

Critical Care News

Implementation of a seamless solution for bedside quality ventilation therapy in critical care patient transports and MR

CRITICAL CARE NEWS is published by MAQUET Critical Care.
Maquet Critical Care AB
171 54 Solna, Sweden
Phone: +46 (0)8 730 73 00
www.maquet.com
©Maquet Critical Care 2009. All rights reserved.
Publisher: Fredrik Wetterhall
Editor-in-chief: Kris Rydholm Överby
Contributing editor: Judith Marichalar-Sundholm
Order No. MX-0554
Printed in Sweden
www.criticalcarenews.com
info@criticalcarenews.com

The views, opinions and assertions expressed in the interviews are strictly those of the interviewed and do not necessarily reflect or represent the views of Maquet Critical Care AB.

©Maquet Critical Care AB, 2009.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any other means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the copyright owner.

The following designations are registered or pending trademarks of MAQUET Critical Care AB: Servo-i®, Automode®, Open Lung Tool®, NAVA®



Return transfer of a 12 year old patient from the MRI to the PICU at Dartmouth-Hitchcock

Implementation of a seamless solution for bedside quality ventilation therapy in critical care patient transports and MR

The internationally renowned Dartmouth-Hitchcock Medical Center in New Hampshire in the United States is an academic medical center that has venerable roots stemming from Dartmouth Medical School, which was the fourth medical school founded in the United States in 1797.

The current state-of-the-art medical center facility was opened in 1991 as a 429 bed regional referral and teaching facility, including a trauma center and pediatric hospital. With 85 critical care patients throughout the facility, the Respiratory Care department faced challenges for in-hospital patient transports, including the MR environment – how to provide a solution for critical care patient transports without compromising ventilation therapy?

Critical Care News spoke with Scott Slogic, RRT, RCP, Director of Life Support, and Clinical Educator Matthew McNally, RRT to hear of the solutions to these challenges.

The fifty registered respiratory care therapists on staff at the Dartmouth-Hitchcock Medical center face daily challenges in caring for critical care patients in the adult medical CCU, surgical and trauma units, as well as a pediatric intensive care unit and a 30 bed level III intensive care nursery. The facility also offers a coronary referral center and CICU where patients arrive from over 28 hospitals within the region. With an average of 82 critical care patients from all categories – infant, pediatric and adult, the Respiratory Care Department were looking for an opportunity to standardize in 2002, without compromising quality in ventilation for their critical care patients.

A concept for standardizing ventilation therapy

Director of Life Support, Scott Slogic, RRT, RCP has been head of the Respiratory Care Department at Dartmouth Hitchcock for over twelve years. He describes the resources and activities within the Respiratory Care Department: “We have about 50 registered therapists, and we run typically 8-9 staff members per 12 hour shift. We have a clinical educator and an equipment manager, and transport therapists also, that are flight qualified that go on specific types of transports. We have two helicopters, and two ambulances, we do about 400 external transports per year. The majority of these are intra-hospital and planned transports, rather than trauma and emergency, although that may occur periodically. More frequently it is a matter of a hospital contacting us with a sick child that is referred over to our institution.”

“I have been working in this capacity in Respiratory Care for 12 years. Life Safety is a new concept, that of a virtual department that functions to improve patient safety throughout the organization. We have a Life-Safety Nursing Consult service, and these RNs are also part of the Rapid Response Team, termed HERT (Hitchcock Early Response Team). The nurses are part of the Life Safety Department, which is part of Respiratory Care. We have had great success at improving patient safety on non-critical care floors,



Scott Slogic, RRT, RCP is Director of Life Support at Dartmouth-Hitchcock for the past twelve years

reducing the number of intubations and codes on the floors with this Life Safety program, so we are thrilled with it. We started it three years ago.”

Scott Slogic and his co-workers identified a concept for standardizing from another industry that was applicable within his own department: “I believe in the Southwest Airlines model, with one standard aircraft, the Boeing 737. This means that every pilot, maintenance engineer, every crew member knows how to work on that plane. When there is an equipment change, they can substitute another and it is seamless. It is an engineering concept that many places have bought into. For use, we bought into the standardization of SERVO-i ventilator in 2002. It took a couple of years to phase in but we now have 50 SERVO-i ventilators. Everybody knows the ventilator and is familiar with it, physicians and nurses as well as the RT staff members.”

The educational effort

The standardized ventilator solution required an educational effort for respiratory therapy staff members to learn the new platform. Scott Slogic explains: “Education was seamless, we do a lot of ongoing education

with the SERVO –I. Every quarter we have educational series specifically about unique aspects of the ventilator: internal functioning, application of modes, but we continuously educate the staff on the ventilator. It is a fairly straightforward platform to use, with a few idiosyncrasies, such as inspiratory cycle off when to use it and how to tell if it is being used correctly. In future with NAVA, it probably won't be necessary. It was seamless for us. The universal application means we do everything between 500 gram babies and 300 pound adults. Because of its flexibility, the SERVO ventilator can be used for all patients.”

Patient transport challenges in the past

According to Clinical Educator Matt McNally, RRT, the technology limitations of solutions in the past would impact on patient care, requiring interruption of the circuit or the ventilation strategy. “We do upwards of 8 in-house transports per day, not including the times we transfer patients from the operating room to the ICU. In the past we would have used either an antiquated ventilator which required us to alter ventilator settings or oversedate the patient to help



Scott Slogic with some of his staff members

them tolerate the ventilator, or manual ventilation with a resuscitation bag.” Scott Slogic concurs: “We would use an old model of transport ventilator, which provided basic ventilation, but we obviously could not ventilate the more complex patients well with this device. We eventually modified a SERVO 300 ventilator by putting batteries underneath it and adding tanks, but that was a big platform and very unwieldy. For MRI, many may remember that there was an article published in *Respiratory Care* about how to modify the SERVO 900C for use in MRI in order to do MRI ventilation. We did that and it worked out pretty well, but the problem is that it is a 30 year old platform that my staff had to convert the patient to in the MRI and many of the younger staff members were not familiar with it. To be honest, we had two of them that got too close, even if they were modified. Before that, we were using basic pneumatic ventilator, but it was very clear that there were patients that needed MRI that we simply could not accommodate properly. The settings would not be appropriate; we needed to ventilate them in the MRI environment just like we

ventilated them in the critical care unit.”

The new solution – continuity of care in ventilation, even to the MRI

One of the advantages of standardizing to the SERVO-i ventilator was the ability to transport patients within the facility. The ability to provide uninterrupted ventilation to all patients is paramount, and continuity of care is the key objective according to Scott Slogic and Matt McNally, who explains: “This feature has enabled us to provide uninterrupted ventilation to some of the sickest and most fragile patients in the hospital. We use the SERVO-i to transport patients to and from diagnostic studies and interventions including CAT scan, MRI, X-ray, angiography and the cardiac catheterization lab.”

The new solution also provides some clinical advantages in patient transports, according to Matt McNally: “We are often requested by anesthesia providers in the operating room to assist with patients who are difficult to ventilate. In this case, we are able to bring the SERVO-i,

stabilize the patient, and then transfer to the ICU without interrupting the circuit or ventilation strategy. The trauma room is another place where we employ these ventilators. When a trauma is admitted, they are placed on the SERVO-i and ventilation is not interrupted from the initial application in the trauma bay, to the CAT scanner, then on to the ICU. Finally, one of our most crucial applications is in the neonatal resuscitation room. Recent literature supports the use of a resuscitation system with the ability to closely monitor and titrate ventilator settings which may result in better outcomes regarding broncho-pulmonary dysplasia and chronic lung disease. By using the SERVO-i, we feel that we can deliver consistent care from the delivery room to the NICU without interruption.”

The new solution was also made to be compatible for the 5 MRI suites at Dartmouth-Hitchcock Medical Center. Scott Slogic describes the implementation: “When we found out that an MR-compatible SERVO-i was available, it just made sense to us since there would be no interruption in ventilation, other than to transition them over to the MRI ventilator, and even then we learned. In the beginning, we thought that the SERVO MR compatible ventilators should be kept in the MRI department, and that we would transition the patient down there. That procedure actually changed very quickly after only a month or two. Now, we transition the patient right in the critical care unit to the MRI compatible ventilator, which makes for a seamless transport down to the MRI department. The MR compatible SERVO unit is used several times each day, and is used on all sizes of patients, from infant and pediatrics to adults, and some larger adult patients. We do have MRI capabilities for larger patients. For a typical MR transport procedure there is one respiratory therapist, one critical care nurse and two orderlies that accompany the patient.”

Scott Slogic also explained some of the clinical advantages that the new solution provides in MR transport situations: “With our particular procedure with the SERVO-i, we transition the patient at the bedside in the critical care unit to the exact same settings on the MR



The MR compatible SERVO-i ventilator is used in up to 8 transports a day at Dartmouth-Hitchcock Medical Center

compatible vent and monitor them for a while to make sure that they are stable. Even if they are transferred to the same settings there is the possibility of in some cases with larger settings to lose some lung volume very briefly, which should be recruited back up again. The transition down to the MRI unit is seamless after that. As we disconnect and reconnect, we might do a breath-hold and pinch the endotracheal tube in a breath-hold maneuver and reconnect so they don't lose lung volume. We don't know if that has an outcome effect, but it is a brief moment in time. We do know from lung modeling that a breath or two off of significant amounts of PEEP can mean lost amounts of lung volume. In a really sick patient it does not take long to lose volumes, which is why we transition them at bedside in the critical care unit, and monitor them before we go down to the MRI suite."

Future innovations in the Dartmouth-Hitchcock Respiratory Care Department

In terms of ventilatory strategies at the present time, ARDSnet guidelines are used for patients who qualify for ARDS, according to Scott Slogic. "For non-ARDS patients we ventilate usually in Pressure Support, and some level of PEEP that is appropriate for their FiO_2 requirements,

somewhere between 5 and 10 cm H_2O of PEEP. We analyze graphics to determine if they need reduced inspiratory times, or have air trapping. The vast majority of our adult patients are in Pressure Support, for our infant patients we use SIMV with Pressure Control for the most part, pediatrics are a mix of Pressure Control and Volume Control, depending on their condition."

"In future, we are pretty excited about starting up Neurally Adjusted Ventilatory Assist, or NAVA. We have only used Edi monitoring on one patient so far, but we are going through the process of the educational model with the physicians, step by step. We used it on an infant that was asynchronous, to see if the asynchrony was real or not, and it was. It was more a matter of using the Edi signals diagnostically rather than running the NAVA ventilation mode, but we are really excited about it. Dr Christer Sinderby was here last year and spoke about NAVA, when we heard about this concept, which is truly new in mechanical ventilation for us. Mechanical ventilation has been kind of the same for the last decades, with maybe some variations on the theme from a pneumatic perspective. In terms of mechanical ventilation, neural ventilation is truly unique. We don't know if it will change outcomes, but we believe it has the potential to do so." ■

Biographies

Scott Slogic, RRT, received his certification in Cardiopulmonary Science at Parkland College, followed by his Bachelor of Science degrees in Respiratory Therapy and Business Administration at St Petersburg College in Florida.

Scott Slogic has worked within Respiratory therapy at St Josephs Medical Center in Bloomington, Illinois and at the Bayfront Medical & Trauma Center in St Petersburg, Florida. He joined the Dartmouth-Hitchcock Medical Center in New Hampshire as Staff RCP in 1990, and was named Director of Respiratory Care in 1996 as well as Director of Life Safety in 2006. Scott Slogic has published a number of scientific studies in peer-reviewed critical care publications.

Matt McNally, RRT received his Bachelor of Science degree in Respiratory Care from Quinnipiac University in Hamden Connecticut, and worked as Staff Respiratory Therapist at Connecticut Children's Medical Center from 1998-199, and was employed as Respiratory Therapist Traveler with Cross Country TravCorps from 1999-2001.

Matthew McNally was employed by Dartmouth-Hitchcock Medical Center in Lebanon, New Hampshire as Transport Respiratory Therapist in 2002 and worked in that capacity until 2008, when he received his current position as Clinical Educator, Respiratory Care.



The Dartmouth-Hitchcock Medical Center in New Hampshire, US