

Wi-Fi: At the heart of Intelesens Surveillance Monitoring

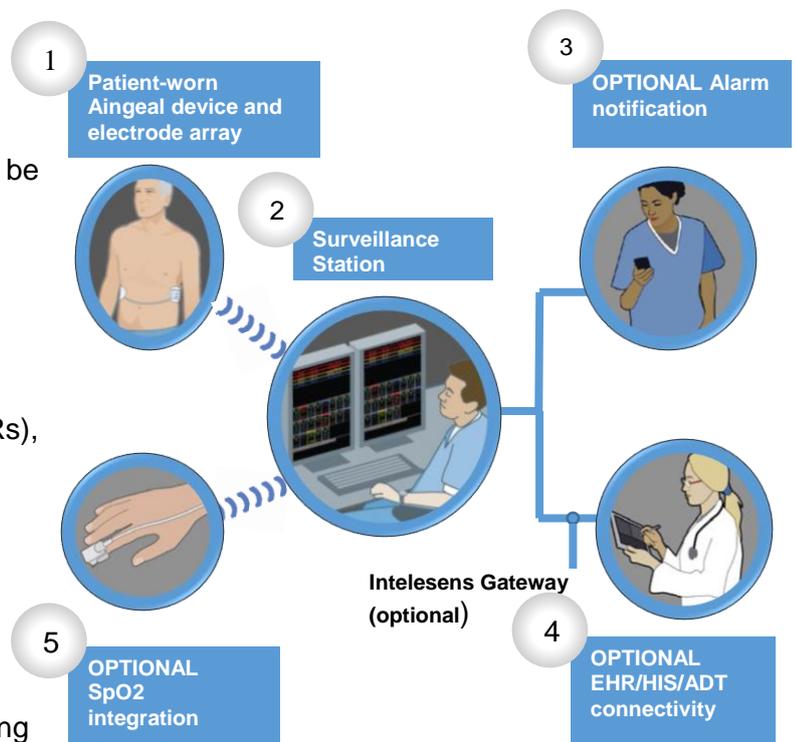
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Wi-Fi IN HEALTHCARE

Wireless communications, and specifically Wi-Fi technology is revolutionising healthcare. By 'unplugging' all sorts of electronic devices patients need no longer be constrained to their hospital bed to be monitored, and clinicians can view patient vital signs and trends away from the traditional bed-side monitor. Applications including infusion pumps, vital signs monitors, smart beds and mission critical access to electronic medical records (EMRs), X-rays and MRI scans can all be enabled with Wi-Fi.

In the last decade hospitals have made significant investments in wireless technologies with the aims of:

- Improving patient safety by deploying connected medical devices to alert clinicians to patient deterioration, allowing intervention in a timely fashion.
- Improving clinical productivity by providing clinical coordination functionality such as pagers.
- Improving patient satisfaction by providing continuous patient monitoring unencumbered by large bedside displays and multiple patient wires. This mobility without compromise to monitoring performance also aids patient recovery.



Wi-Fi ROBUSTNESS

Wi-Fi is a global set of standards managed by the Wi-Fi Alliance and implemented in millions of devices worldwide from asset location tags, to smartphones, to televisions and printers. Worldwide sales of Wi-Fi technology into the healthcare market were expected to reach \$4.9 billion in 2014¹.

As an enabling wireless technology Wi-Fi is largely invisible, yet is entrusted with voice calls, video calls, bank access, retail and every sort of enterprise grade application. This widespread adoption and ubiquity is based on speed, reliability, robustness and security. The security and encryption technologies implemented in the latest Wi-Fi standards are accepted and trusted by IT professionals, business and individuals throughout the world.

The number of Wi-Fi enabled devices in hospitals is growing significantly as clinicians, hospital leadership and IT professionals realise the advantages of networking between devices, applications and systems. It is common for Wi-Fi communications to be present in every part of the hospital, in devices such as infusion pumps, patient monitors, smartphones and PCs.

Wi-Fi networks provide proven, interoperable and security-protected systems covering a broad range of devices and data transfers.

INTELESSENS SURVEILLANCE MONITORING

One such healthcare application is Intelesens Surveillance Monitoring, which provides healthcare professionals with relevant and timely indicators of their patients' health. A comfortable and discrete body-worn monitor (Aingear device) intelligently measures ECG and heart rate, respiration waveform and rate and skin temperature. Pulse oximetry can also be monitored using existing bedside solutions. This information is sent via Wi-Fi to an intuitive central station platform.

Clinicians can see at a glance current and previous health status, view trending information, and be alerted immediately to breaches in predefined limits for heart rate, respiration rate, skin temperature and SpO₂ (that can be tailored to suit each patient). Key cardiac arrhythmia detection algorithms are also used to notify healthcare professionals of ventricular fibrillation and asystole events.

¹ ABI Research, 2010.

KEY WIRELESS FEATURES OF AINGEAR WI-FI

The Aingear device incorporates a complete Wi-Fi solution: antenna, radio circuitry, encryption, and Wi-Fi stack including IP protocols. This solution has been certified to IEEE 802.11b/g standards to ensure full compatibility with the broadest range of the extensive installed base of Wi-Fi infrastructure.

The radio operates in the 2.4GHz industrial, scientific and medical (ISM) band with a transmit power of +18dBm and a receive sensitivity of -85dBm. Additional testing conducted by an external third party has confirmed the radiation pattern and effectiveness of the wireless link, when worn on-body in typical hospital buildings. The radio is also compliant to FCC and body Specific Absorption Rate (SAR) requirements. To extend the battery life of the Aingear device the Wi-Fi radio is placed in standby mode between updates, thus also freeing up Radio Frequency (RF) bandwidth. The internal antenna of the Aingear device has an excellent uniformity in the radiation pattern of this implementation. This ensures that there is the optimum connectivity to the patient-worn device, regardless of the orientation of the patient. The roaming behaviour of the Aingear device between access points within the care area is a key feature of the system. As the patient ambulates around the care area, or even as the RF patterns and strengths vary due to other people, doors, carts, etc, the device will change the access point through which it is connected so as to maintain full monitoring of the patient. The intermittent nature of communications from the Aingear device assist this roaming through association-on-powerup with the access point with the strongest signal. Roams during active transmissions are also effected efficiently, with any dropped data being resent. Low connection and transmission times ensure that clinically relevant data is presented to clinicians at the Surveillance Monitoring Central Station in a timely manner, ensuring adverse events are raised within medical device standards alarm delay time requirements.

In the worst case scenario of the Wi-Fi network not being within range of the Aingear device through a Wi-Fi infrastructure failure, or the patient transiting a low signal area, the system will manage this outage through

indications to the patient, and at the Surveillance Monitoring Central Station. Data is recorded on the device while the Wi-Fi network is not available and resent once communications are re-established.

CONCLUSION

Intelesens Surveillance Monitoring utilises high performance Wi-Fi communications between body-worn sensors and a central Surveillance station to provide continuous monitoring of ambulatory patients throughout the healthcare setting. Standard Wi-Fi technologies including efficient spectrum use, encryption and roaming are paired with proprietary 'Wi-Fi lost' recovery techniques in the Aingeal device to ensure safe and reliable patient monitoring. The ubiquity of Wi-Fi and the ease of adoption of this system make Intelesens Surveillance Monitoring a compelling solution for wireless patient monitoring.

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Intelesens Ltd. is the designer and manufacturer and distributor of the Aingeal

Cardiopulmonary Corp. is the designer and manufacturer and distributor of Intelesens Surveillance Station



Intelesens Surveillance Monitoring allows us to reliably monitor those patients previously confined to their room for monitoring. It gives the patient freedom of movement around the ward whilst continuously being monitored from a central location. The system also facilitates continuous monitoring of patients who previously would have had observations carried out at defined intervals.

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