Medication Errors

Therapy for Acute Myocardial Infarction: There’s Simply No Room for Error

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Problem: When fibrinolytic agents and related drugs are used to treat patients with acute myocardial infarction (AMI), any deviation in the dose, timing, or use of specific agents may adversely affect patient outcomes. However, complex regimens and variations in the way the drugs are dosed and administered increase the chance of serious errors, especially if multiple products are on the formulary and protocols are absent or poorly designed.

The Institute for Safe Medication Practices (ISMP) has received several reports of errors that demonstrate these problems. In one case, a 62-year-old man died after receiving duplicate therapy. The patient, who was admitted to the emergency department (ED) with unstable angina and chest pain, was initially treated with aspirin, clopidogrel (Plavix®, Bristol-Myers Squibb/Sanofi), and dalteparin sodium injection (Fragmin®, Pfizer). An hour after his chest pain resolved, the electrocardiogram showed changes consistent with an AMI.

A thrombolytic protocol was initiated, and the patient received the first bolus dose of intravenous (IV) reteplase (Retavase®, Centocor). The protocol also directed the staff to begin a heparin infusion. The nurse began the infusion without realizing that dalteparin had already been given to the patient. About 30 minutes later, before the second bolus dose of reteplase was administered, hemorrhaging occurred and the patient died despite aggressive treatment for bleeding.

The potential for overdoses with tenecteplase (TNKase™, Genentech) was also reported. Tenecteplase is the first fibrinolytic agent that can be administered as an IV bolus over five seconds in a single dose. Other fibrinolytics are split into several doses. For example, reteplase is split into separate injections, given about 30 minutes apart. If the dosing schedule for TNKase is confused with that for reteplase, a patient might receive a second TNKase dose 30 minutes later, or the dose might be split in half and delivered as two doses, 30 minutes apart.

Another error involved confusion between tissue-plasminogen activators (t-PAs) when a specific drug was referred to as “t-PA.” A physician ordered TNKase, a genetically engineered mutant form of t-PA. A nurse who was unfamiliar with the drug asked for clarification. The physician inadvertently misled the nurse by answering in the affirmative when asked specifically if the drug ordered was a “t-PA.” The nurse erroneously administered alteplase (Activase®, Genentech), which is commonly referred to as “t-PA.”

Safe Practice Recommendation: Errors that involve fibrinolytic agents and related drugs can be reduced if we apply some basic safety principles: (1) standardize, (2) simplify, (3) improve access to information, and (4) restrict access to “high-alert” drugs.

Standardizing

• The number of fibrinolytic agents on the formulary should be limited. When selecting these agents, P&T committee members should actively analyze what might go wrong during their use, determine the consequences of an error, and build safety nets (e.g., independent double-checks and dosing tables to avoid miscalculations) if injury to patients is likely.

• Protocols should be streamlined, and order forms should be standardized to promote proper use.

• Fibrinolytic drugs, especially tissue-plasminogen activators, should be identified by their full generic names (e.g., alteplase, reteplase, and tenecteplase), not “t-PA,” on preprinted and handwritten orders and drug protocols.

• For weight-based therapy, prompts should be added on standard order forms to communicate the patient’s weight.

Simplifying

• The complexity of the treatment regimen should be minimized.

• Clinicians should consider all associated drugs that might be used to treat the patient (e.g., heparin, low-molecular-weight heparin, oral and IV beta blockers, aspirin, IV nitroglycerin) and the tight time constraints for administering these agents.

• Protocols should require practitioners to assess all recent drug therapy. For instance, it should be clearly noted that a heparin infusion should not be started if the patient has just received low-molecular-weight heparin.

Improving Access to Information

• When new drugs are added to the formulary, physicians, pharmacists, and nurses should be routinely educated about them.

• Responsibility for staff education should be assigned to the person who researched and presented the new drug to the P&T committee for approval. In this way, one practitioner who is most knowledgeable about the drug can determine the level of education necessary for each discipline and can ensure that the information is disseminated.

Restricting Access to Drugs

• Education is important, but its leverage for preventing errors is lower, especially with the current shortages of pharmacists and nurses. Such shortages often result in a patchwork of
new, temporary, and floating staff. As such, restricted access to drugs provides higher leverage for preventing errors.

• If the pharmacy can provide service on a 24-hour basis in a timely fashion, it should dispense the fibrinolytic agents, especially if mixing is necessary.

• Limiting the number of doses available in stock is another way to restrict access. For example, in the ED, stocking just one “clot-buster kit” containing a single dose (with immediate access to back-up supplies) helps to prevent accidental overdoses.

• Finally, drug therapy for AMI patients should be reviewed periodically to assess outcomes, to identify weaknesses, and to implement needed changes.

The reports described in this column were received through the USP–ISMP Medication Errors Reporting Program (MERP). Errors, close calls, or hazardous conditions may be reported on the ISMP (www.ismp.org) or the USP (www.usp.org) Web site or communicated directly to ISMP by calling 1-800-FAIL SAFE or via e-mail at ismpinfo@ismp.org.