



# WINN FELINE FOUNDATION

For the Health and Well-being of All Cats

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## Acute Respiratory Distress Syndrome and Acute Lung Injury in Cats

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The development of lung disease is a serious issue in any species. Inability to properly oxygenate tissues leads to severe physical and mental distress and is often fatal if not dealt with quickly. In cats presenting to veterinarians in states of respiratory distress, common findings include heart failure, asthma, pneumonia, bronchitis, or cancers. Acute Respiratory Distress Syndrome (ARDS) is a less commonly diagnosed cause of respiratory difficulty; however it is increasingly recognized as a significant component of disease in critically ill cats.

ARDS is the clinical manifestation of Acute Lung Injury (ALI). This disease is characterized by the rapid development of fluid and cellular material within the lungs of animals with normal heart function. Causes of ARDS may be pulmonary (within the lungs, such as inhalation of vomit or caustic substances) or more commonly non-pulmonary (characteristically sepsis, but may also include other causes of systemic inflammatory response syndrome (SIRS)). Typically in animals with sepsis/SIRS, clinicians are concerned with the development of sudden damage to the kidneys, heart, and even GI tract. It is crucial that veterinarians (especially those in an emergency or critical care setting) recognize the lungs are a major “shock organ”, especially in cats. This disease has also been recognized in dogs and horses (especially foals).

Various human and veterinary criteria exist for the defining and characterization of ARDS/ALI. These schemes are beyond the scope of this article, but generally involve a combination of a known risk factor, inefficient gas exchange, diffuse lung inflammation, and fluid leakage from pulmonary capillaries (small blood vessels). Underlying causes of this syndrome involve the release of inflammatory chemicals called cytokines, the presence of bacteria and bacterial components in the blood stream, and direct damage to the cells of the lung. Once ALI occurs, the lung undergoes a vicious cycle where lack of surfactant production, intra-pulmonary shunting, and fluid buildup precipitates further inflammation, worsening clinical signs.

There is very little published data on ALI/ARDS in small animals species, and even less in cats specifically. Much of what we know is extrapolated from human data. It is, however, widely accepted that survival rates for small animals with ALI/ARDS are very poor, even in ICU settings with aggressive support. The first paper describing ALI in a cat was published in 2013, with sporadic anecdotal reports before this.

One report in particular described the clinical course of disease in cats with ARDS (Sauve et. al). These authors identified 65 cats with post-mortem evidence of ALI and retrospectively evaluated their medical history. Cats often had high respiratory rates and low heart rates on presentation. Cats were generally middle aged with normal white blood cell counts. Duration of disease was short, a median of only 4 days; with respiratory distress only occurring for a median of 1 day. Most cats were affected with either SIRS or sepsis, and most had respiratory difficulty at presentation, with the remainder developing lung disease over the course of hospitalization.

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In humans, ARDS occurs in three phases; an acute exudative phase; a delayed proliferative phase, and a final fibrotic phase. Whether these distinctions exist in canine and feline medicine remains to be seen. Most patients encountered in veterinary medicine would be encountered in the first or rarely second phase, with few surviving to develop longer term issues.

Therapy for ARDS is difficult and often unrewarding. There are no specific medications used in managing ARDS/ALI, and so supportive care is essential. Treatment of the underlying condition is the most important aspect of resolving ARDS, as without removal of the initial insult ALI may be ongoing. Diagnosis and treatment of intra-pulmonary causes of ALI may be more challenging than extra-pulmonary causes. Management of SIRS and sepsis by standard protocols is essential, keeping in mind that care must be taken with fluid therapy. Both early goal-directed (ie Rivers-like) and alternative therapies have been described in veterinary medicine for the treatment of septic patients.

Pulmonary support in ARDS patients often involves ventilator use. This is more readily available in humans than veterinary species, and often more available in dogs than cats. A discussion of ventilator settings and strategies is again, beyond the scope of this article. In feline medicine, non-invasive ventilator strategies such as cage or nasal prong oxygen delivery are often required. If ventilator support is used, care must be taken to avoid oxygen toxicity and barotrauma (physical damage to the lung tissue by high air pressures). Low tidal volumes are often used in ARDS patients.

Medical therapies other than treatment of the underlying cause and respiratory support have been unrewarding. Corticosteroids, NSAIDs, adrenergic agonists (inhaled or systemic), and synthetic surfactants have all been unrewarding in human medicine. Fluid therapy should be conservative to avoid increases in pulmonary pressure. While pulmonary artery catheters are often impractical in cats, central venous lines should be strongly considered for both monitoring and drug delivery.

The use of diuretics in ARDS (or in any case of non-cardiogenic pulmonary edema) remains controversial. In hemodynamically unstable patients, furosemide and other diuretics are contraindicated; however, in stable patients this is less clear. The utility of a diuretic in animals with damaged or “leaky” blood vessels is debatable. In hemodynamically stable animals a furosemide CRI has been advocated by some, however the literature does not support this.

Some human data supports the use of neuromuscular blocking agents (paralytics) to facilitate ventilator use, and suggest that they may have some effect on improving survival rates. There have been no feline studies investigating this.

ARDS patients are true ICU cases, and referral to a specialty center with the ability to perform advanced care such as ventilator support, placement of central venous catheters, and 24h intensive monitoring would be strongly recommended. Cats in critical situations of suffering from major illness who develop or present with respiratory distress should be considered to potentially have acute lung injury and treated as such.

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As therapy is generally difficult, prevention of ALI is crucial. This necessitates early and aggressive therapy for cats in sepsis and SIRS, prior to the development of ARDS. Judicious fluid therapy is crucial, as is careful observation for early signs of respiratory distress. The development of novel medical and pharmaceutical strategies in all species is a crucial step in the treatment of ARDS/ALI. Educating veterinarians on the recognition and appropriate therapy of this frustrating condition is the first step in its management.

## References:

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Goggs R. Acute Lung Injury. *International Veterinary Emergency and Critical Care Symposium*. 2015  
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## See Also:

SIRS and sepsis in feline patients

<http://www.winnfelinefoundation.org/education/cat-health-news-blog/details/cat-health-news-from-the-winn-feline-foundation/2016/07/26/sirs-and-sepsis-in-feline-patients>

Systemic Inflammatory Response Syndrome in Cats

<http://www.winnfelinefoundation.org/education/cat-health-news-blog/details/cat-health-news-from-the-winn-feline-foundation/2011/10/26/systemic-inflammatory-response-syndrome-in-cats>

## Keywords:

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