Medication Errors

Electronic Prescribing Vulnerabilities: Height and Weight Mix-Up Leads to Dosing Error

Matthew Grissinger, RPh, FASCP

Problem: Electronic prescribing with clinical decision support is widely accepted as a means to improve safety in the medication-use process. However, these early warning systems are not error-proof, as demonstrated by an event reported to the Institute for Safe Medication Practices Canada in which a patient’s height and weight were transposed into an electronic chemotherapy prescribing system.1

The Event

Using the electronic prescribing system, a physician entered a new order for panitumumab (Vectibix, Amgen) to be given intravenously every three weeks to an adult patient with metastatic colorectal cancer. The usual dose of this drug is 6 mg/kg every two weeks, but the patient was enrolled in a clinical trial with a protocol that called for doses of 9 mg/kg every three weeks. While entering the drug therapy into the electronic prescribing system, the physician inadvertently transposed the patient’s height and weight: the height (in centimeters) was entered as the weight, and the weight (in kilograms) was entered as the height. As a result, the patient received about 650 mg more panitumumab than intended for the first dose of therapy.

The error was detected before administration of the second dose, and the patient received the second and third dose of panitumumab as intended according to the treatment protocol. After the third dose, the patient was admitted to the hospital with symptoms of pulmonary embolism and died a few days later. Panitumumab has been associated with pulmonary embolism, but it is not known if the initial erroneous dose of the medication influenced the outcome in any way.

Contributing Factors

With the assistance of the facility where the event occurred, several factors contributing to the error were identified:

• Panitumumab and other monoclonal antibodies are commonly dosed by weight, whereas most chemotherapeutic agents are typically dosed according to body surface area (BSA).2 In this case, the electronic prescribing system automatically calculated the patient’s BSA, which incorporates both height and weight; the BSA was within the expected normal range, although it was not needed to calculate the dose.

• The patient was to receive a higher-than-usual dose of panitumumab as part of a clinical trial protocol (9 mg/kg every three weeks, rather than the usual 6 mg/kg every two weeks). As a result, the miscalculated dose, although high, might have been attributed to the clinical trial protocol and, therefore, might not have been investigated further.

• The electronic prescribing system in use at the facility alerts prescribers when the entered height and/or weight are out of range. However, it is hard to distinguish between the height and weight alerts, and the electronic prescribing system does not require the prescriber to acknowledge the alert or enter a reason for overriding it.

• Warnings about height and weight being out of range appear only at the point of order entry into the electronic prescribing system. During order review, pharmacy and nursing staff must manually review patient characteristics such as height and weight when double-checking the prescribed dose. In this case, the error was not detected because only the BSA was viewed and it appeared to be within normal limits; the individual entries for height and weight were not viewed.

• Despite an ongoing endorsement for using the metric system in health care, many practitioners continue to think in terms of inches and pounds, not centimeters and kilograms. Thus, the transposed height and weight entries in this case were not immediately correlated to a height of 3.5 feet and a weight of nearly 400 pounds.

• Electronic prescribing systems can provide important safeguards during the prescribing process, particularly for complex treatment regimens and protocols used to manage cancer. However, their use may create a false sense of security among health care providers. Given alert fatigue, distractions, multitasking, and other less than ideal working conditions, even proper activation and programming of electronic alerts will not ensure that an alert will be read, understood, and acted upon appropriately when it appears on an order screen.3 In addition, there is often no requirement to acknowledge an alert or enter a reason for overriding it, so warnings may be bypassed without full cognitive evaluation.

Other Weight and Height Errors

We are aware of numerous other events related to incorrect height and weight entries made when entering patient data into computer software. Examples include typographical errors during entry of the numbers (170 cm entered as 107 cm), the use of out-of-date or estimated weights and heights instead of recent and measured weights, and entering the patient’s weight in pounds instead of kilograms (or grams) and height in feet and inches instead of meters and centimeters. ISMP also coauthored a 2010 article describing the

continued on page 215
Medication Errors

continued from page 151

The facility where the event occurred has implemented changes to its internal processes, including setting protocol-based minimum and maximum doses in the pharmacy computer system for panitumumab and other monoclonal antibodies, with the goal of improving the detection of this type of error in the future. The facility also worked with the pharmacy and electronic prescribing software vendor to improve the management of height and weight information. Planned changes include:

1) updated height and weight tables, with warnings triggered for both very high and very low values based on the patient’s age; 2) display of height and weight in both metric and imperial units (but with entry maintained in metric units only); and 3) automatic calculation and display of body mass index (BMI), with a hard stop alert if the BMI exceeds 50.

Given the potential vulnerabilities of electronic prescribing systems, health care providers can take these additional steps to enhance effectiveness and improve safety:

• Share this article with members of the health care team and review the potential for a similar event in your organization.

• Where possible, set protocol-based maximum doses in the prescribing and pharmacy computer systems that, at a minimum, require practitioners to enter a reason for overriding an alert. The system should display the numeric value of the dose limit for comparison with the prescribed dose.

• Monitor the existing prescribing and pharmacy electronic alert system to minimize the number of low-priority alerts, and test for inclusion of high-priority alerts.

• Assess vulnerabilities in the existing procedures used to double-check targeted high-alert medications. Consider forming an interdisciplinary team that includes direct-care staff to identify how any existing double-checks regarding medication orders and drug doses are being conducted, and how they can

be improved. For example, health care providers might consider changing the procedure for double-checking all prescribed chemotherapy doses to include verification of the height and weight entered into the computer and recalculation of the BSA and actual doses (mg/m² or mg/kg).

• Conduct a failure modes and effects analysis on the use of your organization’s electronic prescribing system, and use the prospective findings to improve safety and error detection when using the system.

REFERENCES


