information.

So what's out there? What are the two potential advances? Here is one of them. Some sort of handheld automated physician order entry. Now this was studied in a couple of hospitals and reported in JAMA two years ago. In a setting that was not necessarily the OR, but could we take the information that they have learned and apply that to the OR or perioperative setting? Handheld automated physician order entry device on which are contained, within which would be a menu of acceptable formulary medications with a default dose range and a range of suggested doses. Now there are these kinds of systems in place right now. For example, at LBS Systems in Salt Lake, a physician on the ward can go to the computer terminal and push a button and it says that the patient has "this" disease and the computer will suggest the antibiotic for it and a range of doses. Could we move that kind of thing into a handheld device that would be widely applicable to the OR? What about information that would contain also the patient's current lab results that would influence the drug or the dose administered. Suggesting consequent orders. For example, if you order Lasix, the device might also ask, "Would you also like to measure potassium in four hours?" Or if you give a particular antibiotic, "Would you also like to order a blood level of this antibiotic in a certain period of time?" Information that would also contain drug allergies of the patient and potential drug/drug interactions of drugs the patient is also on that you are now also contributing to by your medication order. As a result of their study, they found a 55% decrease in serious medication errors with the utilization of this device in the clinical setting outside of the OR now. But could we apply something like that to the OR? 23% decrease in dosage errors, 50% decrease in drug allergy errors, and a 40% decrease in potential drug/drug interaction errors.

Now another front page article in this series of issues again from the Chicago media, "Nursing Accidents Unleash Silent Killers." At the bottom it says, "Misuse of medical pumps leads to death." Now this article said a nurse was managing a patient with 6 or 7 infusion pumps. And we think, what a complicated environment the ICU is. I submit to you, the OR is a more complicated charged environment, faster paced. It's like how a college athlete moves from a national ranking to the NFL. Suddenly the pace quickens. The time in the huddle is much shorter. You've got to make decisions more quickly. Things pick up! So also is it from the ICU to the operating room. And at the risk of stepping just a little bit on Tim's topic, I'd just like to talk about our feelings about how can we improve the infusion devices, infusion pumps. When they're moved down to the operating room from the ICU and back up again, could we standardize those devices? Could there be some national kind of a norm of standardization? Could we as a variety of companies agree on what we're going to do? Could we get the input of the community and get everybody to agree on something which would therefore potentially minimize confusion in set up and programming? Some kind of a double check system has been recommended by the ISMP for hazardous medications including PCA devices.

Another strategy would be this: improve training. Do we have to have a device that requires training? I like to say to the following concept: should we be using a device that is designed by idiots that takes a genius to operate? Wouldn't it be better if geniuses designed the device and even an idiot could operate it? Could it be standardized and simplified? Could there be improvements such as medication recognition? To do that, the suggestion might be that we could use some kind of bar code reader. And this is an advance called reduced space symbology which I am no expert in. I'll bet there are experts in the room here. Where the bar coding technology has minimized and microtized so much to where it can be applied on various small areas, on ampoules and the like to where medication information and patient information can be compared. And then finally, could a PCA device itself be preprogrammed with bar code technology where the medication would be observed and recognized without an individual human having to interface with the device potentially increasing the likelihood for medication error. Those are the kinds of advances that potentially are available in

the field. So this article goes on to say that where we ought to be placing our approach probably is getting information on-line ♦ both medication information and patient information on-line ♦ and then somehow advancing with the implemented automated delivery devices potentially with bar code technology so drug recognition becomes far, far easier and simplified for all of us to use in a charged environment.