

# ARDS Ventilation, The Man Behind the Evolution

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Professor Luciano Gattinoni (1945–2024)

In 1967, when Ashbaugh et al. published their paper on acute respiratory distress syndrome (ARDS), the real interest in this syndromic entity began.<sup>1</sup> The components of this syndrome, were regarded as the “definition,” and positive end expiratory pressure (PEEP) was offered as the attempt at treatment. It has now been nearly 60 years, and in 2025, ARDS management will have evolved significantly since the time the concept was introduced. The main credit for the evolution of the management of ARDS is to the evolution of understanding of the underlying pathophysiology behind ARDS. Initially the pathology was believed to be predominantly alveolar and interstitial oedema, atelectasis, heavy lungs and thus significant loss of compliance, along with histopathologic features termed diffuse alveolar damage (DAD).<sup>2</sup>

Radiological appearance of diffuse pulmonary infiltrates in the initial description of Ashbaugh et al., was suggestive of homogenous pathology.<sup>1</sup> Our understanding of the pathophysiology really took a significant step when the use of computerized tomographic (CT) scan studies on the ARDS lung were demonstrated by Gattinoni et al.<sup>3</sup> The demonstration of heterogeneous nature of the disease, with collapsed and consolidated areas mainly in the dependent zones and small, relatively normal areas in the non-dependent zones was a path breaking one. It opened the vistas for the concepts of baby lung, ventilator induced lung injury and lung protective and gentle ventilation for patients of ARDS.<sup>4</sup>

All these are the basics which we have been following as the backbone of ventilator strategies for patients of ARDS over the last 2–3 decades. The demonstration of low tidal volume ventilation reducing the mortality, published in 2000, has continued to be a

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major recommendation in the guidelines for ventilation of ARDS.<sup>5,6</sup> For this understanding of the concepts, demonstration of its proof and converting it to a strategy at the bedside to save lives, we therefore owe a lot of credit to one scientist in particular, i.e. Prof Luciano Gattinoni.

Prof Gattinoni has been an extra ordinarily brilliant scientist in this field. A person with the highest intelligence, his journey in the field of critical care started with his training in NIH, USA in 1975–1978. He studied the concepts of extra corporeal membrane oxygenation (ECMO) and PEEP during his tenure there and contributed his thoughts.<sup>7</sup>

After his return to Milan, his home, he began his extra ordinary journey into the mechanisms of ARDS. For that generation of ours, just entering in the fascinatingly challenging field of critical care in general and mechanical ventilation in particular, ARDS was the biggest intellectual challenge. He embraced that and went after his passion.

In those early years of intensive care, a vibrant European community of young clinicians and researchers helped shape the discipline’s foundations. Among them there was a group particularly interested in respiratory pathophysiology, represented among others by Antonio Artigas, Hilmar Burchardi, Konrad Falke, Göran Hedenstierna, Maurice Lamy, François Lemaire, Peter Suter, Keith Sykes and Adrian Versprille. These pioneers exchanged ideas, data, and findings even before formal publication.<sup>8</sup> Prof Gattinoni’s journey began with conceptualizing certain ideas, checking them out, confirming or refuting them on animal model studies in the lab and then bringing these into bedside concepts, with appropriate studies on patients.

His contribution to mechanical ventilation was completely original. The analysis of CT images to generate the baby lung concept was as brilliant. His understanding of the physiological processes, be it blood gas or fluids or pulmonary physiology, was outstanding, but what was unique was to apply it to critically ill patients to revolutionize the treatment.

During this journey of understanding, he conceptualized and studied recruitment of lungs, and also the relatively normal non-dependent zones of the lung. From these originated the concept of prone position ventilation. With the publication of his Initial study on prone position, he was disappointed.<sup>9</sup> However, he had firm belief in his physiological concept. He would say,

*“Evidence is the final step of a long journey. Lack of evidence of any promising and physiologically sound approach should not discourage us from its application in the given single patient”*

He believed that the results of this trial, which showed oxygenation benefits but no survival benefits were due to a methodological imperfection. The duration of prone position ventilation was inadequate (7 hours in this study) and he wanted future studies to correct that. When that was corrected (to 17 hours), in the PROSEVA study, the survival benefits could be demonstrated, confirming his belief.<sup>10,11</sup>

He dwelled in ECMO, extra corporeal CO<sub>2</sub> removal (ECCO2R), Power of mechanical ventilation as a concept, and definition and management of ARDS due to COVID, among other topics.<sup>12,13</sup> He devised equations for calculating power and helped colleagues to test the importance of measurement of power. Newer ventilators have incorporated these in the monitoring modalities. This is a testament to his skill, singular devotion, perseverance, and passion in bringing the concepts to the bedside through a rigorous scientific journey of evidence.

He also questioned the over dependence on evidence and guidelines, emphasizing the needs for personalization of ventilation and pinpointing the extent of “expert opinion” overriding evidence, He also challenged us to question the utility of meta-analyses and the weight of expert opinion.<sup>14,15</sup>

Beyond his contributions to the science, he had equal passion for art, music and literature. He had formed his own quartet in music and loved playing his piano to perfection. In 1961, he co-founded the vocal quartet, performing over 1,000 concerts and produced 20 LPs, CDs and videos.

He could quote Greek and Latin authors in their original language. He was a great human being full of warmth, humaneness and wisdom. He held his positions as president of SIAARTI, ESICM, and WFSICCM with aplomb and distinction, inspiring loyalty and collaboration.

In the recent passing away of Prof Gattinoni this month, the Intensive care world has lost a true giant. His life was a true symphony of absolute brilliance, passion and unwavering commitment to saving lives. He will live on as a constant source of inspiration and a true role model.

Rest in peace, Luciano. Arrivederci, my friend.

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