



Electrical Shock Hazard Identified

Addressing an Existing Risk in Healthcare

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The quantity of electrical and electronic devices used in healthcare environments increased exponentially in the last century and [continues to increase today](#). This trend is especially apparent in patient care vicinities, where more equipment than ever provides patient monitoring and care, requiring power strips to compensate for a lack of AC wall receptacle outlets. Healthcare facilities often rely on relocatable power taps (i.e., power strips) with little or no safety-related design improvements over common commercial models, thus exposing patients to potential risk of electric shock. The purpose of this paper is to help educate healthcare facilities, technical and safety professionals and all other partners about this potential risk, and the recent standards established to address the risk, specifically:

- Background: shock hazards in healthcare settings
- Analysis of the redundant-grounding plug
- New UL 2930 standard and how it best protects patients



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An Existing and Growing Risk

Hospitals built in the not-too-distant past typically had limited receptacle outlets in each wall of patient rooms, whereas hospitals today may have four duplex receptacle outlets (eight outlets) or more in the area by the hospital bed headboard alone.

The historical shortage of receptacle outlets in patient care areas was addressed by adding commercially available relocatable power taps. Relocatable power taps are certified by UL and other OSHA certification testing agencies, using the UL1363 Standard. This standard requires relocatable power taps with hospital grade plugs and receptacles to include the

warning label: "NOT FOR USE IN PATIENT CARE AREAS." These devices are deemed unsafe for use inside the "patient care vicinity," which is defined as anywhere within a six-foot radius in all directions from the patient. This is also identified in the [UL Product iQ](#), under the product category "XBYS," which states: "Relocatable power taps have not been investigated and are not intended for use with general patient care areas or critical patient care areas of health care facilities as defined in Article 517 of ANSI/NFPA 70, "National Electrical Code."

Also available are UL1363A "Special Purpose Relocatable Power Taps (SPRPT)." UL 1363A devices may be used in general patient care areas or critical patient care areas but are only intended to be permanently attached to a rack-, table-, or pedestal-mounted cart.

Why? Neither UL 1363 nor UL1363A address a key risk: **the lack of a redundant grounding connection for prevention of potential electrical shock.**

The Ground Fault Path in Healthcare

In electrical systems, "grounding" is the process of transferring dangerous electrical charge into the earth to protect against shock. All wall outlets also include redundant ground wiring that provides an extra level of protection in the event of a single fault (failure at a single point in the electrical system hardware). Healthcare requires protection in the event of a single fault!

Relocatable Power Taps (RPT) —in particular UL 1363 RPT —continue to pervade patient rooms, yet their designs do not incorporate this extra level of personnel protection. Specifically, the rubber-covered cords on such relocatable power taps have three conductors: Hot, Neutral and Ground. But they have no provision for the ground fault path carried by the receptacle (wall) outlet service by the electrical metallic conduit system...the fourth conductor!

This missing "fourth conductor" provides the redundant grounding connection. Therefore, a UL 1363 or UL1363A RPT with multiple attached electrical devices that is directly or indirectly in contact with a patient, such as through a connected hospital bed or through electronic monitoring equipment, **risks passing a dangerous potential electric shock to the patient in the event of an electrical fault condition.**

Fortunately, new cord-and-plug-Connected Health Care Facility Outlet Assemblies with a redundant grounding connection that are purpose-built for patient care vicinities are now available.



In 2010, an update to UL 1363 was introduced. The new UL 1363A established standards for the use of power strips inside and outside patient care vicinities as mounted components on mobile equipment assemblies, such as a mobile medical cart. This new standard provided no electrical change to provide the necessary ground-fault protection to the UL1363 (commercial) products.

Recommendations for Safer Patient Care

UL (Underwriters Laboratory, Inc.) staff and suppliers have identified the safety issues resulting from a lack of redundant grounding connection in relocatable power taps. UL has developed UL 2930 specifically to address the need for redundant grounding. This new standard requires a cord-and-plug-connected healthcare facility outlet assembly (HCOA, i.e., power strip) to **extend the redundancy out of the receptacle (wall) outlet all the way to the end of the electrical appliance/cord for connection to the devices used in the end outlet assembly.** This will drastically reduce the potential risk of electric shock to a patient if a ground fault occurs. The redundant grounding design complies with NEC Article 517.

As of this writing, there are four companies manufacturing Cord-and-Plug-Connected Health Care Facility Outlet Assemblies that comply with UL 2930. All are currently commercially available. These Cord-and-Plug-Connected Health Care Facility Outlet Assemblies connect the redundant grounding (the fourth conductor) in one of two ways:

- 1) An all-in-one plug that connects to the standard receptacle (wall) outlet found in a patient care rooms. **OR**

- 2) One cord connected to the receptacle (wall) outlet + a second Patient equipment grounding conductor (i.e., “flying lead”), which must be connected to the PEG (Patient Equipment Ground) typically located near the bed headboard wall.

UL and the four manufacturers have started the ANSI process of adopting UL 2930 as a published National Standard. A National initiative should begin to address the potential shock hazard that has been introduced into our healthcare systems with hundreds of thousands of deficient power strips in use in hospitals, health centers and doctors’ offices.

Further, we recommend that the Centers for Medicare & Medicaid Services (CMS) immediately consider phasing out of the current waiver (S&C: 14-46-LSC) allowing the use of UL 1363A products in healthcare. The CMS should adopt UL 2930 as the required standard and give health care facilities appropriate time to transition to UL 2930 approved solutions.

UL 2930 Healthcare Power Strips from Tripp Lite by Eaton

Tripp Lite by Eaton is one of the four companies referenced above to manufacture UL 2930-compliant cord-and-plug-connected healthcare facility outlet assemblies (HCOA, i.e., power strips).

These three new power strips have a redundant-grounding plug to reduce the risk of electrical shock to patients in a healthcare environment. Their innovative, patent pending plug design provides this safety without the tripping hazard and clutter created by strips designed with a second wire for grounding.

UL 2930 power strips are part of our Safe-IT™ series and feature an antimicrobial coating on their housing that helps resist the growth of bacteria, viruses, fungi, mold and mildew. With up to six hospital-grade NEMA 5-15R outlets, they provide safe and convenient device powering and charging for patients and staff.

[View UL 2930 Power Strips](#)

Questions about this article or these products may be addressed to:
Medical@Eaton.com

GLOSSARY OF STANDARDS

Standard	Description	Application
UL 1363	Commercial safety standard for power strips that stand alone and are NOT designed as components of a larger system.	Lab applications and administrative areas SAFE! (in the above application only)
1363A	Basic safety standard for power strips integrated as components of a larger system where they supply power to equipment in a movable assembly that is rack, table or pedestal-mounted cart. Intended for OEM integration.	Mobile applications inside and outside patient and treatment rooms NOT SAFE!
UL 2930	Safety standard for all standalone power strips; requires redundant grounding to reduce the potential risk of electric shock to a patient in the event a ground fault occurs. Code specifies redundant ground connection.	Patient and treatment rooms & any other areas of a healthcare facility. SAFE!

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