ICU implementation and clinical application of non-invasive ventilation protocols
The very first intensive care unit in Brazil was opened at Hospital Sirio-Libanes in 1971. The principles of humanism, pioneering and excellence are still prevalent in the current ICU environment of 22 beds, scheduled to expand to forty beds in the next year. For many years, the ICU at Sirio-Libanes has focused on less invasive and more patient friendly therapies, and this unit is internationally recognized as a center of excellence.

Critical Care News spoke with Guilherme Schettino, MD, PhD, Director of the ICU at Sirio-Libanes, São Paulo, Brazil, regarding their utilization of non-invasive ventilation and weaning protocols on a routine basis.
As an internationally-known profile in research and on the lecture circuit, could you tell us briefly about your background?

I have been working in critical care medicine for the last 15 years as a pneumologist and intensivist, and I have published some studies on mechanical ventilation. I also work together with Carlos Carvalho and Marcelo Amato at Hospital das Clinicas at Sao Paulo University where I did my PhD thesis on mechanical ventilation. I also conducted some research on non-invasive ventilation. When I returned to Brazil, I assumed the position of ICU Director here at Hospital Sirio-Libanes.

Can you describe your current ICU operations and capacity?

Yes, we are operating with two adult medical-surgical ICUs, one on the first floor with 12 beds, and the other one on the eighth floor with an additional 10 beds. We also have an intermediate care unit with 24 beds for adult patients, where we do a lot of non-invasive ventilation and invasive ventilation for chronically ventilated patients with tracheostomies.

We are now completing a project for a new ICU with forty beds to consolidate the ICU operations. It will be quite large, but we are expanding the hospital and need more beds for critically ill patients. I think it will be up and operating in the beginning of 2008.

When did you start utilizing non-invasive ventilation therapy?

I used non-invasive ventilation for the first time more than 14 years ago at Hospital das Clinicas, after reading the Meduri’s paper on non-invasive ventilation for COPD patients. We started by using an ICU ventilator with a mask. I think we were the first group to start using non-invasive ventilation here in Brazil.

Was there a particular patient category at that time?

At that time it was patients with COPD exacerbations. We were using ICU ventilators with Pressure Control and a mask to deliver non-invasive ventilation. Since that time, non-invasive as a ventilation therapy has changed a lot, with different interfaces and different ventilators that are more tailored for non-invasive treatment, with leakage compensation, and so on.

Currently, when we use non-invasive ventilation, we use either BIPAP machines or ICU ventilators that have software to compensate leakage, such as SERVO-i.

You mentioned that you are using masks, have you had experience of the helmet in non-invasive ventilation?

I received a few helmets from Paolo Pelosi in Italy, so I have used the helmet a few times, and it worked well. I think however, that the helmet works better on patients who need non-invasive ventilation for a short period of time, for instance patients with cardiogenic pulmonary edema. The cost of the helmets is a factor here in Brazil.

You started out by gaining experience of non-invasive ventilation with COPD patients, which patient categories do you use non-invasive ventilation most frequently on today?

Now I think we are using non-invasive in almost all COPD patients in the ICU. I really think the best way to take care of patients with COPD exacerbation is to use non-invasive very early in the treatment. We also use non-invasive ventilation in most patients with
cardiogenic pulmonary edema and in patients weaning from invasive ventilation, and also in patients with hypoxemic respiratory failure. In patients with COPD exacerbation or patients with cardiopulmonary edema, we use non-invasive in the emergency room or in the step down unit, but for patients with hypoxemic respiratory failure, we only use non-invasive here in the ICU, since we have all the facilities for monitoring and intubating the patient, if necessary. All of the ICU staff members are trained in non-invasive ventilation, and we have a good team of nurses and physiotherapists. Our situation here differs a bit from the United States, where they have respiratory therapists; here in Brazil it is similar to Europe in that we have no respiratory therapists but a team consisting of physical therapists, and nurses specialized on respiratory support and mechanical ventilation, working closely together with physicians.

We are using a lot of partial facial masks, and total face masks. But I am waiting for the helmet to become commercially available in Brazil, which I think will be useful for patients with cardiogenic pulmonary edema and some patients with post-operative respiratory failure, because most of these patients are using nasogastric tubes, and it may be easier to provide non-invasive ventilation with a helmet than a mask in these patients.

**What is your ratio of patients, roughly, in terms of invasive and non-invasive?**

I think that for patients with respiratory failure in the step down unit, most of them use non-invasive ventilation. Here in the ICU I have at least three to four patients using non-invasive ventilation each day, which means roughly 25-30% of patients in the ICU receive non-invasive, or at least we try to administer it before intubation. This has grown in recent years. We have now 12 BIPAP ventilators at Sirio-Libanes, and sometimes all twelve are in use.

![Dr Guilherme Schettino.](image)

We talked about CPAP for patients with lung edema and non-invasive ventilation may be controversial in this setting. Could you tell us more about your use of non-invasive ventilation in patients with cardiogenic pulmonary edema?

We use non-invasive ventilation in patients with cardiogenic pulmonary edema, and one question posed in the medical research is which mode is best to treat these patients; CPAP, BIPAP, Pressure Support and PEEP? I think that for most patients if you use CPAP, it is okay to treat cardiogenic pulmonary edema. But for some patients, especially those with hypercapnia, I think it is better to use BIPAP or Pressure Support with PEEP to increase the alveolar ventilation. In a paper that was published some years ago, there was a report of a few patients with myocardial infarction treated with BIPAP, which was subsequently followed by a lot of papers published to show that BIPAP or Pressure Support with PEEP is safe in this patient category. There was a meta-analysis in JAMA 2006 showing that you can use both modes; both are safe and work similarly. One very nice study that has been published about using non-invasive ventilation for patients with cardiogenic pulmonary edema; comparing BIPAP with CPAP, was done by a Brazilian colleague named Marcel Parker at Hospital Clinicas a few years ago and published in Critical Care Medicine.

When you encounter a patient in any category with leakage problems, how do you address this situation?

I think that the first action is to try to adjust the mask and avoid leakage. But this may be difficult at times, and if you have to use high pressures, you can change the face mask to a total face mask that will work better with high pressures. If you use a non-invasive ventilator, like the BIPAP, it works very well even in the presence of high leakage. Non-invasive ventilation with SERVO-i with leakage compensation works also very well in these situations. You can also adjust the cycling off criteria for Pressure Support that is good in non-invasive ventilation. If you are using an ICU ventilator where you cannot adjust the cycling off criteria for Pressure Support, then one option is to change the mode to Pressure Control—which works well and is an alternative—but in this case it is not so comfortable for the patient.

Since facial morphology can differ from one patient to another, this must be a challenge?

Yes—it is always a challenge for the patient interfaces—sometimes we need to try a number of different masks and
adjust them in a variety of different ways on different patients. It is an individual process in each patient.

**Can you tell us more about using non-invasive ventilation as a step in the weaning process?**

Yes, we use it in the step down unit, but also in the ICU, as a method for weaning. We developed a very nice weaning protocol for patients who we believe are at high risk to develop post-extubation respiratory failure. For that group of patients, immediately after extubation, even if the patient is ok, I use non-invasive ventilation for 4-6 hours. Patients receiving non-invasive ventilation after extubation include patients with COPD, all patients with cardiological problems, and patients that have been invasively ventilated more than 4 days, as well as patients who failed spontaneous breathing trials the day before. Our team utilizes the protocols every day: the physical therapists check for criteria for weaning against the protocol, and the therapists and nurses follow the protocol. We use non-invasive ventilation to avoid reintubation, whenever possible.

**There seems to be a trend in some countries, where non-invasive ventilation is not recommended in patients with gastric problems?**

In my opinion, non-invasive ventilation is contra-indicated in patients with esophageal surgery. For patients with gastric surgery, we do use non-invasive ventilation in some cases. I discuss the case with the surgeon, and we decide together if the patient is a good candidate for non-invasive. Some obesity patients having gastric surgery receive non-invasive ventilation before the surgery, because of issues like sleep apnea. There are some papers published in the literature saying it is safe to use non-invasive ventilation in this category, and I think that this patient category benefits from the use of non-invasive ventilation, to avoid post-op atelectasis. But again, with patients with esophageal surgery, non-invasive ventilation is contra-indicated in my opinion. Non-invasive ventilation is obviously also contra-indicated in patients with gastric distention, or vomiting.

**In regards to ICU colleagues around the world who are considering implementing non-invasive ventilation, what are your most important recommendations in starting up?**

I think that first you have to train your team in non-invasive ventilation. Just like
other interventions in the ICU, you need to train the physicians, nurses, physical therapists or respiratory therapists. I think that one good recommendation is to develop your own protocol for using non-invasive ventilation. It makes it easier to utilize in terms of patient categories and situations, based on literature and local experience. Define clearly what kind of contra-indications should be made for non-invasive ventilation. You can use non-invasive in a lot of patients with respiratory failure, but define the conditions that are not safe for the patients, like patients with shock, in patients with esophageal surgery or gastric distention. Together with the team, define the criteria for failure of non-invasive ventilation: when you would need to intubate the patient, to avoid using non-invasive ventilation for too long and needing to intubate in a worsening clinical situation. In my opinion, if the patient condition does not improve in the first two hours of non-invasive ventilation, I think it is better to intubate.

Are there any research developments that you see that might have an impact on non-invasive therapy in future?

I believe that NAVA (Neurally Adjusted Ventilatory Assist) will play a significant role in non-invasive ventilation, where you can solve the problems of synchrony, leakage and patient comfort.
Biography

Guilherme Schettino, MD, PhD is Director of Intensive Care at Hospital Sirio-Libanes, Sao Paulo, Brazil, as well as a staff member of the Respiratory ICU at Hospital das Clinicas in Sao Paulo.

He obtained his medical degree at the Universidade Federal do Rio de Janeiro in 1988, and was resident at the Faculdade de Medicina da Universidade de Sao Paulo where he received his degrees in Pneumology and Intensive Care in 1992. He attained the degree of PhD at the Faculdade de Medicina da Universidade de Sao Paulo in 1998, and completed his Research Fellowship at Massachusetts General Hospital, Harvard Medical School in Boston 2002.

Guilherme Schettino, MD, PhD is an internationally-known profile who has lectured at many international meetings and congresses, and has conducted research for many years within the areas of mechanical ventilation and non-invasive ventilation.

References


