



Doctor's docket

Transfusion confusion? Cell saver adequacy in an ectopic pregnancy presentation

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1. Facts

MW, a 24 year old woman, and her spouse had vacationed in Jamaica where she developed gastrointestinal pains that she believed were food poisoning. A hotel physician provided pain medication, and the couple flew home on 10/26. On the morning of 10/27, MW was still in pain, and she drove herself to Hospital ED. On presentation, MW's vital signs were normal, as was a mental status examination, and the patient was noted to be stable. During her history, MW noted that she sometimes had multiple menstrual periods during the month. Laboratory tests were ordered. MW's complete blood count (CBC) showed a hemoglobin (Hb) of 5.2 g/dL, hematocrit (Hct) of 15.8%, and a positive pregnancy test. A peripheral blood smear showed that MW had recently experienced blood loss. An ultrasound was ordered, verifying the suspected diagnosis of an ectopic pregnancy. The ultrasound also showed the presence of abdominal blood.

Anesthesiologist Dr B, CRNA S, attending OB-GYN Dr W, and residents Drs. BE and K, discussed the need for

surgery and potential transfusion with MW. MW, a Jehovah's witness, was reluctant to accept blood products. Dr B then discussed with MW the option of autotransfusion using a cell saver. MW consented to the use of the cell saver and a transfusion of heterologous blood if it was absolutely necessary to save her life. No additional CBC was ordered because it would take 45 minutes and would delay surgery.

MW was brought to the operating room (OR) and anesthetized. Dr W, under the direction of Dr B and CRNA S, used the cell saver to salvage and reinfuse two units of MW's abdominal blood; the two units of available banked blood were not used. Dr B and CRNA S noted that MW produced approximately 100 mL of urine intraoperatively. Dr B noted that during surgery, the abdomen was dry after cell saver use, with no active bleeding. After suctioning the blood for the cell saver, Dr W clamped the ruptured fallopian tube to stop the bleeding, removed it and sutured the area, checked for additional bleeding, and removed some scar tissue on the other tube to prevent future ectopic pregnancies. Dr W estimated that she suctioned about 1,000 mL of blood, and any additional blood loss was minimal. CRNA S also calculated approximately 1,000 mL of total blood loss, with 700 mL from the cell saver canister, a negligible amount on the drapes and floor, and about 200 mL on tapes, sponges, and what was left in the canister for discarded blood. Dr W then concluded the surgery, and MW was brought to the

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Postanesthesia Care Unit (PACU) in stable condition, with respirations of 18 breaths/min.

After a short time in the PACU, MW was moved to the floor at approximately 6 pm. Dr BE's orders included nursing to notify her if the urine output decreased below 60 mL in two hours, heart rate (HR) increased more than 110 beats per minute (bpm), or temperature greater than 101.5° F twice. A postoperative CBC showed an increase in Hb to 6.1 g/dL and Hct to 19.1%. Postoperatively until roughly 11 pm, MW was noted to produce urine, although the nurses did not chart a specific output measurement, and MW had no change in mental status. Nurses notified Dr BE of one incident of a 101.4° F temperature.

Shortly after 11 pm, MW suddenly became agitated and combative. She began flailing her limbs, breathing rapidly, and drifting in and out of consciousness. MW's spouse alerted the nurses, who called Dr BE. On examination, Dr BE found MW coughing and emitting wet lung sounds; Dr BE could not elicit any verbal responses, and ultimately no pulse. Dr BE called a code. Dr W and the code team transfused two units of banked blood and attempted to resuscitate MW. During the code, MW experienced ventricular arrhythmia. After an hour of effort, the code team was unsuccessful, and MW was declared dead at 12:31 am.

On autopsy that same day, deputy medical examiner Dr S sampled 22 distinct parts of MW's heart. He found "focal patchy lymphocytic infiltrates associated with focal myocyte necrosis and fibrosis" but no significant blood in the abdominal cavity. He concluded that MW suffered a "sudden death due to a cardiac arrhythmia elicited by myocarditis of probably viral etiology ... [with] physiologic stress incurred as a result of the ruptured ectopic pregnancy with pelvic hematoma [as] a contributory condition." Dr S did not note any renal ischemia.

MW's spouse as plaintiff sued anesthesiologist Dr B, CRNA S, the resident physicians, attending Dr W, and the Hospital for wrongful death. He claimed that the defendants' negligence particularly related to transfusions was the cause of MW's death.

At trial, plaintiff's anesthesia expert Dr K testified that a normal Hct level is between 36% and 45%. He opined that because MW's level was 15%, she had lost half her blood volume, roughly 2,000 to 3,000 mL. He assumed that MW had a normal Hct level. He indicated that while younger patients like MW can compensate for such loss for a short period of time, they "cannot compensate forever." He also noted that a patient who has lost so much blood, particularly into the abdomen, must receive blood. Dr K stated that MW needed an infusion of additional blood to "pull her heart out of overdrive, ... [but without it] [her heart] simply quit." He indicated that both anesthesiologist Dr B and CRNA S breached the standard of care before, during, and after surgery because of their failure to obtain another CBC preoperatively and to provide replacement blood intraoperatively or postoperatively. He indicated that additional blood was necessary because of MW's low blood count, and

surgical incisions may lead to a mass bleed from the release of pressure.

Dr K indicated that the use of cell saver technology specifically was not appropriate in this case. He indicated that much of the 1,000 mL of blood in MW's abdomen would have been clotted, and that it is not possible to recycle blood clots. He also indicated that MW needed much more blood than the blood salvaged. He indicated that a human body does not replenish its own blood within hours, but rather days to weeks. He also testified that MW's salvaged blood was suspect because of its age after having been within her abdomen approximately 5 days. He also noted that all the physicians overlooked MW's extremely low Hct level because she was asymptomatic and walking. He indicated that in such circumstances, the question is not whether the patient is tolerating the low blood count but "rather how long she can tolerate it." He concluded that use of the cell saver would have been appropriate only when coupled with the transfusion of additional banked blood.

Plaintiff's pathology expert Dr J indicated that MW's cause of death was severe anemia due to her ruptured ectopic pregnancy, because she saw no signs of myocarditis on recut slides. Dr J indicated that MW fell into a life-threatening category of anemia. With a presumed 2,000 to 3,000 mL blood loss, hemoperitoneum and decreased oxygenation, leading to great stress on her heart and other organs, which led to her death.

Plaintiff's OB-GYN expert Dr E indicated that MW's condition required both prompt surgery and banked blood transfusion. He considered a failure to transfuse intraoperatively as well as postoperatively as breaches of the standard of care, and that the anesthesiologist and surgeon shared this breach. He also indicated that both clinicians had breached the standard of care by failing to order and recheck another CBC preoperatively. Dr E indicated that MW died because she bled to death from her blood loss prior to hospitalization and because that blood had not been replaced. He indicated that estimates of 1,000 mL of blood loss were gross underestimates, and that she had actually lost 2,000 to 3,000 mL of blood.

Defense anesthesia expert Dr P indicated that despite MW's low Hct level, MW was asymptomatic, which implied clinical development over days, not hours. He opined that MW's starting Hct value was likely in the 20% range and that she was chronically anemic. He noted that the cell saver is accurate, and the reported 1,000 mL loss was reasonable. He pointed out that if MW had started at a normal Hct level and decreased to 15%, she would have lost 60% of her blood volume. He noted that MW showed no such signs or symptoms on presentation. Given MW's clinical condition, he concluded she did not need a transfusion preoperatively.

Dr P indicated that it was entirely appropriate to use the cell saver to autotransfuse MW without heterologous transfusion. He noted that MW was hemodynamically stable, had limited blood loss during surgery, and did not present or experience any onset of hypotension intraoperatively or postoperatively. MW's response to autotransfusion

intraoperatively was appropriate and she was hemodynamically stable, hence no additional blood was required postoperatively in the PACU. Finally, Dr P indicated that additional transfusion of banked blood would not have made any difference in outcomes because a patient typically only receives two thirds of the blood transfused because of cell death, and because stored blood is not very stable due to the 2,3-DPG levels that reduce oxygen availability at the tissue level. He concluded that Dr B and CRNA S met the standard of care.

The defense OB-GYN expert Dr BU believed that MW's anemia developed over 5 to 7 days. He indicated that transfusion should occur on the basis of symptoms and vital signs, not merely laboratory numbers. He noted that the defendants monitored urine output, respiration, HR, BP, mental state, and risk of postoperative bleeding. He also testified that a patient who develops a Hb level of 7 to 8 g/dL over time can typically do well without a transfusion. He claimed that MW could not have lost 2,000 to 3,000 mL of blood because she could not have driven herself to the hospital in that condition, her abdomen would have been distended, all blood was suctioned by the cell saver, which accurately measures blood, and she would not have presented with normal and stable vital signs. Dr BU concluded that the defendants met the standard of care.

The jury concluded after an 8-day trial that none of the defendants was negligent and found in favor of all of them. MW's spouse filed a motion with the trial court for a new trial, arguing that the verdict was not sustained by the weight of the evidence. The trial court denied the plaintiff's motion, and plaintiff appealed. Plaintiff argued that the trial court abused its discretion in not granting a new trial because the evidence presented by plaintiff's side was substantial and overwhelming, and the jury's verdict was against the weight of the evidence. The defendants argued that the trial court did not abuse its discretion and that the verdict was supported by the evidence presented, and hence the motion for a new trial should be denied.

2. Legal analysis

The appellate court affirmed the trial court judgment for the defendants (*Walker v. Suma Health Systems et al.*, 2008 WL834431 (Ohio App. March 31, 2008)).

The appellate court first noted that a new trial may be granted when the judgment is not sustained by the weight of the evidence. However, it noted that:

Absent some indication that the trial court's exercise of its discretion was unreasonable, arbitrary, or unconscionable, the judgment of the trial court will not be disturbed. ... Where the verdict is supported by competent substantial and apparently credible evidence, a motion for a new trial will be denied.

It also observed that the trial court stated that there was competent and credible testimony on both sides, and that "the jury did not lose its way if they found the defense [expert] witnesses to be more credible in regards to blood transfusion [than plaintiff's expert witnesses]."

The appeals court also noted that in a motion for a new trial, it would not directly review whether the judgment was against the manifest weight of the evidence. Rather, "the appellate court does not directly review whether the judgment was against the manifest weight of the evidence ... [T]he court is to determine [only] ... whether a manifest injustice has occurred."

The court indicated that upon review of the record, there was significant evidence that was competent and substantial to support the verdict for the defendants. It found that the trial court appropriately abstained from interfering with the verdict, since it was not clear that the jury had reached a seriously erroneous result. The appellate court then concluded that there was no manifest injustice incurred in this case under the verdict the jury rendered. It held that the trial court did not abuse its discretion by denying plaintiff's motion for a new trial. It then affirmed the trial court's decision for the defendants.