Case Study

The value of post-operative Intelesens Surveillance Monitoring

Detecting changes in vital signs in a patient recovering from hip replacement surgery at Ulster Independent Clinic

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ABSTRACT
A clinical study in a Northern Ireland hospital and clinic explored the potential clinical value of continuous Intelesens Surveillance Monitoring of patient vital signs in step-down and general wards. The experience of a 79-year-old hip replacement patient provides an example of how continuous monitoring may have been beneficial.

BACKGROUND
Patients discharged from post-operative recovery to lower-acuity care areas can remain vulnerable to adverse events, yet typically are under observation by nurses rather than monitored continuously. There is clear evidence that changing vital signs and a period of deterioration can occur six to eight hours before a cardiopulmonary arrest.1


About Ulster Independent Clinic
The Ulster Independent Clinic located in South Belfast Northern Ireland, is an independent hospital with over 200 doctors providing Consultant led healthcare to outpatients, in and day patients across a broad range of specialities.

For patients undergoing surgery there are 70 private en-suite rooms and 6 operating theatres staffed by a highly trained team of professionals. The hospital is RQIA registered and has CHKS accreditation.
With reduced monitoring outside post-operative recovery in stepdown and general wards, sentinel events are frequently undetected; leading to complications that possibly could have been avoided.²

This situation can be improved by appropriate vital signs monitoring that is well accepted by patients and caregivers. Such technology enables patient vital signs information to be accurately and consistently measured, recorded, and relayed to frontline staff frequently enough to allow deteriorating patients to be identified earlier and cared for appropriately. The experience of a patient in recovery from hip surgery provides insight to the potential clinical value of continuous Intelesens Surveillance Monitoring.

**STUDY PROCEDURE**

A clinical study at the Ulster Hospital in Dundonald (South Eastern Health and Social Care Trust) and the Ulster Independent Clinic in Belfast, both in Northern Ireland, aimed to evaluate the relationship between respiratory rate and oxygen saturation in a diverse adult population in the hospital setting. Patients were continuously monitored using an Intelesens Surveillance Monitoring device and a wrist-worn pulse oximeter for up to three days during their hospital stay. Data were reviewed retrospectively, and analysis was applied to define the relationship between respiratory rate and pulse oximetry.

As an addition to the original study, data on respiratory rate, oxygen saturation and heart rate were used retrospectively to assess whether Intelesens Surveillance Monitoring could have helped clinicians detect the onset of adverse conditions sooner, enabling earlier intervention. This case study looks at how Intelesens Surveillance Monitoring of heart rate and respiration rate may have detected the onset of a clinical event.

**MONITORING TECHNOLOGY**

The Intelesens Surveillance Monitoring solution provides healthcare professionals with relevant and timely indicators of patients’ health. A comfortable and unobtrusive body-worn monitor intelligently measures ECG and heart rate, respiration waveform and rate, and skin temperature. 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, temperature and SpO₂. The limits can be tailored to suit each patient. Key cardiac arrhythmia detection algorithms are also used to notify healthcare personnel of ventricular fibrillation and asystole events.

**PATIENT EXPERIENCE**

A 79-year-old woman was admitted to the Ulster Independent Clinic for elective hip replacement surgery. After surgery, she was set up with an Intelesens Surveillance Monitoring device in recovery. She was later admitted to the post-surgical unit. The device was configured to record and store physiological data for retrospective analysis instead of the standard configuration that transmits data to the Surveillance Station using Wi-Fi. Nurses carried out routine observations and measured vital signs at four-hour intervals from 4 p.m., following hospital protocol. At 11 p.m., a regular vital signs check revealed that the patient had hypotension. The resident medical officer was called and diagnosed the problem as volume depletion as a result of internal bleeding, necessitating fluid resuscitation. The patient showed prompt improvement after the fluids were administered. A check of the patient’s haemoglobin level revealed that this had fallen. One unit of blood was given to address this.

POTENTIAL CLINICAL IMPACT

Trend data on heart and respiration rates from Intelesens Surveillance Monitoring illustrates how the technology may have enabled nursing staff to respond to the patient’s deterioration sooner than with standard observations at four-hour intervals. The accompanying figures show heart and respiration rate trends during the 15 hours after surgery.

Figure 1 shows that from noon (when the monitoring device was deployed) to 3 p.m., the patient’s heart rate rose gradually, as would be expected during recovery from anesthesia.

In Figure 2, the heart rate still increases gradually from 3 p.m. to 4 p.m., as the effects of anesthesia continue to wear off. However, between 5 p.m. and 6 p.m. a few notable spikes in heart rate occur. The rising heart rate becomes more pronounced between 6 p.m. and 7 p.m. On a few occasions the heart rate spikes above 100 bpm.

If Intelesens Surveillance Monitoring had been actively deployed and the heart rate limit set at 100 bpm, these events would have triggered alarms, alerting nursing staff to the patient’s condition.
Figure 3 shows that between 7 p.m. and 10 p.m., the heart rate is consistently above 80 bpm with peaks well above 100 bpm, again likely resulting in alarms. It was at the end of this period (11 p.m.) that nursing staff, making observations at the required intervals, noticed a drop in blood pressure and called for intervention.

Figure 4 shows the patient’s condition stabilizing after administration of fluids.

**CONCLUSION**

From this example, the clinical value of routinely checking patients’ vital signs trends is clear. The patient’s baseline heart rate is noted to be about 70 bpm, and the respiration rate about 18 bpm. During sleep, these rates fall to 60-65 bpm and 12-15 bpm. The gradual rise in trend data is most pronounced after 9 p.m., when both heart and respiration rates are consistently higher and more variable, indicating that something may be wrong. A heart rate alarm limit of
110 bpm on Intelesens Surveillance Monitoring would have resulted in approximately five alarm conditions being met from 5:45 p.m. to 9 p.m. Continuous monitoring of heart and respiration rate could have identified the patient’s condition sooner and allowed healthcare professionals to react earlier.

This patient’s case also points to potential cost savings associated with Intelesens Surveillance Monitoring – in this case the patient’s deterioration was related to blood loss as a result of internal bleeding. If Intelesens Surveillance Monitoring had enabled nursing staff to see the patient’s heart rate rising and react sooner, it is conceivable that the subsequent blood transfusion may not have been necessary.

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Continuous vital signs monitoring may enable staff to respond to patient deterioration sooner than with standard observations at four-hour intervals.

Vital signs trending provided by Intelesens Surveillance Monitoring assures staff that the patient is responding to treatment as anticipated.

Detecting patient deterioration earlier with Intelesens Surveillance Monitoring may help reduce costs associated with emergency intervention and follow up treatment.

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