Clinical Information Hotline News

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Electromagnetic Interference

The Clinical Information Hotline occasionally receives calls that the video monitor during electrosurgery is "grainy," "snowy," or "has lines running through the screen." Occurrences such as these not only cause frustration and anxiety for the surgical staff, but also can delay the case, resulting in prolonged anesthesia for the patient as well as increased costs for both the patient and facility. The circulator is often asked to correct the problem, but many times isn't sure of the exact nature of the problem or how to troubleshoot it.

The problem is called electromagnetic interference, or EMI. The video imaging system and electrosurgical unit (ESU) are very effective tools when used alone; however, certain problems can arise when these two technologies are used together. These problems are caused by the influence of electromagnetic radiation from the high frequency ESU on the camera's circuitry.

ESUs operate in a frequency range of 200 kHz to 3.3 MHz, which is similar to AM radio stations, television stations, and video imaging systems. High frequencies are required to avoid muscle and nerve stimulation, which ceases above 100 kHz. In addition to the high frequencies ESUs require to operate, high voltages are required to push the electrical current through the patient's tissue. The effect of these high voltages can be seen when sparking to tissue using either the fulgurate or the spray coagulation mode found on most electrosurgical units. By their nature of operation, ESUs have a high potential for interfering with other electromedical devices found in the operating room environment.

The electromagnetic energy emanating from the ESU can be transmitted from one device to another in three different ways. First, energy can be transmitted through space in the form of electromagnetic waves. This method is called **radiated** energy and is utilized by the broadcasting industry to bring entertainment to an audience by either radio or television transmission. The outcome is much different when a medical device picks up these signals.

Second, a direct electrical path can be established through **conduction** between the ESU (transmitter) and the video monitor (receiver). This pathway could be through the power cords, an ECG lead, or even the patient.

The third form of energy transmission, **induction,** occurs when the video monitor (receiving device) is connected to the ESU (transmitter) either magnetically or capacitively. For this to occur, the electrosurgical accessory cords would have to be in close proximity to those cords used with the video monitor.

No matter what the mode of electromagnetic energy transmission, the simplest and most effective method to reduce interference is a spatial separation of the two pieces of equipment. The video imaging system should be placed as far away as possible from the ESU and it's connecting cables. Just as a radio station will fade as you drive away from it, EMI will decrease with distance.

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Other suggested interventions include:

- Know the type of electrosurgical generator technology in use. Compared to conventional ESUs, certain newer generators with improved technology are designed to reduce the high frequency harmonics that cause interference problems.
- Plug the power cord of the ESU into a separate electrical outlet from that of the video imaging system.
- Plug power cords for all equipment directly into a wall outlet. Avoid the use of extension cords as they make excellent antennas for transmission of interference.
- Keep the electrosurgical active cord and patient return electrode (PRE) cord close together. This can be achieved by placing the PRE as close to the surgical site as possible.
- Keep electrosurgical cords separate from those of the video monitoring system. Specifically, do not bundle together all cords on the sterile field.
- Inspect connections and insulation to ensure all accessories are in good working order.
- Reduce the amount of energy available for interference. Use both the lowest power setting possible to achieve surgical effect and a low voltage waveform (blended cut or a low voltage coag).
- Avoid wrapping cords around grounded metal objects to prevent induction of the current to a metal object.
- Locate monitoring leads as far away from the surgical site as practical.
- Ensure all electromedical equipment in use is grounded properly.
- Contact equipment manufacturers for available filters or isolation devices if a particular piece of equipment is continuously affected by activation of the ESU.

Troubleshooting interference problems is a process of elimination. Upon successful intervention, document the steps you followed and draw a picture of how the operating room is arranged for that specific procedure. Where are the cords plugged in? Where exactly is equipment located in the room? How are the cords on the sterile field arranged? Utilizing the information from a successful experience may prevent a repeat occurrence, or at the very least help you feel confident in handling a similar situation.

Occasionally, interference persists no matter what you do. In this case, contact the Clinical Engineering or Biomedical Department for technical assistance. An environmental assessment may be necessary to identify other potential interference sources.

Being aware of the troubleshooting techniques for electromagnetic interference will provide fast, efficient intervention in a setting where wasted minutes may potentially affect the patient's health status and/or surgical outcome.

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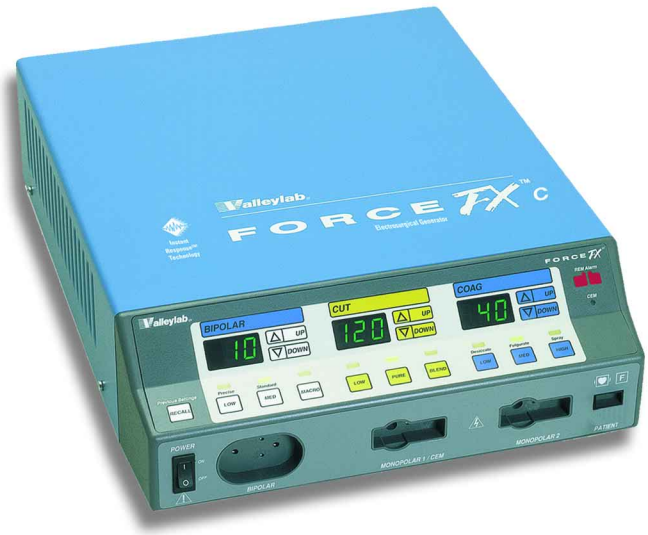

Smart™ Generator Technology
providing consistent performance with less power

The Force FX™ electrosurgical generator, which incorporates Instant Response™ technology, is a revolutionary advancement in electrosurgery. Compared to conventional generator technology, the Instant Response™ design reduces the high frequency harmonics that cause monitor interference problems. The low voltage and greatly reduced capacitive coupling of Instant Response™ generators, also minimize electrosurgical risk.

- Less lateral thermal damage
- Less need to adjust power settings
- Less sticking and charring
- Consistent performance