

GE Healthcare Device Accessory Measures Every Breath to Improve Patient Ventilator Monitoring

CASE STUDY



Abstract

When GE Healthcare set out to develop a medical device accessory to capture ventilator data from the Engström Carestation®, they knew they needed innovative embedded technology. GE Healthcare chose Eurotech's TurboXb embedded computer for the Engstrom EView data capture device accessory, which is designed to provide clinicians and researchers with a tool with broad capabilities to capture detailed patient ventilator data.

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Introduction

GE Healthcare provides transformational medical technologies and services that are shaping a new age of patient care. Their broad expertise in medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, biopharmaceutical manufacturing technologies and performance improvement help customers deliver better care to more people around the world. GE Healthcare aims to reduce costs, increase access and improve the quality and efficiency of medical device accessories.

One way that GE Healthcare can assist clinicians in improving the quality of care that they provide to their patients is through capturing medical device accessory data. A patient's well-being can be greatly influenced by a clinician's ability to obtain data that accurately reflects a patient's condition.

The Engström Carestation is an expandable respiratory care station from GE Healthcare. Its design is intended to help satisfy clinicians' need for accurate, timely data with advanced features, networking option, equipment integration, patient care documentation, and medication delivery. The Engström Carestation offers the ability to monitor unique parameters, such as Functional Residual Capacity (FRC), SpiroDynamics and Metabolics.

Attention to detail and adaptability to the critical care environment were primary design concerns in creating the Engström Carestation. The result is a respiratory care station designed to be user-friendly to help clinicians focus more on patient care. Key features include secure access to central stations, viewers and wireless connections.

The Challenge: Gathering Historical Ventilator Data

Too often, some of the most important indicators of a change in a patient's status can occur quickly, and then be lost forever. Obtaining and filtering patient data, which adequately reflects a ventilated patient's status, can be challenging. Historical methods have focused on snapshots of patient health, performing

ventilator checks, taking notes on how the patient is doing, and checking vital signs at one particular instance versus over time.

The ability to capture patient data has become an expectation in the monitoring of a patient's heart rate and other patient vital signs, and GE Healthcare believed ventilators should be able to provide the same level of detailed patient data.

Paul Hunsicker, Global Product Manager for GE Healthcare explains, "Patient data is the most valuable when a critical event happens, but former data capture methods only offered a snapshot in time. At GE Healthcare we wanted to develop the capability to capture ventilator data breath by breath, to help clinicians capture the details of what happened before a critical patient event."

In order to gather more meaningful data from Engström ventilators, GE Healthcare began to develop a portable data capture device accessory. The solution would need to be

designed for ease of installation, and most importantly, it needed to capture the output data of the ventilator reliably and continuously.

GE Healthcare had two audiences in mind for the ventilator data capture device accessory that would attach to the Engström – researchers who want a more complete picture of patient health, and clinicians who need to customize data and analyze bits and pieces as they see fit.

In general, researchers previously studied case histories with a limited amount of patient data gathered at specific points in time. In some cases, if a patient passed away, researchers could only study random data points due to technical limits on data capture

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devices, and the most important piece of the puzzle that led to a patient's deteriorating health was often missing.

Previous data capture methods also left some clinicians wanting more information and flexibility for patients. When a patient ventilator alarm went off, it generally showed what happened to the patient at that moment, but not in the moments leading up to the problem. Some data capture solutions also required patients to be tethered to a machine, so if they moved for a test or appointment, the data would not be captured. GE Healthcare wanted to develop a data capture device accessory that would allow clinicians to record patient health moment-by-moment. They wanted to allow clinicians to gather near-constant data, with customizable settings to meet a broad range of patient needs.

To satisfy both audiences, GE Healthcare had to develop a modular, wireless device accessory that could move with the patient for broad data capture. The platform needed to function independently from the Engström so as not to impact its ventilation operation in any way.

The Solution: Capturing Every Breath

To accomplish their goal of broad ventilator data capture, GE Healthcare knew they needed to take advantage of innovative technology to create a modular data capture device accessory they would call EView.

The main goal was to develop an embedded data capture device accessory that would be reliable and consistent in its collection and transmission of data. GE Healthcare wanted a device accessory with the ability to store data, retrieve data, and maintain data when the product shut down.

First, GE Healthcare chose the Windows embedded operating system for the EView. Since the Engström Carestation and many other GE Healthcare offerings also use Windows, it was a clear choice for the new device accessory.

Next, GE Healthcare chose to work with Eurotech for the embedded computing platform.

"We chose Eurotech for the EView embedded platform to get to market faster and allow our internal engineers to continue to develop our core product offerings," said Hunsicker. "Eurotech had prior experience with our design requirements."

GE Healthcare's data capture device accessory was based on the Eurotech TurboXb computer on module, and as follows typical Eurotech engagements, Eurotech was also responsible for the board support package for the Windows embedded operating system.



Eview device accessory from GE Healthcare

Hunsicker explained why GE Healthcare used a vendor to develop the hardware platform rather than developing a solution in-house. "The Eurotech TurboXb computer on module is already an established, stable platform. We knew from experience how long it could take to get a new hardware platform done and develop the board support package. Working with Eurotech streamlined the process."

Eurotech's TurboXb allowed for customized I/O boards, and compact flash, USB and other peripheral drivers were already included. GE Healthcare also found that Eurotech offered

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excellent support, especially during the design and development process.

“If we had questions during application development, we had someone to talk to at Eurotech. We found that Eurotech provided timely customer support and constant communication,” said John Huttenhoff, GE Healthcare Lead Program Integrator.

GE Healthcare and Eurotech worked together to create a solution designed to better serve the healthcare industry and its potentially chaotic working conditions. The EView is designed for quick installation, and the accessory is also very rugged – Eurotech tested and adjusted the device for shock and vibration, electrostatic discharge, electromagnetic emissions and temperature as part of the product development process.

“At Eurotech we perform rigorous testing on all of our embedded computing platforms, and there are specific requirements for medical devices,” said Pete Dombrowski, Eurotech Director of Engineering. “We have prior experience with these specific regulatory requirements, so our engineers kept every requirement in mind while developing the embedded computer to power the EView for a smooth development process.”

The Result: EView from GE Healthcare

The project was completed and the EView received FDA clearance in the United States in May of 2010.

“Pending regulatory reviews, the EView will be available in markets outside the U.S., with roll out to various countries over the following months,” said Hunsicker.

The EView attaches directly to the back of the Engström, capturing the output data of the ventilator. Captured, this data is then available to the clinician for downloading and viewing at any given time. The mobility of EView also allows the device accessory to move from one Engström to another.



EView installed on back of Engstrom (top left)

EView offers the ability to look back as far as seven days and recreate the past, allowing for evaluation and review of patient information down to a breath-to-breath level. Detailed information at this level can not only influence current patient care, but also guide a clinician towards developing specialized solutions to meet individual and unique patient requirements.

Eurotech and GE Healthcare worked together to develop a product that utilizes innovative embedded technology with a long useful life. Medical device accessories typically depreciate after about seven years, but due to budget and time constraints they often remain in the field much longer.

Eurotech design engineers ensured the product met all GE Healthcare guidelines, and kept careful design documentation to meet all disclosure requirements.

By working closely throughout the development process, GE Healthcare and Eurotech collaborated to develop a data capture solution that represents a significant innovation in respiratory care.