A Perspective on Dose Banding

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Calculating and preparing chemotherapy can be a time-consuming task for the oncology pharmacist. In addition, administration of drugs based on the current standard of precise dosing can lead to the incomplete use of vials resulting in unused drug. Dose banding, or the standardization of injectable chemotherapy doses into a defined set of dose ranges or bands, has been suggested as an alternative approach to precise dosing. Rather than precise doses being based on body surface area (BSA) or other factors (eg, weight, age, contraindications), dose banding determines a standard, preprepared dose of chemotherapy based on predefined ranges.

The table of predefined ranges, validated by prescribers or pharmacists, can either be drug-centered or BSA-centered. For example, if a patient’s dose falls between 1550 and 1700 mg (an example of a drug-centered dose band), the patient would receive a preprepared dose of 1625 mg. Alternatively, BSA-centered dose banding bases doses on BSA ranges rather than drug-dose ranges. Regardless of whether a drug-centered or BSA-centered table is used, the preprepared dose is usually within 5% of the precise dose. This preprepared dose of chemotherapy can either be purchased directly from the manufacturer or prepared by the hospital.

Although dose banding has not been implemented in the United States, the practice is currently used abroad. Potential benefits include decreased outpatient waiting time and reduced drug waste, medication errors, and preparation time for administration. In addition, decreasing drug waste may help conserve drugs during times of shortages. Despite these potential benefits, however, questions remain regarding the safety and efficacy of drug doses determined by dose banding. To gain a better perspective on the potential use of dose banding, NCCN asked Audrea Szabatura, PharmD, BCOP, from Dana-Farber/Brigham and Women's Cancer Center, her thoughts on dose banding and its potential implementation.

Answering Questions About Dose Banding

Does your institution experience a great deal of chemotherapy drug waste? If so, what have you done to prevent waste and alleviate the cost burden?

Dr. Szabatura: At first glance, our total waste in dollars may appear high; however, relative to the amount of chemotherapy prepared, the overall percentage of drug wasted is pretty low. Our institution has implemented several strategies to reduce our waste. We have instituted a committee consisting of key members of our pharmacy materials management department, as well as our pharmacy technician supervisor, our IT pharmacy technician specialist, and the Director of Pharmacy Infusion Services. This group meets regularly to review our waste data, which are tracked and trended. This information is presented in terms of total dollars wasted, the reasons for waste, and specific drug wasted, and by specific location. The group develops and incorporates changes based on this information as necessary. This may necessitate changing the way medications are labeled in terms of expiration date or time, how overall inventory is monitored and managed, or how drugs are prepared, among other possibilities. And, similar to most institutions, we continue to seek ways to minimize our waste.
Overall, do you think that dose banding has feasibility in the United States?

Dr. Szabatura: Data show that using BSA to calculate chemotherapy doses may not be the most accurate method to determine a dose with an acceptable level of toxicity that does not compromise the agent’s therapeutic efficacy. That said, the attempt to administer an exact dose based on a person’s BSA may be futile. Furthermore, with drug costs escalating and demands for chemotherapy services on the rise, investigating alternative dosing strategies may prove beneficial. In theory, dose banding may reduce pressure on nurses and pharmacists, minimize drug waste, improve the ability to plan workload, reduce patient wait times, and even decrease chemotherapy preparation and administration errors. Unfortunately, the data supporting these theories are limited.

Despite these limitations, however, I do think implementing dose banding is feasible in the United States. I think this dosing philosophy could be deployed once 1) drugs and regimens suitable for dose banding have been identified; 2) dose banding tables have been developed; 3) impact on pharmacy operations and finance have been determined; and 4) a collaborated plan has been developed.

Has your institution ever considered implementing a dose banding strategy? Why or why not?

Dr. Szabatura: We have not at this time. From the wide use of dose banding outside the United States, including more than 48 hospitals in the United Kingdom, limited data demonstrate reduced patient wait times, medication errors, and waste. Given the safety practices in place at our institution that minimize dose calculation and preparation errors, our overall low percentage of drug waste, and our efficient drug preparation process, we have not formally evaluated the potential benefit of a dose banding strategy. I think it is definitely appealing from the preparation standpoint, but I question how much time it will save our institution in particular. Our overall turn-around time—including the pharmacist’s order review for clinical appropriateness, order processing, drug preparation and verification, and delivery—is relatively efficient, although it can be lengthy, depending on the clinic day and time. The drug preparation time is only a small proportion of the overall pharmacy approval and preparation process.

The opportunity to minimize chemotherapy preparation errors is motivating; however, errors could still be made, and these could potentially affect patients on a larger scale. Finally, reducing medication waste and its associated costs is a significant advantage. However, since our institution has relatively low waste, the advantages of producing batches of chemotherapy products within the hospital pharmacy is uncertain, especially given limitations due to USP 797 sterility standards. I would anticipate greater advantages in terms of waste if products were supplied from outside commercial sources in which sterility and expiration times are prolonged.

Despite potential advantages of dose banding, what reservations might you have in implementing such a strategy?

Dr. Szabatura: Although the practice of BSA-based chemotherapy dose individualization has been questioned, the added variance introduced by dose banding may result in an unacceptable deviation from the true intended dose. This, in addition to the lack of clinical data on pharmacokinetic equivalency and outcomes efficacy for dose banding, contributes to some reservation in embracing this concept uniformly. Furthermore, dose banding may be inappropriate for certain drugs, such as carboplatin or monoclonal antibodies, or for some patient populations, such as pediatric patients or those who are significantly obese or underweight.
Additionally, our institution treats a significant number of patients who are on clinical trials. The dosing strategy for these patients is determined by the trial and is often controlled by sources outside the institute. These circumstances require differences in practice; in some cases, a dose banding approach could be used, but others would require a BSA-based approach. From a medication safety standpoint, the significant variations in how medications would be ordered, processed, and prepared in such a system could lead to a great potential for error.

**Is your institution considering clinical trials to assess the efficacy and safety of dose banding?**

**Dr. Szabatura:** We are not at the moment. However, I think research in this area is warranted and would provide valuable information to oncology practices. As mentioned previously, clinical trials should quantify and qualify differences in patient exposure to chemotherapy in terms of efficacy, ease of chemotherapy preparation, impact on administration efforts, and reductions in cost. Trials assessing standardized dose bands according to pharmacokinetic data and clinical outcomes would be of paramount importance.

**References**
