

Medication Safety Alerts

Jason C. Volling, Sylvia Hyland, and David U

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ANTIBIOTIC AND ANTICOAGULANT FIRST-DOSE DELAYS

Impact of the Problem

When treating certain conditions such as pneumonia or pulmonary embolism, delays in the administration of the first dose of an effective therapy may result in patient morbidity or mortality. Treatment outcome studies of pneumonia have shown that if the first antibiotic dose is not given within 8 h of arrival at the hospital, mortality rate is significantly increased.¹ Pharmacists, as members of multidisciplinary teams, can affect patient outcomes by reducing the time to administration of the first antibiotic dose.² It is also well recognized that timely treatment of venous thromboembolic disease (e.g., deep vein thrombosis or pulmonary embolism) with anticoagulants is important.³

Objectives

This article has 3 objectives:

- To raise awareness of the impact of first-dose delays on patient outcomes.
- To discuss some of the contributing factors that lead to first-dose delays.
- To provide suggestions for strategies that can be implemented to prevent first-dose delays.

Case examples

A patient is admitted with a diagnosis of community-acquired pneumonia. At 1300, shortly after admission, an order for “levofloxacin 500 mg IV daily” is written.

The first dose is given at 1000 the next morning. The patient’s status progressively declines, and she is admitted to the Intensive Care Unit for respiratory support.

Medication error: First-dose delay

A patient is clinically diagnosed with pulmonary embolism in the emergency department. The admission medication order written at 1230 reads “dalteparin 7000 units SC bid”. When the order is transcribed to the medication administration record, a start time of 2200 is selected. The patient’s oxygenation progressively declines throughout the afternoon, and reassessment is required. Fortunately, the first-dose delay is recognized, and anticoagulation therapy is administered immediately.

Medication error: First-dose delay

Possible Contributing Factors

First-dose delays can occur for a variety of reasons. Some of these contributing factors are described below.

Incomplete Medication Orders

Traditionally, written hospital medication orders have these 6 main components:

- Date and time of order
- Drug name
- Drug dose
- Drug route
- Schedule (frequency)
- Duration (when applicable)

There is a seventh component that is necessary for accurate order interpretation and administration of critical medications: the time to give the first (or next) dose.



Antibiotics and anticoagulants are broad drug categories, within which a number of new agents have recently been developed that have less frequent dosing requirements (e.g., q24h or q12h). While at first glance this change might seem to represent a significant convenience, less frequent dosing also comes with the risk of long delays in initiation of treatment if the start time is chosen to coincide with the next “standard medication administration time” within the hospital. New orders, including hospital admission orders for critical medications, should clearly indicate the desired time of the first or next dose.⁴ If such an order does not indicate the time of the first or next dose, the nurse or pharmacist should discuss the timing with the ordering physician.

Communication Issues

In special circumstances, good verbal communication must accompany a well-written order to ensure that the desired medication is available and administered as soon as possible. Problems can occur when physicians prescribe restricted drugs, drugs not listed in the hospital formulary, drugs that are unavailable from the manufacturer (e.g., because of back orders or product discontinuation), or drugs that are only available in certain areas of the hospital. Unless the need to initiate therapy immediately is clearly communicated, a lack of drug availability or a lack of familiarity with the clinical scenario may lead to unnecessary delays in initiating therapy.

Education Issues

A new nurse, pharmacist, or physician may not have encountered some of the situations that require urgent drug administration. Use of drugs that are unfamiliar or drugs that are used infrequently may contribute to first-dose delays. Pharmacists have an important role in providing relevant information and participating in continuing education initiatives.

Misinterpretation of hospital policies related to medication administration times may also lead to first-dose delays. This situation is well illustrated in the 2 cases described above. In the first case, the antibiotic was ordered for “daily” administration. The scheduled time for a daily dose is often defined within a policy as 1000. The hospital policy needs to also specify situations when exceptions to the standard medication administration time are necessary. The policy and the exceptions should be included in nursing orientation programs and ongoing education initiatives. For antibiotics, the policy must clearly state that the first

dose should be given as soon as possible and that subsequent doses should be given every 24 h, at a suitable time based on the time of the first dose. Similarly, in the second case, the standard administration times for medications ordered “bid” may be 1000 and 2200. However, when dalteparin, a low-molecular-weight heparin, is used for the treatment of pulmonary embolism, the first dose should be given as soon as possible. This scenario needs to be addressed in the policy and communicated to staff.

Patient Transfers and Work Flow Issues

For patients who require medications urgently, urgent diagnostic testing may also be needed. Diagnostic testing is usually performed in a different area of the hospital from where medication administration occurs. Therefore, decision making should include consideration of urgent medication administration before patients are sent for tests, to avoid significant delays in initiation of therapy.

Patient transfers from one hospital to another or from one unit to another can contribute to dose delays or other medication errors. Procedures that include extra checks and good communication are needed to decrease the risk for error. Good written documentation with verbal reinforcement is essential. Ideally, direct verbal communication should take place between the nurse who was administering the patient’s medications initially and the nurse who will be doing so after transfer. Patient transfers should be avoided during shift changes.

Prevention Strategies

Educate clinicians about writing complete and clear medication orders. Require that all 7 main components of a medication order (see above) be included.

Complete written order:

31/01/2002 0945 levofloxacin 500 mg IV q24h, first dose now

Incomplete order:

1/31/2002 levofloxacin 500 mg IV daily

It is noteworthy that computerized physician order entry with decision support and online patient information is the way of the future. Such systems can force the entry of all medication order components and could significantly reduce the frequency of first-dose delays. Implementation of computerized physician order entry in Canadian hospitals should be advocated.

Enhance interdisciplinary communication. Have pharmacists, nurses, and physicians work together to develop treatment guidelines. Have 24-h on-call



pharmacy services available. Ensure high-quality written and/or electronic documentation of administered medications, as well as good verbal communication between caregivers.

Educate staff about the situations they may encounter where medications would be needed quickly, as well as the applicable hospital policies that address special considerations for medication timing (e.g., standard medication administration times with identified exceptions).

Heighten staff awareness of patient flow issues and how they can affect patient care. Emphasize the need for complete documentation of medication doses administered. Work together to ensure that barriers to safe patient transfers and work flow are minimized.

Conclusions

Preventing first-dose delays for antibiotics and anticoagulants can be as easy as 1, 2, 3:

1. Include the start date and the time of the first dose in the medication order.
2. Clarify the order if the time of the first or next dose is not indicated.
3. Ensure effective communication.

These 3 steps will help to decrease the possibility of first-dose delay medication errors with antibiotics and anticoagulants and will help to prevent the negative patient outcomes that can result from such errors.

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Jason C. Volling, BScPhm, is Emergency Department Pharmacist and Medication Safety Specialist, Toronto Western Hospital, University Health Network, Toronto, Ontario.

Sylvia Hyland, BScPhm, is Pharmacy Site Operations Manager, Toronto Western Hospital, University Health Network, and a founding member of ISMP Canada.

David U, MScPhm, is President and CEO, Institute for Safe Medication Practices Canada (ISMP Canada).

e-mail: davidu@ismp-canada.org

ISMP Canada home page: www.ismp-canada.org

