Respiratory variation of arterial line waveforms

In a spontaneously breathing patient, it is normal to observe a downward displacement of the arterial pressure baseline with each inspiration. This phenomenon is exaggerated in patients with cardiac tamponade or restrictive pericarditis.

In a mechanically ventilated patient, it is normal to observe a decrease in arterial pressure baseline, systolic blood pressure and mean arterial pressure. This phenomenon is exaggerated in patients who are hypovolemic, as it is the influence of the tug-of-war between positive pressure of the ventilator and the diastolic pressure of the venous system. It’s a fight: PEEP vs central venous pressure.

If the PEEP wins, the right heart doesn’t fill enough, consequently the left heart doesn’t fill enough, and the stroke volume is decreased as per the Frank-Starling mechanism.

If the patient has low central venous pressure (eg. dehydrated or hemorrhaging), PEEP wins more often.

Of course all of this goes out the window if the ventricles are abnormal, eg. in LV dysfunction- then, the positive pressure might actually INCREASE the stroke volume, because it augments the transmural pressure of the barely coping ventricle, and assist in ejecting the blood from the thorax.