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Anesthesia Incident Reporting System (AIRS)

Case 2024-11: The Night the Lights Went Out in Georgia

We were doing a robot-assisted intra-abdominal procedure, when the power failed. This has happened in our ORs before. We restored power briefly, but then it failed again. After three power failures to the robot, we moved to a different OR while the patient was asleep and the surgical incisions were covered with a drape. After that, the procedure was uneventful, and the patient made a full recovery.

Power failures in the OR are relatively rare. In most institutions, power to critical equipment is initially supplied by an uninterruptible power system, while a backup generator comes online. Even so, power failures may occur when a circuit breaker is tripped, when a cable is cut during construction in another part of the hospital, or even when a team member accidentally kicks the plug out of the socket. When a power failure does occur, equipment may suddenly stop working, and the room will be plunged into darkness. The optimal response to electrical failures is not necessarily intuitive and requires advanced planning by clinicians who work in the immediate area and engineers and administrators who plan and maintain the hospital infrastructure. Unfortunately, a clinician may never have experienced (or trained for) a power failure that occurs during a surgical procedure. In this case, the team rapidly identified the problem, developed a solution, and moved the patient (and equipment) to an OR with a reliable source of power.

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Electrical failures can have external causes, including an outage of the local utility grid or failure of one of multiple incoming utility circuits. Internal causes can include a failure of a building's power switchboards, an electrical riser, or a distribution panel (*Health Facil Manage* 2016;29:25-9). Electrical shorts and ground faults may deactivate specific outlets, especially in procedure areas that use ground fault circuit interrupters instead of line isolation to protect against shocks. Power systems are especially vulnerable during construction, when cables can be cut or misconnected. The Joint Commission has developed recommendations for managing patient care during a power failure. These include plugging critical equipment into emergency power outlets (which are usually red); rapidly deploying battery-powered equipment (e.g., physiologic monitors); providing backup methods for accessing electronic health records; making provisions to ensure access to drug supply cabinets; and providing access to emergency supplies such as flashlights, two-way radios, and extension cords (*Sentinel Event Alert* 2006;37:1-3).

The response to a power failure depends on the specific nature of the event. In the case of a tripped circuit breaker or ground fault circuit interrupter, simply moving affected equipment to an outlet on a different branch circuit (after identifying the device that caused the problem) may restore power. If the failure is caused by a problem with the external power grid, the hospital's emergency generator will supply electrical power to the red emergency power outlets. The first step in managing a power failure is therefore preventative: While setting up the OR, clinicians should ensure that life-support equipment is connected to an emergency power outlet. This will mitigate danger to the patient, as power to safety-critical equipment should be restored automatically when the emergency generator starts. If power is restored but the equipment is still not functioning, an "off-on" reboot of the equipment might get it working again (*Anesth Analg* 2010;110:1519-21).

A failure that affects the entire OR or hospital, including the emergency power supply, requires a more comprehensive response: The most critical steps are to ensure adequate oxygenation, ventilation, and perfusion. A call for help may get additional personnel in the room to help manage the problem, unless the outage affects the entire facility and other clinicians are dealing with the same situation. If a flashlight is unavailable, a laryngoscope or smartphone can be used to illuminate the work area. Nearly all anesthesia machines and physiological monitors have a battery backup that should keep the equipment functioning for a short period of time. (How long? Now is the time to consult your equipment manual and find out.) If the anesthesia machine or ventilator has failed, the patient should immediately be connected to a bag-valve resuscitator and manually ventilated. The next step is to ensure delivery of anesthesia to the patient, which may be possible with some anesthesia machines if emergency power is available or the vaporizers do not require electrical power. (Desflurane vaporizers always require power; their battery is only to power their alarms.) If vaporizers require power to operate or the anesthesia machine is not functioning, consider total intravenous anesthesia with battery-operated pumps (*Anesth Analg* 2010;110:1644-6). As a last resort, microdrip intravenous administration sets, which are typically calibrated for an infusion rate of 60 drops per minute, can be used to maintain drug infusions without electricity. The anesthesia clinician must also communicate with the surgeons and ask them to finish the procedure as quickly as possible.

A hospital-wide power failure will also prevent access to the electronic health record, which is the information backbone of many institutions. In many cases, it will be impossible to order or retrieve laboratory results, retrieve medications from automated drug systems, view radiological images, or even post new procedures to the OR schedule. "Downtime documentation" drills can help clinicians prepare for this possibility and also guide institutional leaders to develop workarounds for a prolonged failure.

Of course, training is the best way to prepare for a rare, safety-critical event that could occur at any time. As a first step, simply sitting around a table imagining "what if" and developing a plan is a good start. A cognitive aid listing the steps that one should take in the event of a power outage would be very helpful when trying to manage equipment failures in a dark room (*Anesth Analg* 2018;126:223-32). High-fidelity, simulation-based team training for disaster scenarios that include OR power failure can be extremely helpful, both for training and to help develop potential responses. The increasingly violent weather associated with climate change makes power failures ever-more likely, but even an electrician switching off the wrong panel in the basement of a hospital can wreak havoc in the OR. Everyone should prepare for these events. ■

This entry was written by Keith J. Ruskin, MD, on behalf of the AIRS Committee.

Each month, the AQI-AIRS Steering Committee abstracts a patient history submitted to AIRS and authors a discussion of the safety and human factors challenges involved. Absence of commentary should not be construed as agreement with the clinical decisions described. Reader feedback can be sent to **airs@asahq.org**. Report incidents at **aqiairs.org**.