

Critical Care News

First impressions and clinical experience of the SERVO-U ventilator in pediatric intensive care patients

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Maquet Critical Care AB
171 54 Solna, Sweden
Phone: +46 (0)10 335 73 00
www.maquet.com

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www.criticalcarenews.com
info@criticalcarenews.com

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Intensive Care Nurse Vicky Irwin with post-op congenital heart defect patient.

First impressions and clinical experience of the **SERVO-U ventilator in pediatric intensive care patients**

As the largest pediatric hospital in Ireland, Our Lady's Children's Hospital Crumlin cares for over 1100 intensive care patients each year. Care for both pediatric and premature neonatal surgical patients are provided in the 23 bed intensive care unit.

The ICU has a longstanding history and treatment culture of using SERVO ventilators, from the 900 series in 1975, to SERVO-i in 2002, and SERVO-i with Neurally Adjusted Ventilatory Assist (NAVA) in 2007. This SERVO legacy led naturally to the testing and clinical experience of the fourth generation SERVO platform in the ICU of Our Lady's Children's Hospital. Critical Care News met with cross-functional team members to discuss their experiences.

Critical Care News spoke with Dr Martina Healy, Medical Director of the Pediatric Intensive Care Unit at Our Lady's Children's Hospital in Crumlin, Dublin.

What were the primary factors leading to the use of this new ventilator at your center?

We have worked with SERVO in the past and we originally did clinical evaluation for NAVA, so we were pleased and happy to try this latest generation SERVO.

When did you first start using the SERVO-U ventilator in the ICU and in what situations?

We started using the SERVO-U ventilator 3 weeks ago, and since that time we've used it on three patients, where we have used Pressure Control, Pressure Support, NAVA and SIMV modes.

One patient is a 2 kilogram baby that had a congenital heart defect, a single ventricle. He has undergone cardiac surgery and has chronic lung disease. He will probably have to grow on the ventilator before he is ready for his next operation. He was on SIMV (PC) and when we turned him over to NAVA on the SERVO-U, he looked very comfortable, in fact so much so that his parents thought it was very impressive. In fact his parents became advocates, saying "keep him on this ventilator please!" For this patient the ventilator has been very easy to set up, it has been easy to ventilate the patient on other modes and easy to switch over to NAVA. SERVO-U seems much easier than SERVO-i, to summarize our first impressions in this patient after our three week experience so far.

The clinical situation for the other patient on the new ventilator is a little girl and her underlying history is congenital cardiomyopathy. She subsequently developed bowel problems due to the low diastolic perfusion of her intestines. She initially wasn't on a ventilator at all, but she has an abnormal rhythm which is probably related to her cardiomyopathy and subsequently needed a ventilator. Her current issues are lung compliance, her distended abdomen and she has

a rate of 30. She probably will have no issues with chronic lung disease, but will most likely need to stay on the SERVO-U ventilator for another week or two. She is about 6 weeks old and 3.5 kilos at the present time.

What are your first impressions of the SERVO-U ventilator, in terms of ease of use?

Settings are very easy to change between modes, and if you want to change from one mode back to the original mode, the ventilator gives you that option and it is very easy to do. The alarm management system is a big change – it is definitely positive and a big improvement on what we've experienced on earlier generations. The different views are very user friendly, they are clear, you can see tidal volumes and trends, and settings and mode settings are simple, clear and easy to use as well.

Comparing NAVA on SERVO-U to SERVO-i, what is the primary difference?

We have been using NAVA here since 2007, and one of the limitations we've had in the past is that it takes an extra effort to change settings and change the nasal-gastro tube, but I do feel it is a useful mode. On this ventilator, once the Edi catheter is placed, it is certainly much easier to set up and use, and it is easier to move between modes. We've already had 2 of the 3 patients on NAVA without any added fuss. The NAVA workflow on the new ventilator is 100 percent better, that's my impression. We have not had an opportunity to try non-invasive NAVA on the ventilator yet, but we look forward to utilizing that mode when the patients are ready for it.

Have you used the SERVO-U media library to record events and review them later?

Yes, in fact it was very valuable to take screen-shots and recordings to give a lecture to our juniors here. It seems to be easy to save and to access.



Dr Martina Healy, Medical Director, Pediatric Intensive Care Unit at Our Lady's Children's Hospital

From your initial experience, what is your opinion of the opportunities for views and configurability with SERVO-U?

I find it to be very user-friendly, with fewer alarms, and I definitely like the screen set up. It has a perfect screen size and is easy to see. I especially like the Family view screen.

We've found that the ventilator is very easy to learn and use. We started using it after a 10 minute tutorial, and we didn't need anything more than that. Our impression is that it is very easy to access, and easy to change between modes.

"We are happy to use these new ventilators"

So overall we are happy to use these new ventilators and to keep using them. We are excited to start using non-invasive modes soon, particularly non-invasive NAVA. I think we would particularly want to use them on children that are on the ventilator for longer periods of time.

Team impressions

Training on the new SERVO-U ventilator



Nurse Vicky Irwin and Pediatric Specialist Registrar Cathy Gibbons

Vicky Irwin, registered intensive care nurse, and Cathy Gibbons, Pediatric Specialist Registrar training in intensive care shared their cross-functional team impressions of working with the SERVO-U ventilator.

What are your first general impressions in regard to the new ventilator from a user / caregiver team perspective?

Vicky Irwin: I really like it, I like that it's all touch screen, and it makes it all very easy and user-friendly. In many ways it is very like the SERVO-i – it is not hard to go from one function to another, but the new SERVO-U has a lot of additional new benefits. I especially like the supportive workflow for working with the Edi catheter, it makes placement very easy.

Cathy Gibbons: I think it's absolutely gorgeous, lovely to look at and it is very inviting, I love all the additional information it offers about settings and ventilation modes. This is really important for when we have additional staff coming into the unit, who have not worked with SERVO previously or are working on the night shift with limited

staffing, all the information is there and to clearly see what setting you are on and what might help your patient is all very helpful. We see a lot of pediatricians coming through the ICU who have no intensive care background, so ventilators are new to many of them. They are coming from treating the babies and are suddenly having to ventilate a 15 year old, and they frequently don't know what the names of the settings are on one ventilator compared to another. The fact that they can go in and study and clearly see the modes to select is very nice.

I really like the safety features, like having to hold certain buttons down just a little while longer to confirm is reassuring. I love the Autoset feature of the alarms, and I really just love just being able to slide your finger to make adjustments to settings, instead of having a multiple process with other knobs and having to re-confirm.

From a practical working perspective, what are your opinions about the Basic and Advanced Views, media library and ergonomics of the new ventilator?

Cathy Gibbons: The Family view is lovely. We do have a lot of parents here for 4 or 5 weeks and they do spend a lot of time watching the screens. They become really stressed when the numbers are changing or alarms are going off. The Family view screen helps the parents put the focus back on their child, which is right where it should be. I love the fact that the ventilator swivels with 360 degree access. Very often we are at the patients head doing something with the airway and often the ventilator is facing completely away from us, so we have to rely on alarms to tell us if there is a problem, but with SERVO-U I can turn the screen to face me wherever I am in relation to the patient and bed, and that is something I haven't been able to do before. For patient safety and feedback for us when we are working at the head of the bed, that is really good.

All of my impressions are really positive, and among us registrars we are fighting amongst ourselves to work with these new ventilators. I think the touch screen interface has been cleverly designed, it feels familiar even if you are working with it for the first time, as so much of what we interact with nowadays is tablet-based.

We haven't had much chance to work with the media library yet, but that is something that we registrars see as a big advantage for learning. The fact that you can easily download trends and recordings of treatments by a USB to review later on with your colleagues and the intensivists is really powerful and exciting. Especially with cold and influenza season upon us, we know we will be getting children with bronchiolitis and asthmatics coming in this winter. They will be difficult to ventilate at times, so I think to be able

to use real-time data in the course of treatment of these patients will be helpful for teaching purposes.

What are the impressions of the alarm management system in SERVO-U from a nursing perspective?

Vicky Irwin: I do think it is an advancement and I like the fact that you only need to press one alarm button to see all the settings, and I think it is really easy to change alarm parameters with the SERVO-U, it is more direct and much more easy to do. You can go directly into the alarm you want and change it, it is very quick.

What are your impressions of using NAVA on the SERVO-U ventilator?

Cathy Gibbons: I think it comes back to the support and information the system gives you. For those who have not worked with NAVA previously, it is much easier for them to learn how to position the Edi catheters, get information about the NAVA level and visually it is very clear when you are on a NAVA triggered breath, versus a non-NAVA breath. The information is all there and

very clearly explained and I think that is brilliant, it makes you more confident. I also like how easy it is to access and see the Edi trends and curves.

How quickly have you learned to use the SERVO-U ventilator, and what are your experiences in teaching other staff members to use it?

Vicky Irwin: It is very easy to learn, in fact even today I was teaching the relief nurse that was to cover for me on my break today. She had never seen the SERVO-U before, but I showed her how to use the unit in about five minutes and she had no problems. Even she remarked on how easy it was to use, in general and for routine nursing procedures like disconnecting suction support and nebulizing. Even if there were some instructions from me that she couldn't remember, it was very easy as the system guides you through these routines. It is very user-friendly, and that was her first remark to me when I came back from my break.

I like how it is very easy to exit something, you click on something and it is very simple to go back to the main menu, it is direct with very few steps. I

also love the integrated nebulizer on this unit, it is really easy to set up and use.

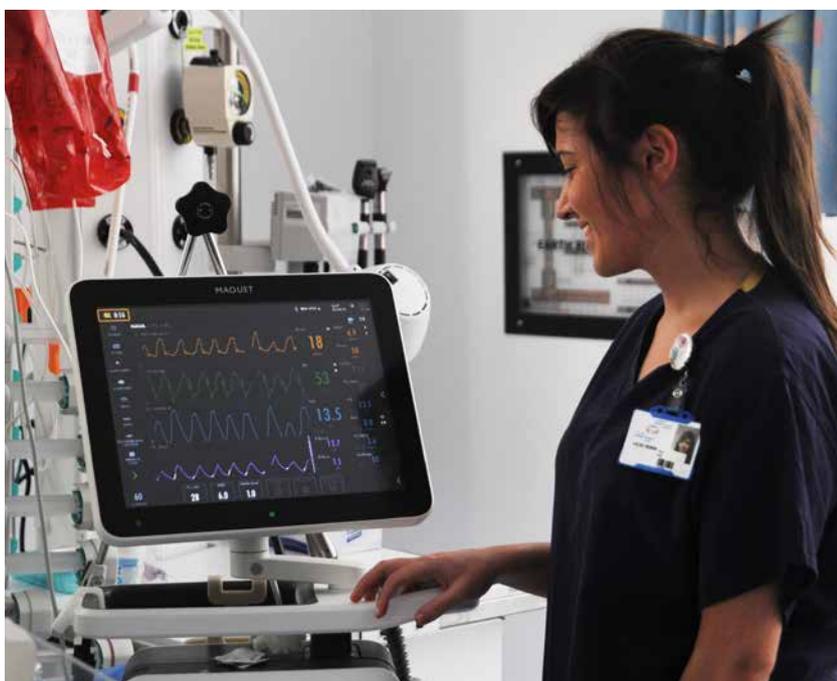
Cathy Gibbons: Even though we have only been using it a few weeks, I feel I could instruct a new staff member or consultant to use it within only five minutes. We just had a ten minute tutorial ourselves before we started using it, and there were no problems at all. We haven't really used the Distance view much yet, but I can think this would be useful when patients are undergoing a CT, that you can see values clearly at a distance.



Intensive Care Nurse Hugh Murphy

"This is my very first day working with this ventilator. The touch screen is nice and easy to use. This baby is on NAVA right now and he seems to like it.

The clinical engineers gave me a quick overview for about 20 minutes, and I have been using the ventilator since then"



Nurse Vicky Irwin observing NAVA treatment parameters on the SERVO-U ventilator.

Dr Cathy McMahon is consultant intensivist at Our Lady's Children's Hospital Crumlin and in the Children's University Hospital in Temple Street in Dublin as well. She is a very familiar SERVO ventilator user, with experience from pediatric ICUs in Dublin as well as at the Hospital for Sick Children in Canada. She shared her first impressions of SERVO-U.

As an intensivist, what are your experiences with the new SERVO-U ventilator?

My first impression of SERVO-U is that the screen is larger, and that it is very easy to use. I think it took me all of 10 minutes to figure out what was where on the ventilator in terms of features.

I like the variety of views and the screenshots that you can obtain on the ventilator, as you can set it up to see what is going on with the patient. The loops are nice and big, and it is easy to read even at the end of the bed on the larger wards. I really appreciate the fact that you can see the values such as tidal volumes clearly from the end of

the bed, and as we are now all focused on lung protective strategies, I like to see that the patient is receiving tidal volumes within the proper ranges.

The display is visually much more appealing to me. The modes are good, even if we all tend to use the same modes. I use a lot of SIMV PC but I also like PRVC with post-op patients with healthy lungs. I haven't used non-invasive on it yet but I am interested to try that and NIV NAVA as well. I definitely like NAVA on the new ventilator, it is much easier to position the catheter, and it removes a lot of the work when you are guided through the process on the screen.

What is your impression of the ventilator features for working and for educating?

I like the ventilators' ability to record, especially for research purposes. But also in cases where you have been having difficulties in ventilating, it is nice to be able to record this, even to show and discuss what's going on with the registrars the next morning.



Consultant intensivist Dr Cathy McMahon

This feature is absolutely helpful from a teaching perspective. Even just to show to our registrars in discussing compliance related issues, results and response to treatment, it is valuable. The ability to easily download the trends makes things so much easier.

What about ergonomics in transporting patients?

When we transport patients, what is really important is that they are on a good ventilator, especially our cardiac patients – just putting them on a bag for transport won't do when you've got someone with stiff lungs you want to ventilate them properly. The ergonomics are good and we like to see improvements in this area.

What features would you like to see in future?

The end tidal CO₂ that is on the module is too heavy to put on the small babies, as it kinks the tube. So we need a smaller one that you can visually see on the screen. And all on one monitor rather than looking at a separate hemodynamic monitor. End tidal CO₂ is a marker of ventilation and when something is wrong with it, it tells a lot. In future I would love to have it consolidated with the actual waveform and small enough so there is no huge dead space for the small babies.



Dr Cathy McMahon and Medical Director Dr Martina Healy

Service and support

The Clinical Engineering Department at Our Lady's Children's Hospital has been intensively involved with the introduction of each new generation of SERVO ventilator, starting with the SERVO 900B ventilator in 1975. Critical Care News asked Jim Davenport, Chief Clinical Engineer for 36 years, and Tony Fitzgerald, Principal Clinical Engineer for 14 years, of their impressions and experiences with the fourth generation SERVO ventilator.

What are your first impressions of the SERVO-U ventilator for a clinical engineering perspective, compared to earlier generations?

Jim Davenport: The 900B was the first SERVO ventilator we had, and we were happy to work with it for many years. Then we went to the SERVO 300 ventilator when it came out, in the early 90s and that was a massive kind of step forward. Ten years following that, we had the next massive step forward with the SERVO-i in 2002, followed by the clinical development of NAVA a few years ago. You might think in some ways that you have reached the top of the line of the delivery system – there is only a certain amount of perfection to put into it. So now it makes sense that the user interface is the aspect to develop, for more optimal use of the delivery system. The interface has improved immensely, and an especially nice aspect about that is for teaching. I have been helping the nurses become familiar with SERVO-U, and to show them how to change the trigger level and rise time and cycle-off criteria (end inspiration), for example, and they can see it directly on the screen, it makes sense, and that makes it so much easier. The Safety Scale aspect is a nice feature on the ventilator, to get indicators when you want to go above certain values.

What are your opinions about the service aspects of SERVO-U?

Tony Fitzgerald: We like what we see, but since our hospital first started working with the SERVO-U ventilators earlier this month, we really haven't had a chance to



Chief Clinical Engineer Jim Davenport

look at them from a service aspect, since they've been in use the entire time so far.

Jim Davenport: What has made a big impression so far is that we do have one baby on NAVA on the SERVO-U, and the parents have been adamant – "you're not taking away that machine without giving us another one exactly like it!" They can see with their own eyes that the baby is doing well on the ventilator. When a parent knows and can express appreciation for the technology, then you really know that it's useful.

Do you have any other general impressions of SERVO-U?

Tony Fitzgerald: It is very nice and easy to learn, especially from the user-interface perspective. I found it very simple to go into the diagnostics and the trends. It is very intuitive.

Even though the products are in use and you haven't had much time to look at the service aspects yet, what are your opinions about the service capabilities?

Tony Fitzgerald: We've only had one instance in which I had to download the logs, and it was a simple and easy procedure with a USB. No rocket science at all. I like the new ventilator trolley; it is much easier and lighter to move around than the older one.

Jim Davenport: I had one instance where a nurse needed help to re-calibrate the Edi, and it took all of 30 seconds. NAVA has become easier on this unit, you have a much easier workflow for NAVA and it is simple to calculate on screen. It provides the same ventilation performance for neonates in transport as the SERVO-i did, and it is a benefit to mount the gas bottles directly on the ventilator trolley, especially when bringing kids to CT, to make things as simple as possible in transport. The integrated nebulizer is also fantastic. It simplifies our management of ventilator hardware. Another feature I like is the USB access to everything, which simplifies our work. ■



Principal Clinical Engineer Tony Fitzgerald

Biography

Dr Martina Healy received her initial degrees as MB, Bch, and BAO at the National University of Ireland in 1984, followed by Fellowship of the Faculty of Anaesthetists of the Royal College of Surgeons in Ireland (FFARCSI) in 1991. She obtained her Certificate of Completion of Higher Professional Training in 1995. Her continued professional training in anaesthesia began at the Liverpool Central Rotational training scheme in Anaesthesia in Liverpool, U.K. during 1986-1992, followed by Research Registrar in Anaesthesia, Mater Misericordiae in Dublin 1992-1993. Her Higher Professional Training scheme in Anaesthesia in Ireland occurred from 1993-1996.

Her paediatric intensive care training was initiated as Registrar in Intensive Care, Royal Children's Hospital, Parkville in Melbourne, Australia from 1998 to 1999, followed by a position as Trust Fellow in Paediatric Intensive Care at Great Ormond Street Hospital for Sick Children from 1999 to 2001.

Dr Martina Healy was appointed Consultant in Anaesthesia and Paediatric Intensive Care at Our Lady's Children's Hospital, Crumlin, Dublin in 2001. Dr Martina Healy is currently Medical Director, Paediatric Intensive Care Unit at Our Lady's Children's Hospital.

Dr Cathy Mc Mahon received her initial degrees as MB, BAO and Bch at University College in Galway in 1998, followed by Primary FFA in 2002 and Fellowship of the Faculty of Anaesthetists of the Royal College of Surgeons in Ireland (FFARCSI) in 2003. She obtained her MSc Anaesthesia with first class honours in 2005. She completed a two year fellowship in intensive care medicine in The Alfred Hospital in Melbourne, Australia in 2008, followed by an honorary fellowship in paediatric intensive care at The Hospital for Sick Children in Toronto, Canada in 2010. Dr Cathy Mc Mahon has been working as Paediatric Intensive Care Consultant in Our Lady's Children's Hospital Crumlin and Children's University Hospital, Temple Street since 2010.

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