

Critical Care News

Implementing NAVA and Edi monitoring as lung protective elements in a regional hospital ICU

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Dr Rory Mackenzie, Clinical Director and Consultant Anaesthetist; Dr Sanjeev Chohan, Consultant Anaesthetist; Dr David Clough, Consultant Anaesthetist, and Dr Jim Ruddy, Consultant Anaesthetist/Intensivist have all been gaining experience with NAVA

Implementing NAVA and Edi monitoring as lung protective elements in a regional hospital ICU

Monklands Hospital on the outskirts of Glasgow in Lanarkshire, Scotland is a district general hospital with 521 inpatient beds. Monklands Hospital provides the Lanarkshire district patients with renal care, an emergency department as well as inpatient services for ENT, dermatology and communicable disease.

This means that the six bed intensive care department of Monklands Hospital treats a wide variety of between 360 and 380 medical and surgical ICU patients a year. These ICU patient challenges are met by five intensive care consultants and 26 critical care nurses, who are implementing lung protective ventilatory strategies on a routine basis. The ICU staff members of Monklands Hospital recently implemented Neurally Adjusted Ventilatory Assist – NAVA as well as Edi monitoring in their unit. They became positive to this new methodology after experiencing it in a worst-case scenario, with a patient that had been on mechanical ventilation for 62 days. Critical Care News spoke with Dr Jim Ruddy to hear of their experiences and observations.



Dr Jim Ruddy at patient bedside

Can you describe the primary factors and process leading to the decision to investigate and implement NAVA in this ICU?

Dr Jim Ruddy: It was the fact that we were changing our ventilator fleet, but also the fact that many of us were curious about NAVA, and are wondering where its niche is going to be. Quite a few of us here have an interest in lung recruitment maneuvers and ventilator strategies, it seemed that this package of the ventilator with options for lung recruitment and NAVA gave us the opportunity to combine recruitment with weaning opportunities as a lung protective package.

When did you have your first patient experience with NAVA?

Our first case was the patient case that we had in the beginning of the year, about 5 months ago, which turned out to be a worst case scenario for a 25 year old patient with severe pneumonia, who developed polyneuropathy, sepsis, ARDS, renal failure and so many complications that we were constantly afraid of losing her. She was in the ICU for 100 days, and it was one of those cases where everything went from bad to worse. We were able to wean her off over a month of HFO with the help of NAVA. It worked an absolute treat, and made believers of us all here. Since then we

have treated about 10 patients with NAVA. *(Editor Note: this NAVA patient case report will be published and located on www.criticalcarenews.com).*

How routinely is NAVA used in the ICU?

We have NAVA at every bedside but we only have 2 Edi modules, which is enough at a unit of this size of 6 ICU beds. That is enough for the potential use of NAVA on a weekly basis, with the capability available for all ventilators. At the current time, we have experienced an average of 1 or 2 patients a month on NAVA.

Are there specific staff members using NAVA, or has all the general ICU staff received training?

Training is an ongoing process, and we conducted initial training for key users, and we have been educating the rest of the staff in succession ever since. The trainees that are interested in intensive care are quite keen on learning NAVA; they see it as a useful knowledge base to mention when they go on to train at other intensive care units and hospitals. That is spreading the news in a good way as well, since the trainees are seeing what could be useful in monitoring Edi; is it high or low, or affected by sedation, and in conventional modes as well as NAVA. It is quite nice that the interest from the trainees can flow from the bottom up when they go to other institutions. We conducted a study day as well, where we offered NAVA training sessions to staff in all the intensive care units in Lanarkshire. All of the critical care nurses got insight into NAVA and why we are using it here.

Who within the ICU is responsible for insertion of the Edi catheter and who is responsible for placement verification and use of the Edi catheter?

We consultants change the Edi catheter, place and verify it, unless there is a trainee on the unit that would like to learn. This is about the easiest part of the procedure, to place the Edi catheter and verify placement by means of the esophageal ECG signals.



Dr Jim Ruddy

Is monitoring of the Edi signal used in conventional ventilatory modes or in stand-by?

In terms of monitoring Edi in stand-by on patients that have been weaned but not yet extubated, we have not tried this yet, but it may well be if the work of breathing correlates with the Edi peak, we can conclude that the patient is getting tired and may need to go back on the ventilator.

With regard to monitoring of Edi signal in conventional modes, in the patient presented in our case report, this girl had a severe critical polyneuropathy, probably the worse I have seen, she couldn't lift her hands up. Even on the HFO, she would make respiratory motions but she was so weak she would not interfere with the oscillation. In weaning her, we thought that since she was making these

movements or attempts that it might be helpful to measure her Edi, which would give us a chance to gauge her level of support so much more closely than any other conventional means of monitoring. While she was on the oscillator, we noted that she was making attempts to breathe, and her Edi was in the 70-75-78 μV range. She clearly wanted to breathe, but did not have the diaphragmatic muscle power to do that. From this first patient, it has been actually quite useful to think of Edi monitoring in this perspective, of diaphragmatic monitoring, even in conventional modes. We also had a patient who we suspected might have a primary neurological insult, such as a brain stem injury, and we placed an Edi catheter to see if she actually had any activity from her phrenic nerve, or was making respiratory effort. Interestingly, her activity was minimal; her Edi

Ppeak was only about 2 μV which again caused us to believe that her breathing center was impaired. We have also had the usual type of patients where we wanted to see if NAVA could improve their ventilator dyssynchrony and Edi monitoring gives us the possibility to see the diaphragm activity and synchrony in conventional modes and in NAVA.

What is the average time on NAVA?

From our experience in hard to wean patients so far, it is difficult to say. I would say that we will trial it in the category of difficult to wean patients in 2 or 3 days to see if it will make a difference. If it is making a difference, we will carry on until we must change the Edi catheter. We then switch them briefly back to the equivalent Pressure Support mode, to see how their NAVA values are corresponding with that.

Does the team do a follow-up or review of the progress of each NAVA patient case?

Certainly, we are fortunate to have a tight knit consultant group. We discuss the individual management of all patients here on a regular basis. On top of this we consult each other in regard to NAVA. If there are consultants with less NAVA experience, but they see a patient that they think might benefit, they usually discuss together with other colleagues that have more experience, prior to placing the Edi catheter. There is a lot of positive feedback in general on the unit. We are quite unified in all things we do, which is great for a new therapy, it means that the enthusiasm is there all the time, we are quite lucky that way.

What in your opinion are the specific elements or factors needed in order to implement NAVA on a routine basis? What is most important to think about when implementing NAVA?

You've got to be enthusiastic about it. I think it is helpful to be someone who is interested in the concept, and what it may potentially provide, not necessarily what it is giving at the present. I think

people still are not clear on that, in our department we are really interested to see how NAVA will help us in the area of sedation and sedation-related issues. We think that in giving sedation breaks and spontaneous breathing trials, that maybe the Edi will help us to gauge the depth of sedation used in the unit. And Edi monitoring is fairly non-invasive; a nasogastric tube usually goes down anyway, so we believe that the additional information provided by Edi will hopefully decrease ventilator time, decrease length of stay, and decrease costs, which can only be a good thing. We do not know yet how NAVA or Edi monitoring will deliver on these variables, but I think one must have the enthusiasm to realize this is a new novel way of getting to the heart of what is controlling the respiratory cycle. I think, to improve patient synchrony and perhaps avoid sedation or deep sedation to do that, can only be positive. If you believe in the concept, then that is all you have to do, and be keen to learn about it and teach others as you go.

We have a busy unit, with a lot of ventilated cases, and we have probably the worst deprivation in Europe in this region, our co-morbidities are enormous; alcohol consumption, smoking, drug use, unemployment, poor housing, and poor diet. In the east end of Glasgow and Larnarkshire, we do have a population with a high rate of ischemic heart disease; male life expectancy is less than other regions in Europe. If NAVA and Edi monitoring can help us to improve these patient outcomes in any way in intensive care, it is good.

Do you think that this ICU will be expanding the use of NAVA in future?

Right now, we see the opportunity for NAVA in the hard to wean patient category. For complex cases, these are the NAVA candidates we see: long stayers, difficulty in weaning, medical patients with a number of different co-morbidities, which is where we find benefit at present. NAVA provides us with the next step for the patient to get them off the conventional ventilator. In terms of the oscillated patient, we think that NAVA was elementary to get her off the HFO and into weaning.

Which types of patient categories are you most interested in gaining more NAVA experience with, and why?

Acute brain injury, prolonged weaning, we used it in a high spinal cord injury, but that was at C5 and it gave a good signal without problems. I don't think we are thinking about new patient categories for NAVA, rather expanding the use to look at things like sedation levels. We are keen to use Edi monitoring to see what happens in patients that may have suffered brain stem infarct or edema. We did have one case of a patient where I wanted to know what the respiratory center was doing. Edi monitoring was

valuable to help us determine that this case was brain stem dead. We have used NAVA in the hard to wean patient category, however Edi monitoring provides opportunities in many different areas. The other monitoring opportunities we are interested in are depth of sedation, and sedation scoring. Titrating sedation by protocol with help of Edi monitoring and NAVA can have long term benefits, and avoiding delirium in patients can have long term benefits. Maybe the Edi might reflect another way of assisting the patient level of sedation, or avoiding diaphragm disuse atrophy, which may be related to sedation levels.



Dr Sanjeev Chohan, Consultant Anaesthetist, and Unit Sister Isabel Paterson

Biographies

Dr James Patrick Ruddy attended university at Edinburgh Medical School from 1986-1991, with distinctions in Obstetrics and Gynaecology and obtained the degree of M.B.Ch.B in 1991. His post-graduate degrees include FRCA in 2001, ALS, ATLS, and PALS: Provider in 2005. Dr Ruddy was awarded the Scottish Intensive Caer Society/West of Scotland Intensive Care Society Travelling Fellowship in 2005. He obtained dual C.C.T. in Intensive Care Medicine/Anaesthetics in 2006.

Dr Jim Ruddy is currently Secretary of the West of Scotland Intensive

Care Society and Lead Audit Consultant for Intensive Care Medicine Monklands Hospital together with the lead for Research. He is also Clinical Lead for Organ Transplantation in Lanarkshire. Dr Ruddy is also principle investigator for the "TRAPPHIC" study (Prophylactic Aciclovir in ICU) and has also recently been appointed Senior Clinical Lecturer in Intensive Care Medicine and Anaesthesia from the University of Glasgow.

Dr Ruddy is currently employed as Consultant in Intensive Care Medicine and Anaesthesia at Monklands Hospital, Airdrie, Scotland.