



# GOT NO STRINGS: WIRELESS POLYSOMNOGRAPHY GIVES RPSGTS MORE OPTIONS

By *Stephanie Richardson*

**M**ost experts agree that wireless and portable technology is the future of computer and Internet connectivity. These innovations that have dominated information technology are quickly moving into the medical arena.

Current trends in polysomnography (PSG) are mirroring the latest advances in consumer electronics. The same wireless technology that allows for real-time data communication for consumer laptops and PDAs also is becoming incorporated into PSG diagnostic devices. Likewise, faster computer chips, memory advances, and lighter, more durable plastics are allowing PSG devices to become smaller and more portable.

In 2004, Frost & Sullivan reported that the use of ambulatory telemetry monitors in U.S. hospitals will double by 2011. Portable and wireless monitors, including PSGs, will expand the reach of sleep labs to help handle emergent and critical situations. The most significant advantage to wireless PSGs is the opportunity to expand sleep testing hospital-wide to intensive care units, rehabilitation units and surgical suites

### *Wireless options*

Choosing a wireless PSG acquisition system for sleep labs is becoming easier as technology improves. Wireless PSGs transmit data through electromagnetic waves, usually via 802.11b or Bluetooth® capability. Recent advances in wireless communication technology have allowed manufacturers to develop portable data acquisition systems capable of transmitting physiological data over short ranges (50 feet to 100 feet).

This newer technology can guarantee reliable data transmission through the use of special data-encoding techniques that allow both detection and correction of errors in transmission. Another technique called frequency hopping improves data throughput by allowing a system to dodge interference.

Upgrading to wireless PSG doesn't require a technical team to come to the sleep lab for setup. Manufacturers are producing out-of-the-box systems that are designed to work immediately. With wireless, hospitals don't need to remodel rooms in order to hide cables under the floor or pass them through the walls. Eliminating wires brings greater comfort to patients.

More importantly, wireless PSG studies become much more practical because they can be done wherever there is a bed and a nearby work area for the technologist or Internet connection for remote monitoring.

One manufacturer has introduced a compact, wireless PSG that uses Bluetooth technology and a 25-channel system to transmit data to a recording station without the patient being tied down by wires. The device can store data on a removable flash card on a small amplifier system that is worn by the patient in a small pouch.

The amplifier is about the size of a PDA. The data can be uploaded later into the laboratory's PSG system software.

Another innovator manufactures a wireless PSG recording system that can record up to 64 channels of sleep data. Unlike the Bluetooth model, this system incorporates a secure medical-grade version of 802.11b wireless protocol. This is the same technology used by laptops at home or at the local Internet cafe. It has a range of up to 350 feet between the amplifier on the patient and the recording base station.

As a failsafe, the unit has a small portable disc drive in the amplifier that stores data for up to an hour if the wireless connection is interrupted. New back-up systems like this have eliminated transmission errors that plagued many first-generation wireless PSG systems.

Yet another wireless PSG system integrates the headbox, amplifiers, transducers and data telemetry in one handheld unit. By using a removable SD memory card, the system can be used for unattended sleep studies, as well as immediate data backup. Its simplicity makes it suitable for traditional sleep labs, as well as nontraditional settings such as inpatient monitoring, sleep hotels and home testing.

In addition, this is the only wireless PSG system that operates at 900 MHz, transmitting test data from the patient unit to the computer at a high speed. The computer can be placed in the patient's room or elsewhere up to 100 feet from the patient.

The same manufacturer created a network-based upgrade for its wireless PSGs. With the upgrade, RPSGTs can remotely monitor sleep testing patients from almost any location in the hospital. This allows PSG to be performed on a patient in the ICU or surgical unit, for example, and the signal to be transmitted back to the sleep lab or central computer.

Transferring the signal rather than the patient is safer and a practical option for improving patient care. Skilled nursing staff can care for a patient's other conditions in the specialty unit while the RPSGT can monitor a sleep study from a different location. Because sleep testing isn't postponed until the patient is discharged and scheduled for a return study, testing and treatment for the sleep disorder are expedited. This PSG upgrade integrates with a hospital's existing network infrastructure and HIPAA compliance strategy. The manufacturer's engineers will create an HL7 compliant solution for a hospital's electronic medical record system.

### *Benefits: No strings attached*

Although wireless PSG systems are currently more expensive than traditional cabled systems, wireless PSG lends itself to several advantages for sleep laboratories and patients. First, it

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allows patients to be more comfortable. Second, wireless technology improves efficiency when a sleep study is interrupted, such as when a patient gets up during the night.

In terms of a hospital's sleep testing footprint, we've already determined that wireless systems are more compact than wired systems. Beyond that, these devices can be brought into a patient room without the need to rearrange equipment on a cart or at the bedside. Because nothing needs to be plugged into the wall or connected to other medical devices, the risk of creating electrical loops between the PSG system and other equipment is removed.

The computer and wireless receiver can be positioned at a nearby nurse's station or other location that is most accessible to caregivers assisting with PSG. The system can then be networked via wired or wireless network to the sleep lab. The sleep technologist can monitor the signal live and, depending on staff situations, can either communicate with the nurse or respiratory therapist on the floor for assistance with lead repair or CPAP changes, or return as necessary for technical intervention.

Wireless can also be cost effective as it allows inpatient sleep studies to be done with less added expense to the hospital.

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## SIDEBAR

### *More Options for Standard PSGs*

Even the most technologically advanced facilities may be unable to integrate wireless technology due to the cost of building a network. But standard sleep diagnostics are also touting portable capabilities to make for easier PSG testing. Now, complete PSG systems can fit into the size of a briefcase.

One such system is slightly larger than a camera and battery operated. It measures up to 26 channels, including the required electrophysiological and respiratory parameters, and it's suited for diagnosing sleep disorders in infants, pediatrics and adults at home and in a sleep lab. Applying sensors is easier for the patient and RPSGT as they are mechanically and color-coded. Electrodes can be connected to the patient with a cable harness, making application simple and comfortable for patients.

This device also provides all of the data for making an optimized diagnosis and evaluates it independently on a computer. An optional online viewer makes it possible for technicians to see signals on the computer directly or via network.

Another sleep system is powerful enough to create seven-channel reports and small enough for the patient to wear while sleeping. Its three sensors plug into the recorder, so the patient isn't tethered to a bed or lab table. It gives patients the ability to sleep more normally and RPSGTs the ability to see how patients breathe in a more comfortable sleep state.

Additionally, this wearable sleep recorder is compatible with several CPAP units when patients need to be monitored for CPAP compliance. The device can be used at home with CPAP systems the patients are comfortable with. And the ability for at-home testing will aid sleep labs with scheduling problems when patients need to be testing and beds aren't available.

Finally, PSG units that offer add-on modules are increasing in popularity. These include oximetry, scoring and extra DC channels for PSG recording. In total, the unit can have from 28 to 132 channels. The units' compact, remote input boxes and thin flexible cable provide patients with greater comfort and convenience for hookup and preparation. Molded connector ports with rapid, secure cable connectors also ensure recording integrity and eliminate accidental disconnections.