Dear Editor,

It is estimated that over 5 million central venous catheters are inserted annually in the United States. Central venous catheters are utilized to safely administer medications, nutrition, intravenous (IV) fluids, perform dialysis, obtain laboratory tests, and to closely monitor a patient’s hemodynamics.[1,2] Overtime, methods have been developed to reduce complications of catheter placement. Some of these methods include ultrasound guidance, improved equipment within kits and better sterile-barrier techniques.[2,3] However, despite these improvements, complications may still arise.[1,3,4] Here, we report a complication of a central venous catheter misplacement that required emergent consultation and transfer to the surgical intensive care unit with an untoward outcome.

A 60-year-old male with a significant medical history of atrial fibrillation on anticoagulation, tobacco use, chronic obstructive pulmonary disease, heart failure with a reduced ejection fraction, an automated implantable cardioverter defibrillator (AICD), history of renal cell carcinoma status postnephrectomy, and a life-threatening abdominal aortic aneurysm (AAA) presented at an outside facility with fatigue, shortness of breath, poor oral intake, and decreased urine output. Given the patient’s multiple comorbidities, he was transferred to our hospital for hemodialysis due to acute renal failure with hyperkalemia and for possible surgical intervention of his 12.6 cm infrarenal AAA. The patient’s electrocardiogram revealed ventricular bigeminy and pertinent laboratories included as follows: international normalized ratio (INR) of 1.8, potassium 6.1 mEq/L, creatinine of 4.46 mg/dL and lactate of 4.3 mg/dL, hemoglobin 12.4, hematocrit 37.3, and platelets 227. He was admitted to the medical Intensive Care Unit for urgent hemodialysis due to acute renal failure with hyperkalemia and for possible surgical intervention of his 12.6 cm infrarenal AAA. The patient’s electrocardiogram revealed ventricular bigeminy and pertinent laboratories included as follows: international normalized ratio (INR) of 1.8, potassium 6.1 mEq/L, creatinine of 4.46 mg/dL and lactate of 4.3 mg/dL, hemoglobin 12.4, hematocrit 37.3, and platelets 227. He was admitted to the medical Intensive Care Unit for urgent hemodialysis, and a left-sided internal jugular dialysis catheter was placed under ultrasound guidance at the bedside (traversing the same veins as the AICD). The postprocedure chest X-ray revealed a malpositioned catheter, and a stat computed tomography scan was performed to confirm the exact placement [Figure 1]. The catheter tip was found to have perforated through the left internal jugular vein into the mediastinal space and subsequently punctured the pericardium (eventually causing an anterior mediastinal hemorrhage/hematoma). Given this emergent finding, the patient was immediately transferred to the surgical Intensive Care Unit to await possible surgical intervention and to correct the coagulopathy. The patient received fresh frozen plasma to correct the supratherapeutic INR. The patient became hemodynamically unstable, was emergently intubated, and then suffered a PEA arrest. Bedside transesophageal echocardiogram revealed a significant pericardial fluid collection. However, despite prompt measures of cardiopulmonary resuscitation, pericardiocentesis, IV fluids, and multiple vasopressors, the patient expired.

While it is recommended for most central venous catheters to terminate at the atrial-caval junction, dialysis catheters should be placed in the atrium to facilitate optimal flow to and from the dialysis machine. Although placement within the atrium may have higher flow rates and lower rates of thrombosis, the risk of atrial perforation is greater.[5] Interestingly, in this case, the catheter did not perforate the atrium from the intravascular perspective. As mentioned above, it most likely dissected the left internal jugular vein at its conjunction with the innominate vein and perforated the pericardium from the mediastinum (extravascular). This event also brings suspicion whether anatomical anomalies could have occurred in the path of the left internal jugular vein secondary to placement of the AICD.

This case reveals a fatal complication from central venous catheter insertion despite the use of ultrasound guidance.
In particular, this catheter misplacement had an unusual path to pericardial penetration (unlike most reports in the literature of central venous catheters leading to cardiac tamponade). The complexity and quantity of comorbidities within hospitalized patients continue to increase and thus, the risks of central venous catheter placements within those patients will presumably increase as well.[3]

The use of ultrasound guidance has decreased but not eliminated the incidence of complications from central venous catheterization. These complications can include arterial puncture, hematoma, infection, failed guidewire and pneumothorax.[6,7] Compression from extravascular structures, thrombosis or stenosis of the veins and congenital venous abnormalities can also complicate the cannulation of central veins.[8]

Case reports and studies have revealed greater complication rates from cannulation of the left internal jugular vein (LIJV) when compared to the right internal jugular vein (RIJV).[6,7] One case report demonstrated a left internal jugular vein dialysis catheter entering the left atrium.[6] The RIJV has a less tortuous path to the superior vena cava than the LIJV. The RIJV also has less overlap with the carotid artery than the LIJV does with head rotation greater than 30 degrees.[9]

The purpose of this report is to encourage critical care providers to be vigilant while placing central venous catheters, bring awareness to this potential fatal complication and when possible to obtain a thorough history and physical examination before performing such procedures.

Declaration of patient consent
The patient’s course was fatal and no relatives were identified. The approval for publication of the manuscript came from the Division Director, Critical Care Anesthesiology at the University of Toledo College of Medicine and Life Sciences. Patients names and initials are not published and due efforts are made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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