contrast, in Australia and many countries in Europe physician passengers do have such an obligation.[1] To date no litigation has been brought against a passenger physician who has rendered assistance during an in-flight medical event. By international law, the country in which the airplane is registered has legal jurisdiction.[1,4,A] However, the country of citizenship of the plaintiff or defendant or the country in which the incident occurs can also have jurisdiction.[1,4,A] In the United States the Aviation Medical Assistance Act (an important step that reduces passenger physician's concerns about medical liability) was signed into law in 1998.[A] The act provides limited "Good Samaritan" protection to any medically qualified passenger who provides medical assistance aboard an aircraft.[A]

In conclusion physicians (including anesthesiologists) rendering care during in-flight medical emergencies should be aware of the logistic and medico-legal implications of their involvement in these events.

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Isovolemic hemodilution in a patient with polycythemia vera undergoing deep hypothermic circulatory arrest

To the Editor:

Polycythemia vera (PV) is a disorder of the multipotent progenitor hematopoetic cell, characterized by increased production of erythrocytes, white blood cells and platelets.[1] Patients with PV present with ischemic attacks to various organs related to blood hyperviscosity and decreased blood flow.[1] Deep hypothermic circulatory arrest (DHCA) further increases the risk of thrombotic complications.[2] A patient with PV requiring DHCA has never been reported. We describe the management of a patient with PV undergoing cardiac surgery requiring DHCA using isovolemic hemodilution.

A 61-yr-old male presented for replacement of the aortic valve, ascending aorta and coronary artery grafting. Preoperative investigation revealed a bicuspid aortic valve with mild insufficiency and moderate stenosis, a 5.4-cm ascending aortic aneurysm and moderate obstruction of the right coronary artery. Past medical history was significant for PV and hypertension. Diagnosis of PV was based on the history of elevated hematocrit values, between 50–53%, associated with a history of transient ischemic attacks with normal platelet and white cell count. Smoking and pulmonary disease were excluded as a cause of erythrocytosis. Diagnosis of PV was supported by a normal serum erythropoetin level of 13 $MIU \cdot mL^{-1}$ and bone marrow biopsy findings of increased cellularity and absent iron stores.

Routine monitors, left brachial arterial and right internal-jugular pulmonary artery catheters were placed. Anesthesia was induced with iv etomidate, fentanyl and succinylcholine and maintained with isoflurane, fentanyl and pancuronium. Aminocaproic acid was administered by bolus and continuous infusion. Baseline arterial blood gas revealed a hematocrit level of 51%. To decrease blood hyperviscosity, prior to DHCA, the technique of isovolemic hemodilution was performed. Two sterile citrate-phosphate-dextrose-adenine containing bags were filled by gravity with 944 mL of blood and stored in the operating room. Blood was replaced by 3000 mL of lactated Ringer's solution. Post-hemodilution hematocrit was 44%. After heparinization and initiation of cardiopulmonary-bypass (CPB), hematocrit decreased to 31%. Systemic cooling was begun and circulation arrested (duration of 8 min) at a nasopharyngeal temperature of 18°C, while the aortic graft was sewn. While re-

warming, the aortic valve was replaced and coronary arteries were grafted. After heparin reversal, two units of autologous blood were administered in reverse order of collection. Post-CPB hematocrit was 33%. No additional blood products were required. The remainder of hospitalization was uneventful.

Patients with PV are at risk for arterial and venous thrombosis due to increased red cell mass and blood hyperviscosity.[1] Although a hematocrit > 45% increases oxygen carrying capacity, cerebral blood flow decreases due to an associated increase in blood hyperviscosity, resulting in cerebral ischemia.[3] In order to improve blood flow and decrease hyperviscosity, isovolemic hemodilution may be used.[1,2] Additionally, increased cerebral blood flow associated with hemodilution maintains oxygen balance during hypothermia with a relatively decreased hematocrit.[4] A decreased need for blood transfusion is an additional benefit of isovolemic hemodilution.[1,2] By collecting the whole blood prior to heparinization the effect of re-heparinization and potential bleeding after the protamine reversal is avoided.

Deep hypothermic circulatory arrest is usually associated with decreasing coagulation factor activation, platelet dysfunction and excessive fibrinolysis resulting in bleeding diathesis.[2] Nevertheless, thrombotic complications from endothelial cell injury, ischemia and blood stasis during DHCA may also be seen.[2] An intrinsic prothrombotic state in patients with PV represents an additional risk during DHCA and may be reduced by decreasing blood hyperviscosity. Although a safe hematocrit for initiation of CPB and DHCA has not been defined, decreasing the hematocrit to within normal levels prior to DHCA may be beneficial. The reductions in blood loss and transfusion requirements with antifibrinolytics have been shown, but little is known of potential thrombotic complications when used during DHCA.[5] Decreasing the prothrombotic potential in a patient with PV by using isovolemic hemodilution may exert favourable benefits of antifibrinolytics on hemostasis.

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Off-hours unavailability of drugs during emergency situations with automated drug dispensing machines

To the Editor:
Automated drug dispensing machines (ADDMs) are promoted to reduce drug dispensing costs and to reduce medication administration errors.[1,2] Although concern exists,[3] few situations have been reported where ADDMs have impaired patient care. In the months preceding this report, our hospital began using ADDMs (Accudose, McKesson Automation, Pittsburgh, PA, USA) as the only source of anesthetic drugs outside regular business hours. Previously, additional drug sources were available in addition to ADDMs. Over a period of five months, we observed five instances involving six patients of approximately 8,000 (0.08%) where a delay in drug administration occurred during emergency situations.

Case 1
Our ADDMs contain generic and also brand name menus. A drug was not found in the brand name menu, and personnel were uncertain of the equivalent generic name, causing a delay in drug administration. We discovered that the drug was entered by its generic name in both menus because generic product was purchased by the hospital pharmacy. The pharmacy now enters brand names for ease of identification even if generic drug is supplied, but identifies the drug actually supplied as the generic equivalent in the brand name menu for accuracy.

Case 2
After placing a routine labour epidural, we were unable to obtain local anesthetic from any ADDMs on the labour and delivery ward. We discovered that