**Use of subcutaneous vitamin K for elevated INR in community-based hospitals: a case series**

**Authors:** Gretchen Ingling, Pharm D; Laura Coles, PharmD, BCCCP

**Practice Site:** Novant Health Forsyth Medical Center, Winston-Salem, NC

**Background:** Vitamin K antagonists (VKA) such as warfarin (Coumadin) are used frequently in the management of atrial fibrillation, mechanical heart valves, and venous thromboembolisms.1 Monitoring of these agents consists of frequent assessment of the international normalized ratio (INR) to ensure the patient is within the desired therapeutic range. The ranges are dependent on a variety of factors, including the indication and patient-specific risk factors. VKAs can be difficult to manage as there are a multitude of interactions that have the potential to influence the INR and cause the level to be supra-therapeutic, increasing the risk for bleeding. In certain instances, vitamin K is required to reverse the effects of the VKAs in order to return the INR to therapeutic range. Phytonadione, the commercially available vitamin K product, is available in oral, intravenous (IV) or subcutaneous (SQ) routes. In 2008, the CHEST guidelines were amended to exclude the use of subcutaneous vitamin K for VKA reversal due to the variability in its effects. Additionally, the 2020 American Association for the Study of Liver Diseases (AASLD) guidelines recommend against measures to reduce INR prior to procedures in patients with cirrhosis who are not taking VKAs. The administration of SQ vitamin K could impact patient outcomes in that it could delay the time it takes the INR to return to therapeutic range, thus delaying subsequent treatment and patient disposition. The purpose of this study is to evaluate outcomes of patients at Novant Health facilities who were treated with subcutaneous vitamin K for the reversal of elevated INR.

**Objective:** The primary objective of this study was to assess the utilization and efficacy of vitamin K administered subcutaneously across the Novant Health system. Secondary objectives include delays in patient care, additional vitamin K administration following an initial dose, adverse effects, and pharmacist intervention.

**Methods:** This was a multi-center, retrospective case series conducted throughout a community-based health system.Patients with orders for injectable vitamin K for INR reversal were analyzed from July 1, 2020 to July 1, 2021. Patients were included if they were 18 years old or older, had an INR level ≥ 1.0, and had at least one order for subcutaneous vitamin K. Patients who were pregnant, or received vitamin K in an outpatient setting were excluded. A case series was developed to present the findings.

**Preliminary Results:** Of the 111 patient charts reviewed, 28 patients had an order for subcutaneous vitamin K. 14 of those patients received a dose, whereas 14 patients had a dose ordered but the vitamin K was ultimately given via an alternative route. 6 patients were documented to have been taking a VKA prior to admission (4 in the group that received SQ vitamin K, 2 in the group who did not). 5 of the 14 patients who received a dose of SQ vitamin K had evidence of bleeding and 5 had some level of hepatic impairment. 43% (6) of the patients required additional agents to achieve the provider-specified desired outcome. There were no documented adverse reactions in either group. The rate of documented pharmacist interventions was higher in the group that had orders for SQ placed but were changed to an alternative agent vs. the group that received a SQ dose (86% vs. 14%). The patients presented in this case series all received a dose of SQ vitamin K for the reversal of INR.

**Conclusion:** The efficacy of vitamin K administered subcutaneously for the management of elevated INR is variable, as stated in previous literature and recommendations. This retrospective chart review demonstrated variable effects from subcutaneous vitamin K and that subcutaneous vitamin K continues to be used incorrectly in a community-based health system.