



NFPA 99: How to Conduct Operating Room Risk Assessments

The National Fire Protection Association recently made an important code change that classifies operating rooms as wet procedure locations unless a risk assessment determines otherwise. Because wet procedure locations must be provided with special protection against electric shock, operating rooms defined as wet locations must be protected by either isolated power or ground-fault interrupters.

Previously, operating rooms were not considered wet locations by default (read more about the history of this issue and the recent code change at the end of this article). ASHE does not agree with the concept that all operating rooms should automatically be classified as wet locations unless risk assessments determine otherwise. However, the key to achieving compliance with this new requirement, and protecting scarce resources of time and money, is to perform a risk assessment to determine whether your operating rooms are wet locations.

How to Conduct an Operating Room Risk Assessment

1. Form a risk assessment group to develop a process for evaluating operating rooms.

The NFPA directs the health care governing body to consult with all relevant parties, including clinicians, biomedical engineering staff, and facility safety engineering staff.

2. The risk assessment group should gather information to help determine which surgical procedures, if any, qualify as wet procedures.*

Clinical staff should be able to identify typical surgical procedures performed at the hospital. Often they can state categorically that wet procedures are never performed in certain operating rooms, such as those used for eye surgery, neurosurgery, or ENT surgery. In the case of rooms used for general surgery, it will be necessary to determine if any particular types of general surgery performed in the room are wet procedures. Any operating rooms in which wet procedures are never performed do not require either isolated power or ground-fault interrupters, and no further steps are necessary for these locations.

3. When a more in-depth risk assessment is needed to determine if an operating room should be classified as a wet procedure location, evaluate the condition of the room during surgical procedures.

This sensible approach can be accomplished by routinely recording the environmental condition of the OR floor, highlighting the presence of any pools of fluid that accumulate during surgical procedures.

The simplest way to do this is to maintain a log for each operating room describing the presence or absence of pools of fluid during surgical procedures. This can be accomplished in a number of ways. OR personnel could maintain a log for each surgical procedure, with a checkbox to be filled in when wet conditions occur. Environmental services staff can track the times they are called to clean up fluid

*The 2012 edition of NFPA 99: *Health Care Facilities Code* defines wet procedure locations in 3.3.184: "The area in a patient care room where a procedure is performed that is normally subject to wet conditions while patients are present, including standing fluids on the floor or drenching of the work area, either of which condition is intimate to the patient or staff."

spills after a surgical procedure. And incident reports can be gathered from any staff members who slip and fall on a wet surface in the operating room.

The purpose of the documentation is to gather sufficient data to show whether a type of surgical procedure is likely to result in—or certain operating room often collects—pools of liquid of sufficient quantity to cause electrical shock to a person in the presence of faulty medical equipment or exposed electrically positive metal.

4. If the risk assessment group determines the facility has wet procedure locations, protect any wet procedure operating rooms with either isolated power or ground-fault interrupters.

5. If the facility has wet procedure locations, assess whether staff would be in danger of electrical shock from standing in a pool of water or other liquid and touching a faulty medical device.

According to the scenario outlined in Appendix B of the 2005 edition of NFPA 99, factors that might cause electrical shock include these:

- A piece of line-powered equipment is within reach.
- A damaged line cord, attachment plugs, or exposed metal presents a risk of direct exposure to a conductor.
- Equipment is damaged and the metal is “live.”
- Exposed metal becomes ungrounded.
- A person makes contact with the live metal surface.
- A second exposed conductive surface is within reach, a person makes contacts with it, and the resultant current flow is sufficient to cause injury.

It is important to note that reducing the probability of any of these factors being present would minimize the possibility of injury. Therefore, it can be useful to assess the likelihood that any of them will occur in a facility’s wet procedure locations.

For example, the likelihood that damaged equipment will be present can be reduced by using medical electrical equipment that complies with the International Electrotechnical Commission (IEC) 60601 series of standards, a widely accepted benchmark for medical electrical equipment. Compliance with IEC 60601-1: *Medical electrical equipment - Part 1: General requirements for basic safety and essential performance* has become a de-facto requirement for electrical medical equipment used in many countries. This standard addresses the electrical safety of using medical electrical equipment and requires that the equipment operate safely not only under normal conditions but also in the event of what the IEC calls a “single-fault” condition. Single faults are occurrences such as the failure of a component or the shorting or failure of basic insulation. IEC 60601 standards require that in the event of a single fault, no safety hazard (electrocution, fire, etc.) will occur.

The possible presence of damaged equipment may also be reduced by visual inspection before starting a surgical procedure, and an effort could be made to have as many pieces of line-powered equipment located as far away from the operating table as possible.

After taking steps to reduce other risk factors, the most important factor in preventing electrical shock could be the amount of fluid present in the working area. It is important to note that the greater the fluid area, the greater the possibility of electrical shock.

6. Review the risk assessment annually to confirm the validity of the process and that conditions (e.g., different surgical procedures or new surgeons) have not changed for any operating room.

The hospital's appointed risk assessment group can update the assessment when necessary.

By conducting a risk assessment for operating rooms, hospitals can use facts and data to determine whether their operating rooms are truly wet locations. This can save hospitals the time and expense of installing special protections that may not be needed.

ASHE Believes Operating Rooms Should Not Be Considered Wet Locations by Default

For years, the NFPA required the use of isolated power systems (IPS) in operating rooms because of fires caused by the use of flammable anesthetics. Flammable anesthetic vapors in operating rooms led to corrosion of power cords, which led to short-circuited wiring that caused fires. During the 1970s, however, flammable anesthetics were discontinued and safer replacements were introduced.

In 1984 the requirement for IPS in operating rooms was removed from NFPA 70: *National Electrical Code®*. However, many in the health care industry believed the issue of microshock from medical devices could be a possible problem. Although the phenomenon of micro shock was widely accepted, no evidence ever backed the claim. In fact, with the introduction of IEC Standard 60601 in 2007, the safety of medical devices was taken for granted.

The proposal to classify all operating rooms as wet locations was first introduced in the NFPA code-making process in 2008. Those who supported the change believed operating rooms are wet and need protection from possible electrocution of staff or patients who come in contact with a medical device.

In 2010 the NFPA published a 72-page study funded by the Fire Protection Research Foundation titled "Evaluation of Health Care Operating Rooms as Wet/Dry Locations." The final recommendation from the study was a proposal to require hospitals to perform risk assessments "to evaluate the proper classification of an operating room." Despite the NFPA's statement that codes must be evidence-based, and despite ample evidence that not all operating rooms are wet locations, a majority of attendees at the 2011 NFPA annual meeting voted in favor of the proposal and it became code.

Those who believe all operating rooms should be classified as wet locations think there are frequent instances of standing pools of saline, water, blood and urine on the floor. However, ASHE is among many respected organizations that believe that is simply not the case.

ECRI Institute sent more than 8,000 e-mails requesting information on adverse events that could be prevented by use of IPS, and reported that it did not receive a single response indicating a preventable adverse event. ECRI Institute also conducted extensive literature and database searches and found that despite more than 30 years of controversy over isolated power, there continues to be no documented evidence of events that justifies a modification of the standard. The Association for the Advancement of Medical Instrumentation's *Electrical Safety Manual* (2004) supports the position that operating rooms are not necessarily wet locations. And the Department of Defense's 2002 handbook on medical facility design states that operating rooms are not wet areas.

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