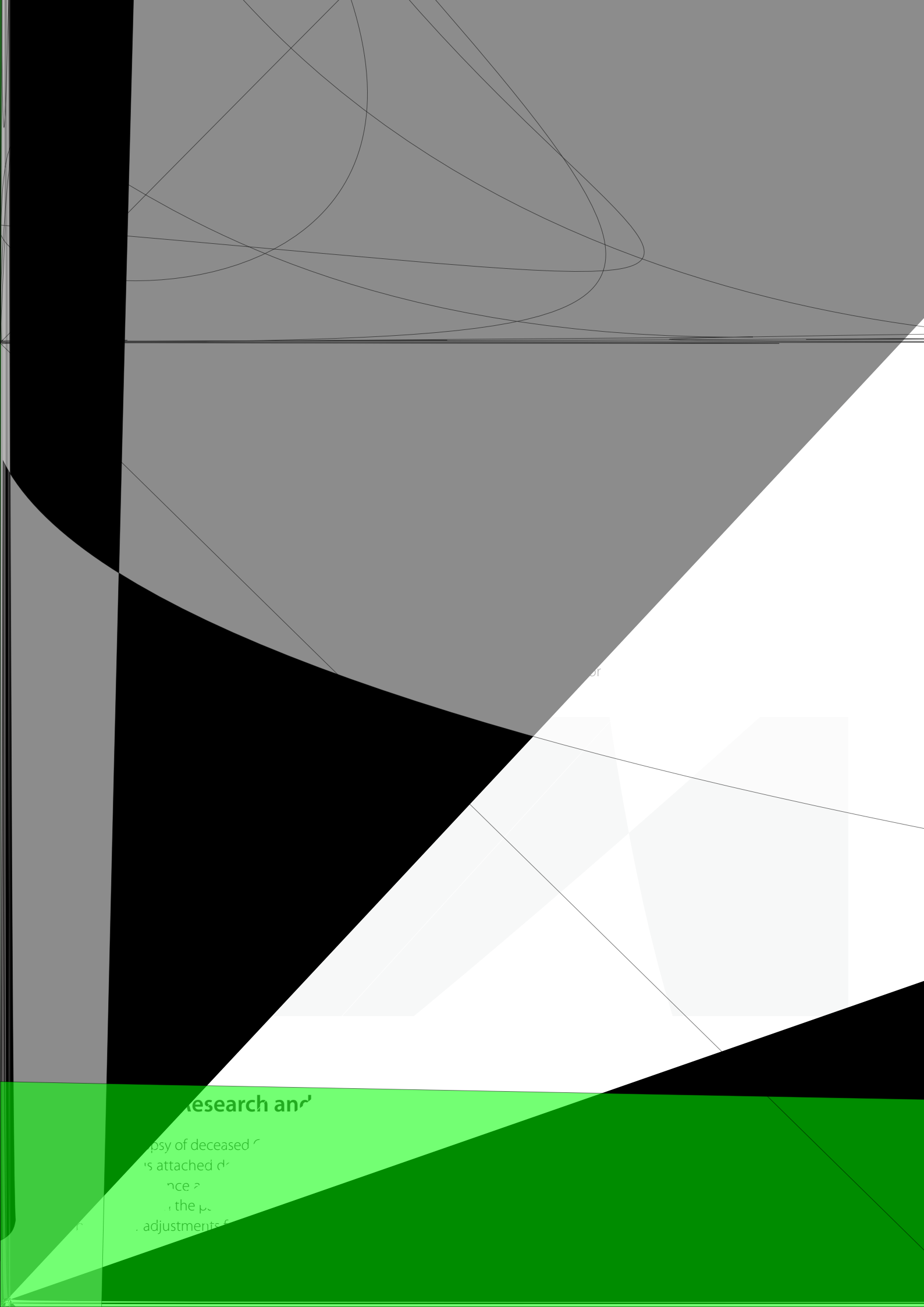
Re ia

d- i g

f



When gas passes through the artificial airway and the

During invasive mechanical ventilation, P_a is the peak pressure (P_{eak}) provided by the ventilator, and P_a can be provided with measurement of plateau pressure (P_a) by inspiratory hold.

$$P_1 = P_a - P_a = P_{eak} - P_a = F \quad Re\,i\_a\,ce$$

$$Re\,i\_a\,ce = (P_{eak} - P_a) / F$$

Measurement technique for P_a:

1. Under Volume Control Ventilation mode, ensure patient have weak or do not have spontaneous breath
2. Square flow (constant flow)
3. Inspiratory pause/hold for at least 3s

C ia ce

The compliance of the respiratory system mainly reflects the elastic resistance. The compliance refers to the volume change produced by a unit of pressure. During invasive ventilation, when the patient do not have spontaneous breath, the tidal volume (Vt) generated by the driving pressure (DP) can indicate the compliance of the patient's respiratory system.

$$D\,i\,i\,g\,P\,e \cdot e = P_a\text{-}PEEP$$

Therefore, $C\ ia\ ce = V\_/DP \quad V\_/(P_a - PEEP\_a)$

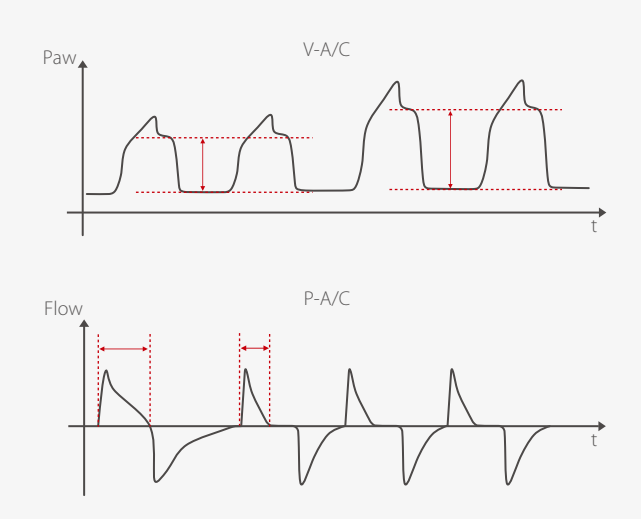
Generally speaking, DP > 12 cmH_2O may increase the risk of lung injury and mortality. Pplat generally≤30cmH_2O is used as a protective lung strategy [4,5]. It should also be noted when calculated compliance of the respiratory system, the PEEP in the formula is not the ventilator setting, but the $PEEP\_a$ (end-expiratory alveolar pressure)

Measurement technique for PEEP$_{ta}$:

1. Under weak or no spontaneous breathing
2. Expiration pause/hold for at least 2-3s
3. If there is no air trapping, PEEP$_{ta}$ = PEEP

For healthy adult, the compliance of the respiratory system is approximately 100ml/cmH_2O, and the value of patients under mechanical ventilation will be lower, usually around 60ml/cmH_2O. When the patient's compliance is reduced, it means that there are restrictive factors within the lungs, such as pulmonary edema, atelectasis, pulmonary consolidation, chest wall disease, pleural effusion, pneumothorax, etc. Decrease in respiratory compliance would often show waveforms like as the following.

During the V-A/C mode, when the compliance decreases, the ventilator's pressure-time curve shows an increase in peak pressure and P$_{ta}$-PEEP increases. During P-A/C mode, when the compliance decreases, the ventilator flow-time curve shows a reduction in the effective inspiratory time and therefore a reduction in tidal volume.



C c· i

What have been discussed above are typical ways of measuring airway resistance and compliance in clinical setting. The measurement requirements are more precise, and the patient's condition can be analyzed according to the change of respiratory mechanics. The SV600 and SV800 ventilator's Pulmosight can intuitively display patient's lungs based on changes in pressure, flow, and volume, so that the patient's respiratory mechanics can be monitored with real-time feedback. This allows clinicians to quickly detect changes patient's lung status and respond accordingly to conditions such as increases/decrease resistance, increase/-decrease compliance, hyperventilation/hypoventilation, and if the patient shows spontaneous breathing.

PulmoSight in the Mindray SV Series ventilators can closely monitor the changes of respiratory mechanics and display the data in a real-time, graphic way.

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