

Case report: using patient-specific alerts in a tele-monitoring programme for the treatment of patients with respiratory failure

**Chronic Respiratory Failure Unit,
Pulmonary Diseases, Hospital Nova**

Key observations by the nursing staff

Following the introduction of Management by Exceptions:

- Proactive patient care has improved
- Patient satisfaction and safety have increased
- Quality of care has improved
- Staff job satisfaction has increased
- Time is used more effectively

Introduction

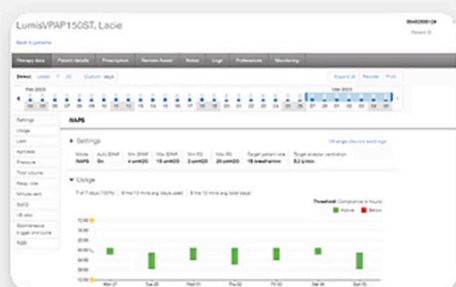
Sairaala Nova is a modern central hospital in Jyväskylä, Central Finland, operating in newly built facilities opened in 2021, and serving as the region's primary specialist care centre for approximately 250,000 residents. Patients with pulmonary disease are treated in the chronic respiratory failure unit, on internal medicine wards, and in the emergency department. The chronic respiratory failure unit treats respiratory failure patients on an outpatient basis. About 130 of these patients are on home mechanical ventilation; all of them are remotely monitored. The unit has three nurses, two of whom work part-time, and operates only during office hours.

The unit initiates approximately 25 patients on to non-invasive ventilation every year. This includes both planned and acute initiations. Planned initiations take place on an outpatient basis at the unit, or at home if necessary. Acute treatment is also initiated in various hospital departments. For several years, Resmed's AirView programme has been used for the remote monitoring of patients. The AirView for Ventilation add-on, which is designed for monitoring ventilation patients, was introduced in 2020.

AirView for Ventilation

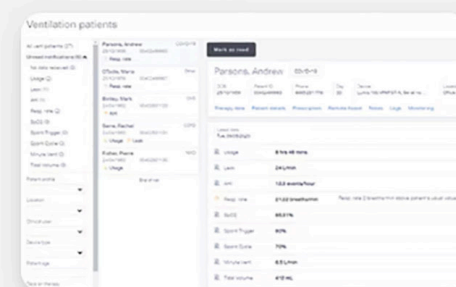
AirView for Ventilation is an add-on to Resmed's AirView remote monitoring programme. It enables the remote monitoring of Lumia and Stellar bilevel ventilators and the Astral life-support ventilator.

AirView's features for ventilation therapy



Access, analyse and share insights: advanced features

Get a comprehensive view of patient therapy with on-screen interactive reporting tools. Visualise and detect variations in therapy trends across all programs.



Management by exception: expert feature

Management by exception together with interactive reporting can help you strengthen your relationships with your referrals, and quickly identify and troubleshoot therapy issues through enhanced remote monitoring capabilities.

Monitoring options

Data

Usage < 14 days

Usage > 14 days

Leak

Valved Leak

AHI

Minute Vent

Resp Rate

Pressure (PIP)

Tidal Volume

Spont Trig %

Spont Cycle %

Monitoring options

Data

When no data is received
☒ Notify
after 3 days in a row

When settings change
☒ Notify
when data is received

Usage (setup to day 14)

When usage issues
continue for 3 days in a row

☒ Notify
if below 6 hours

Usage (after day 14)

When usage issues
continue for 3 days in a row

Example of monitoring options in AirView for Ventilation

Initial situation

In early 2023, the chronic respiratory failure unit noticed that the nurses' work was increasingly focused on firefighting, which meant that their workload was dictated by unplanned patient contact. This led to unplanned care situations that were burdensome for the nurses. Work often had to be done as overtime, and decisions had to be made quickly under pressure. In addition, the nursing staff often felt that they were late in reacting to changing situations.

The unit began to consider whether it would be possible to address changing care needs before the patient's situation became acute and required an immediate response or the patient had to seek emergency care. They decided to try Management by Exceptions, a system of patient-specific alerts in AirView for Ventilation which is designed to identify deviations in care.

The unit wanted to investigate whether the implementation of Management by Exceptions could benefit patients by making it possible to address changes in care more quickly. They also wanted to see whether it could save nurses' time, enabling resources to be directed to the care of patients with more severe conditions. The nurses were concerned that managing the alerts might create additional work and consume already limited time and resources.

Implementing Management by Exceptions

In May 2023, the chronic respiratory failure unit introduced Management by Exceptions. Initially, patient-specific alerts were activated only for new bilevel ventilation patients; later, alerts were activated for all patients on bilevel ventilation therapy.

Alarms were activated for the following parameters:

- Data, i.e. information about device usage and connection to AirView remote monitoring
- Device usage during the first 14 days and thereafter
- Mask leakage
- Apnoea-hypopnea index (AHI) score
- Breathing frequency

Other alarms were activated at a later stage:

- Change in percentage of spontaneously triggered breaths
- Change in percentage of spontaneously cycled breaths
- Change in tidal volume
- Change in minute ventilation

The SpO2 alarm was not activated as the hospital does not regularly monitor saturation values.

 **The system has demonstrated such effectiveness that the alert functionality has become an integral part of our clinical workflow. Its reliability in accurately flagging patients with clinically relevant concerns has minimized the need for routine manual verification, allowing us to focus more efficiently on patient care.**

Helena Isoniemi
Chronic Respiratory Failure Unit,
Pulmonary Diseases,
Hospital Nova

Care pathway: elective initiations

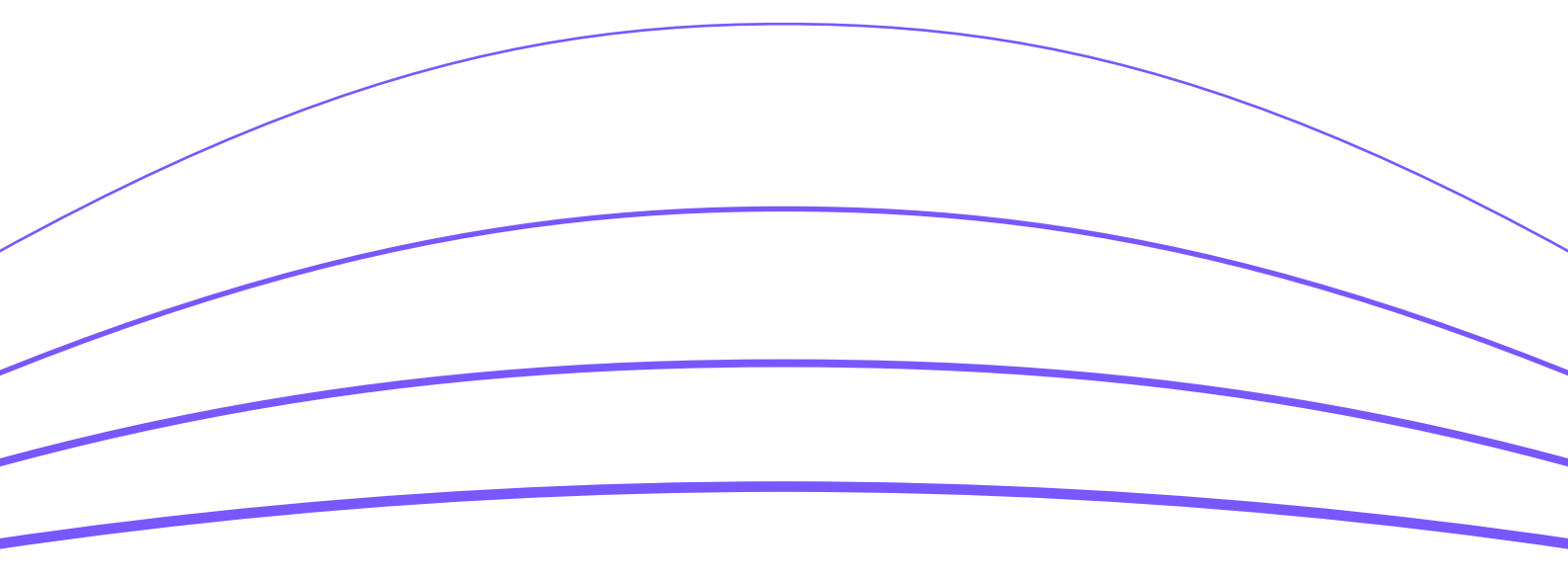
During care pathway planning, each patient receives an individual assessment of their follow-up needs and scheduling. The planning aims to consider the patient's other hospital visits and, if possible, schedule follow-ups in conjunction with these visits. Home visits can be arranged if necessary.

Example of a possible pathway

1. Visit for treatment initiation, with doctor and nurse
 2. First follow-up: two weeks after treatment initiation, conducted remotely by the nurse
 3. Second follow-up: 2–3 months after treatment initiation, with doctor and nurse
- Follow-ups for ALS patients are often scheduled in conjunction with neurology appointments to avoid unnecessary hospital visits.
 - COPD and OHS patients have annual follow-ups with the nurse.

Implementing Management by Exceptions has made the care pathway even more flexible and patient-centred. The doctor can schedule the next follow-up appointment within a range (e.g. 6–12 months), knowing that the patient can be called in for evaluation—potentially at short notice—if they are flagged on the monitoring system's alert list due to individual risk indicators. The nursing staff can rely on the remote monitoring system to issue alerts if a clinically significant change in the patient's condition requires intervention.

As a result, nursing resources can be allocated more effectively to patients who need active follow-up. Stable patients are not burdened with unnecessary appointments and follow-up can be conducted remotely if clinical parameters remain favourable.



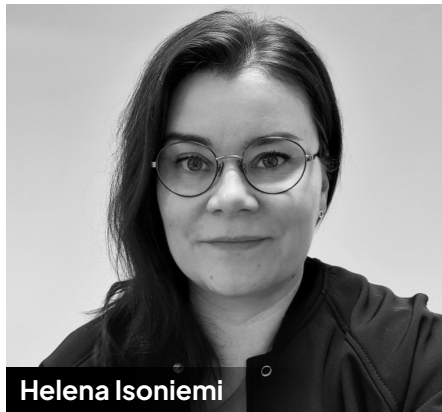
Example of a patient case

During a routine check of the AirView for Ventilation remote monitoring programme, a nurse noticed an alert relating to increased device usage for an ALS patient. The nurse assessed the situation and determined that the patient did not need immediate contact, but decided to bring forward a scheduled follow-up appointment to a time when the unit had good nursing resources available. During a phone follow-up, the nurse assessed the patient's situation and concluded that, due to the increased need for device therapy, the patient would benefit from having a backup device and battery at home. It was agreed that the patient's relative would pick up the device from the hospital.

Patients or their relatives are not always aware of the need to contact the treatment unit when device usage increases. This can lead to a situation that rapidly becomes acute. Previously, when AirView for Ventilation alerts were not in use in the unit, it took nursing staff more time to become aware of changes in a patient's situation. Often, changes were not detected before the scheduled follow-up time, by which point the patient's condition might have deteriorated and they might have had to seek emergency care. Because the increase in the patient's device usage was detected rapidly, the nursing staff were able to expedite the provision of additional support at home.

Interview

Respiratory failure nurse
Helena Isoniemi and
respiratory failure nurse
Aulikki Oksanen,
Chronic Respiratory Failure
Unit, Pulmonary Diseases,
Hospital Nova



Helena Isoniemi



Aulikki Oksanen

Initial situation

We, the staff, felt that we could further improve our operations in monitoring respiratory failure patients. The situation was by no means bad: patient monitoring worked according to pre-made plans, but we still felt that there was room for improvement. We thought it would be great to add more planning to our operations. It would also be great if we could detect potential challenges in patient care well in advance, so patients wouldn't have to seek emergency care outside our office hours. We also handle initiations that take place in the wards. During emergency hours, we don't have an entity that, for example, delivers backup devices, so the ability to plan ahead is very important to us.

Programme implementation and use

The implementation of AirView for Ventilation went smoothly, as we already had years of experience using the AirView remote monitoring programme. Initially, we had to look at instructions when using patient-specific alerts but it soon became routine practice. Activating patient-specific alerts at the start of treatment was easy and only took a few seconds. AirView for Ventilation automatically suggests alerts when patient and device information is added to the remote monitoring programme.

It did not take much time to adopt the new way of working, and we could check the instructions if necessary. We check the remote monitoring programme almost daily. Instead of having to check through every patient's AirView data to find issues, however, we now review the alarms and get straight to work finding solutions. With AirView for Ventilation, our contacts with patients have increased, but contrary to what one might think, this is actually a positive change. The contacts have proven to be very necessary, and the content is of high quality and often reveals other useful information.

Initially, we feared that the alerts would increase our workload. Although there are many alerts, we know our patients well so we know which alerts need to be responded to and with what priority. The system has proven to be so useful that we can no longer imagine working without these alerts. We can also trust the system: every patient who has experienced challenges has been identified, so there is no need to double-check the information. As the number of patients grows, it is important that the filtering system picks out the right patients.

Benefits

The alerts enable us to quickly detect any changes in the predefined alarm parameters. We can respond to changes in the patient's condition in a timely manner, saving time and resources and reassuring the patient and their relatives. The nursing staff can plan their work more easily, no longer have to put out fires, and are better placed to anticipate situations.

Relatives have given feedback that it feels safe when the nurses have alerts in place, especially if the patient's situation changes. The responsibility no longer falls entirely on the relatives. A patient's situation can deteriorate gradually, and relatives do not necessarily know when it would be good to contact the care team. Usually, patients and relatives have a high threshold for contacting the nursing staff. The alerts mean that patients receive help more quickly, even if they have not yet reacted to the situation or identified the need to ask for help.

The goal is to prevent situations in advance, so the patient does not end up in the hospital receiving expensive specialized care unnecessarily. The patient's situation remains under better control, and changes can be better anticipated. The staff are able to focus on the right patient at the right moment, which saves time and helps them to plan more effectively. Remote monitoring helps us respond to changes before the next visit, creating a sense of security and helping patients manage for longer at home.

The introduction of alerts has also made work more predictable: we no longer feel that we are putting out fires, which positively affects our well-being at work. Before this new way of working, we remember situations where the patient's device usage suddenly increased, and the patient immediately needed devices and supplies at home. We felt like we had failed, even though the patient received the help they needed. Now technology helps, and we do not have to rely so much on memory. There are three nurses in our unit and we are not always at work at the same time, so it is important that tasks are evenly distributed.

In the future, we could further optimize the alerts by considering which alert best serves which patient and which alerts can be turned off.

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