

# Preventing Intrathecal Chemotherapy Errors: One Institution's Experience

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Very few medications, including chemotherapeutic agents, can be administered safely into the intrathecal space. Most intrathecal chemotherapy errors involve the accidental injection of vincristine; however, all of the vinca alkaloids (vinblastine, vindesine, vinorelbine, and vincristine) can cause fatal neurologic effects if given intrathecally (World Health Organization, 2007). Although the exact incidence is unknown, the World Health Organization has cited 55 incidents worldwide since 1968. Despite extensive labeling requirements and recommendations, accidental administration of vinca alkaloids into the intrathecal space continues to occur. As recently as 2008, an accidental injection of vindesine led to the death of a 25-year-old man with non-Hodgkin lymphoma (Institute for Safe Medication Practices, 2008).

The vinca alkaloids, if given intrathecally, cause rapidly progressing sensory and motor dysfunction, paralysis, encephalopathy, coma, and death (Al Ferayan, Russell, Al Wohaibi, Awada, & Scherman, 1999; Schulmeister, 2004). Central nervous system lesions are those of chemical leptomeningitis and ventriculitis (Al Ferayan et al.). Autopsy findings show loss of neurons, nerve axon degeneration, and myelin loss on the spinal nerves (Dettmeyer, Driever, Becker, Wiestler, & Madea, 2001; Kwack et al., 1999).

## Process Problems

The most commonly reported reason for errors is that a syringe containing a vinca alkaloid is mistaken for a syringe

containing an intrathecal medication (Schulmeister, 2004; World Health Organization, 2007). In such instances, the practitioners failed to verify the correct medications prior to administering them to patients. Many of the patients had leukemia or lymphoma, and their treatment regimens included intrathecal methotrexate (or cytarabine) and IV vincristine. Both the intrathecal medications and the IV vincristine were mixed in small syringes with approximately 3–5 ml total volume. In some cases, the syringes were sitting next to each other. A previous recommendation to prevent intrathecal chemotherapy errors is to dilute vinca alkaloid medications in larger volumes in syringes, such as

10–20 ml, to prevent confusion between syringes with the same volume. However, despite difference in syringe sizes, errors still occur (World Health Organization). Other reported problems include mislabeling of syringes and lack of knowledge about intrathecal chemotherapy by practitioners administering the medication (Schulmeister; World Health Organization). Although most errors occurred when medication was given by lumbar puncture, similar errors have occurred when vinca alkaloids were given into ventricular reservoirs (e.g., Ommaya reservoirs) (Meggs & Hoffman, 1998).

## Recommendations for Prevention

More than 18 years ago, the United States Pharmacopeial Convention, Inc. developed requirements for manufacturers and pharmacies to label each dose of vincristine with the warning “FATAL IF GIVEN INTRATHECALLY. FOR INTRAVENOUS USE ONLY” (Institute for Safe Medication Practices, 2008). In addition to the syringe label, recommenda-

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tions include placing the syringe in an overwrap with the same warning label. Despite the labels, errors and resulting deaths continued to occur, prompting the World Health Organization, the Institute for Safe Medication Practices, and the Joint Commission to develop further recommendations (see Figure 1). The two main recommendations are to (a) dilute vinca alkaloids in minibags (IV piggybacks) and not place them in syringes, and (b) keep vinca alkaloids and other chemotherapeutic agents out of areas where intrathecal chemotherapy is given.

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