humidity deficit The difference between what is provided by the humidifier and the amount of humidity required by the patient.
hyperinflation See *overinflation.*
hyperosmolar A substance or condition with increased osmolarity.
hyperthyroidism A condition that results from increased activity of the thyroid gland. An increase in metabolic activity that is characterized by nervousness, tremors, hunger, weight loss, fatigue, palpitations, and related symptoms occurs.
hyperventilation Ventilation in excess of a level required to meet metabolic demands (e.g., $PaCO_2$ <30 mm Hg).
hypoventilation A respiratory condition resulting in elevated blood carbon dioxide and generalized reduction in respiratory function.
hypoxemia Lower than normal oxygen pressure in the arterial blood.
hypoxia Lower than normal oxygen pressure in the alveolus or at the tissue level resulting in an inadequate amount of oxygen available to the body cells to meet their metabolic needs.
hysteresis Can be thought of as a lagging of one of two associated phenomena; that is, two associated phenomena fail to coincide or occur simultaneously. An example of hysteresis is the difference between the inspiratory and expiratory curves in a pressure–volume loop for the lungs.

I

iatrogenic Caused by a medical procedure or treatment.
ileus An obstruction of the intestinal tract associated with immobility of the bowel or a mechanical blockage of the bowel.
incisura A small negative deflection on the pressure–time tracing present in the aortic and pulmonary artery pressure tracings; caused by the transient reversal of blood flow toward the heart during the last part of systole that pushes against the respective semilunar valve.
independent lung ventilation A form of mechanical ventilation.
indirect calorimetry Estimate of the caloric expenditure of the body by measurement of exhaled gas volumes and fractional concentrations of oxygen and carbon dioxide rather than direct heat production from the body.
inflammatory mediators Chemical substances produced by the body that are involved in the inflammatory response.
inflection point Occurs during deflation (also sometimes called the *deflection point*) and represents collapse of a significant number of lung units after full inflation (recruitment) of the lungs.
inspiratory pause Mechanical ventilator setting that involves a short prolongation of the inspiratory phase of a breath. Inspiratory pause or inflation hold maneuvers are used to measure plateau pressure.
inspiratory positive airway pressure (IPAP) The application of positive pressure to the airway during inspiration. Compare *expiratory positive airway pressure.*
inspissated secretions Airway secretions that are thickened or hardened through the loss or evaporation of the liquid portion.
intermittent abdominal pressure ventilator (IAPV) A motorized inflatable bladder that fits over the abdomen and assists spontaneous breathing. The motor inflates the bladder, which in turn pushes the diaphragm upward to facilitate exhalation. When the bladder deflates, the diaphragm returns to its resting position allowing for passive inhalation. See *pneumobelt.*
intermittent positive pressure breathing (IPPB) The application of positive pressure breaths to the upper airway on a periodic basis; used to provide short-term or intermittent mechanical ventilation for the purpose of augmenting lung expansion, delivering aerosol medication, or assisting ventilation.
intermittent positive pressure ventilation (IPPV) A general term for mechanical ventilation provided by positive pressure. The acronym *IPPV* can also be used to mean *invasive positive pressure ventilation* in which the patient has an endotracheal or tracheostomy tube in place to connect to the ventilator.
internal pneumatic circuit A series of gas-conducting tubes on the inside of a ventilator that direct gas flow within the ventilator to the outside of the ventilator for delivery to the patient.
internal respiration Movement of oxygen and carbon dioxide between the cells and blood.
international normalized ratio (PT/INR) Calculation made to standardize prothrombin time. INR depends on the ratio of the patient's prothrombin time and the normal mean prothrombin time. Prothrombin time shows how fast the blood clots in patients receiving oral anticoagulant medication.
intrinsic PEEP ($PEEP_I$) See auto-PEEP.
iron lung A negative pressure ventilator. Also called a *tank ventilator, artificial lung,* or *Drinker respirator.*
ischemia A reduction in the flow or supply of oxygenated blood to a body organ or area; may be accompanied by severe pain and organ dysfunction (e.g., cardiac ischemia when an adequate oxygenated blood flow to the heart is lacking).
ischemic Condition characterized by a deficiency of blood supply to an organ.
isothermic saturation boundary The point in the airway where inspired air is warmed and humidified to 100% relative humidity at 37°C and contains 44 mg/L of water (absolute humidity). This point is approximately at the level of the fourth to fifth generation of subsegmental bronchi and varies with rate of gas flow, minute ventilation, and ambient air conditions.

K

ketoacidosis Acidosis accompanied by an increase in ketones; occurs primarily as a complication of diabetes mellitus.
kinetic therapy The use of automated rotating beds to reduce the incidence of ventilator-associated pneumonia (VAP), particularly in surgical patients or patients with neurologic problems.

L

late-onset pneumonia Pneumonia that develops later than 72 hours after exposure to a hospital or clinic setting.
limit variable The phase variable whose size is set at some predetermined maximum that cannot be exceeded during inspiration.
lower inflection point A point of significant change in the slope of a static pressure–volume curve at the beginning of lung inflation; indicates the pressure at which large numbers of alveoli are beginning to be recruited; sometimes called P_{flex}.

M

mandatory breaths Breaths for which the ventilator determines the start time (time triggered based on the set rate) or the volume (volume targeted) or pressure (pressure targeted) or both the start time *and* the tidal volume or pressure delivered.
mandatory minute ventilation (MMV) A closed-loop system in which the ventilator monitors set parameters and makes adjustments based on those parameters and the patient's spontaneous breathing efforts. The operator sets a minute ventilation ($\dot{V}_E$) lower than the patient's spontaneous $\dot{V}_E$. If monitored $\dot{V}_E$ falls below the minimum *set* $\dot{V}_E$, the ventilator increases support to the patient, and vice versa. Also called *minimum* $\dot{V}_E$.
mask pressure Term often used to describe the airway opening pressure.
mechanical dead space The amount of rebreathed volume in a ventilator circuit.
meconium aspiration syndrome The inhalation of meconium by the fetus or newborn, resulting in blockage of the airways, failure of the lungs to expand, potential pneumonia, and possible respiratory failure.

metabolic monitor Device used to measure concentrations of inspired and expired gases (i.e., oxygen and carbon dioxide), as well as sensors for measuring the volume and/or flow of respired gases.
microprocessors Integrated electronic circuits that contain the central processing unit functions of a computer.
minute ventilation The volume of gas per minute inhaled or exhaled from a person's lungs. The calculation of minute ventilation is the product of rate and tidal volume.
miosis The constriction of the pupil of the eye to 2 mm or less.
mode Term used to describe various mechanical ventilator strategies employed to deliver a breath. Ventilator modes are typically characterized by how an inhalation is initiated and ends and how exhalation begins.
mouth pressure (P_M) Pressure at the upper airway (mouth); also called *airway opening pressure (P_{awo}), airway pressure (P_{aw}), upper airway pressure, mask pressure,* and *proximal airway pressure.*
multidrug-resistant (MDR) microorganism A bacteria that resists distinct drugs or chemicals of a wide variety of structure and function targeted at eradicating the organism.
multiple organ failure Modified organ function in an acutely ill patient requiring medical treatment to achieve homeostasis.
multisystem organ failure (multiple organ dysfunction syndrome [MODS]) Severe pathological failure occurring all at once of many organ systems, such as the lungs, gastrointestinal tract, liver, and heart; may accompany acute lung injury or acute respiratory distress syndrome.

N

negative end-expiratory pressure (NEEP) Negative pressure applied to the airway at the end of exhalation during mechanical ventilation.
neonate A newborn younger than 4 weeks of age.
neurally adjusted ventilator assist (NAVA) A mode of mechanical ventilation that provides respiratory assistance for the patient in comparison to and in synchrony with the patient's respiratory efforts.
nocturnal hypoventilation An elevated P_aCO_2 and accompanying fall in oxygen saturation that occurs in response to a progressive fall in minute ventilation occurring during sleep, most often in the rapid eye movement (REM) stage.
nondepolarizing agents Agents that causes skeletal muscle paralysis by causing competitive inhibition of acetylcholine at the muscle receptor site.
noninvasive positive pressure ventilation (NIV) Delivery of positive pressure mechanical ventilation to the lungs without the use of an artificial airway.
nosocomial infections Infections in hospitals and other health care facilities.

O

obstructive sleep apnea (OSA) A condition characterized by episodes of breathing cessation during sleep. Relaxation of the muscles of the upper part of the throat during sleep causes the upper airway to close, blocking the upper airway (oropharynx) and preventing air from entering the lungs. This results in failure of air movement through the obstructed passage while breathing efforts persist. At least five episodes of apnea (lack of air movement) lasting 10 or more seconds are characteristic of OSA.
oliguria A diminished output of urine relative to fluid intake.
open-loop system A control scheme in which a variable is set and the operating system makes no comparisons between output and input signals and no changes to the designated variable; an "unintelligent" system; the opposite of a closed-loop system.
operational verification procedure (OVP) A checklist used to verify that the ventilator systems are fully functional and safe before use with a patient; sometimes a part of the respiratory therapy department's policy and procedure manual. The self-test performed by the ventilator may be part of the OVP.
overdistention See *overinflation* and *hyperinflation.*
overinflation When excessive pressure or volume delivery during mechanical ventilation causes too much stretching of lung parenchyma; overdistention or hyperinflation.

P

paradoxical breathing Abnormal breathing pattern characterized by movement of the thorax outward during expiration and collapsing inward during a spontaneous breath.
paralytic agents Drugs used to facilitate invasive procedures (e.g., surgery, endotracheal intubation) and to prevent movement and ensure the stability of artificial airways. Paralysis may also be used to decrease mean airway pressure (P_{aw}) during uncoordinated or uncontrolled mechanical ventilation.
partial ventilatory support (PVS) Any amount of mechanical ventilation with ventilator rates that are less than those used with continuous mandatory ventilation (CMV), in which the patient is participating in the work of breathing to help maintain effective alveolar ventilation.
patent ductus arteriosus (PDA) An abnormal opening between the pulmonary artery and the aorta resulting when the ductus arteriosus does not close at birth.
patient circuit A series of gas-conducting tubes that conduct gas from the ventilator output connector to the patient and from the patient to the ventilator exhalation valve; also called the *ventilator circuit.*
patient triggering When inspiration begins because of the ventilator sensing a change in pressure, flow, or volume as a result of a patient effort.
patient–ventilator asynchrony A situation in which the patient breathing pattern and ventilator breathing pattern are not harmonious.
patient–ventilator system check See *ventilator flow sheet.*
peak airway pressure The highest pressure achieved during inspiration on positive pressure ventilation; also called *peak pressure* and *peak inspiratory pressure.*
peak inspiratory pressure See peak airway pressure.
peak pressure See peak airway pressure.
pediatric An infant, child, and adolescent from birth to 21 years of age.
perivascular Pertaining to an area around a blood vessel.
permissive hypercapnia Higher than normal P_aCO_2 values resulting from ventilator strategies used to protect the lung from injury associated with the ventilator.
phase variable A signal that is measured and used by the ventilator to begin some part (phase) of the breathing cycle.
physiological shunt The total shunt fraction.
plateau pressure A pressure measurement taken during positive pressure ventilation after a breath has been delivered to the patient and before exhalation has begun. A condition of no flow exists, reflecting the pressure in the lungs and patient circuit.
pneumobelt A belt containing a bladder that inflates during exhalation to move the diaphragm upward (cephalad) to assist exhalation. Inhalation is passive.
polymicrobial infection Infection by multiple pathogenic microorganisms.
polyneuritis Inflammation of many nerves at once or disseminated neuritis.
positive end-expiratory pressure (PEEP) Pressure above atmospheric, applied to the airway during exhalation, that increases the functional residual capacity.
preload The filling pressure of the ventricle at the end of ventricular diastole.
pressure augmentation Dual-control mode that provides pressure-limited ventilation with volume delivery targeted for each breath.
pressure control A mode of ventilation that is normally patient or time triggered, pressure targeted, and time cycled.

pressure cycling Inspiration ends when the ventilator measures a set pressure during inspiration.
pressure gradient A pressure difference between two points, one pressure being higher than the other.
pressure limiting A set maximum pressure that cannot be exceeded.
pressure support A mode of ventilation that is normally patient triggered, pressure targeted, and flow cycled.
pressure-targeted ventilators Ventilators that provide multiple modes for presetting the maximum inflation pressure rather than a fixed tidal volume.
pressure triggering When a change in pressure starts gas flow from the ventilator to deliver inspiration.
problem An unwelcome or harmful matter requiring immediate attention that must be dealt with and overcome.
prone positioning Placing the body with the chest (ventral side) down and back (dorsal side) up.
prophylactic therapy Therapy aimed at defending against or preventing disease.
protected specimen brush (PBS) An invasive microbiologic procedure to culture lower respiratory secretions often necessary to ensure effective treatment of patients with ventilator-associated pneumonia (VAP).
proximal airway pressure Term used to indicate an estimate of the alveolar distending pressure.
pruritus Itching leading to the desire to scratch.
pulmonary angiogram A radiological image of the pulmonary vasculature bed obtained by injecting an opaque contrast medium into the pulmonary circulation.
pulmonary artery catheter (PAC) A long, thin flow-directed tube with a balloon tip on the end (also known as *Swan-Ganz*) that allows it to flow into the right chamber of the heart.
pulmonary vascular resistance The afterload the right ventricle must overcome to eject blood into the pulmonary circulation.
pulse Vibrating sensation or sound that is associated with expansion and contraction of the arteries as blood is propelled through them.
pulse oximetry A technique that uses a sensor placed on a digit, an earlobe, the forehead, or the bridge of the nose to determine oxygen saturation and pulse rate. Pulse oximetry actually combines two physical techniques: (1) the spectrophotometric technique, which is used to determine a patient's percent arterial oxyhemoglobin; and (2) optical plethysmography, which is used to estimate the pulse rate.
pulse pressure The difference between the systolic and diastolic pressure.
pulsus paradoxus A systolic blood pressure that is more than 10 mm Hg lower during inspiration than during expiration.

Q

qualitative Measures the quality of something rather than its quantity.
quantitative Measures the quantity of something rather than its quality.

R

ramp A comfort feature incorporated in many noninvasive pressure-targeted ventilators that allows an incremental rise in set pressures over a set period of time; most often used in conjunction with the *delay time control*.
Ramsay Sedation Scale A graduated single-category scale used to assess the level of sedation in an individual receiving sedation.
recruitment maneuver Denotes activating an intentional transient increase in transpulmonary pressure to open unstable airless alveoli.
relative humidity The actual or absolute amount of humidity in a gas compared with its maximum carrying capacity at that temperature, calculated as a percent. Relative humidity (absolute)/(maximum capacity) × 100.
rescue therapy A life-threatening event requiring nonsurgical treatment.
residual volume The volume of air in the lungs after a maximum exhalation.
resistance Frictional forces associated with ventilation due to the anatomical structure of the conductive airways and the resistance to gas flow through the airways, and the tissue viscous resistance of the lungs and adjacent tissues and organs as the lungs expand and contract.
respiration The movement of gas molecules across a membrane.
respiratory alternans Alternation between using the diaphragm to breathe and the accessory muscles of respiration; an indication of end-stage respiratory muscle fatigue.
respirometer A device used to measure breathing variables such as tidal volume and vital capacity.
respite care Allowing caregivers of a ventilator-assisted individual to have an opportunity to rest and relax by providing another caregiver to care for the patient.
retrograde To direct or turn backward.
rocking bed A motorized bed that moves continuously in a longitudinal plane. Expiration is assisted when the head is in the down position and the abdominal contents and diaphragm are moved by gravity toward the thorax (cephalad).

S

scalar A way to specify the waveforms for pressure, flow, and volume that are graphed against time (e.g., pressure, flow, volume scalars). The resulting waveform is referred to as a *scalar*.
sedatives Used to reduce anxiety and agitation and to promote sleep and anterograde amnesia.
silent chest Term used to describe the absence of audible breath sounds in a patient experiencing a severe asthma exacerbation. It is characterized by the absence of wheezing due to severe airway obstruction.
simethicone agents A nonprescription agent that reduces the surface tension of gas bubbles in the stomach.
single-circuit ventilator A ventilator in which the internal pneumatic circuit allows the gas to go directly from its power source into the patient.
spontaneous breaths A breath or inspiratory gas flow that is started by the patient (patient triggered) and tidal volume delivery is determined by the patient (patient cycled). With spontaneous breaths, the amount of volume and/or pressure delivered is based on patient demand and not by a preselected amount set on a ventilator.
static compliance/static effective compliance Compliance measurement obtained during conditions of no gas flow. Compliance is equal to a volume change divided by a pressure change.
status asthmaticus A severe and prolonged asthma episode that is poorly responsive to adrenergic agents; associated with decreased airway diameter due to bronchospasm, increased mucous plugging, and inflammation of the airway. Signs and symptoms of potential respiratory failure may be present.
stroke index Stroke volume divided by body surface area.
stroke work Cardiac work; calculated by using mean blood pressure multiplied by the stroke volume multiplied by a correction factor.
superinfections Infections that develop during drug treatment for another infection, caused by a different microorganism that is resistant to the treatment used for the first infection.
Swan-Ganz catheter A multilumen, balloon-tipped, pulmonary artery catheter originally designed by Swan, Ganz, and colleagues.
system compressibility See tubing compliance for a description of system compressibility.
systemic vascular resistance The afterload the left ventricle must overcome to eject blood into the aorta and systemic circulation.

T

tachycardia Heart rates in the adult greater than 100 beats/min.
threshold resistor A device that provides a constant pressure throughout expiration regardless of the rate of gas flow; used in the exhalation line of a ventilator. The exhaled air proceeds unimpeded through the resistor until pressure falls to a preset value (PEEP). At that time, the exhaled gas flow stops and the system pressure is maintained.
thrombolytic therapy Drug therapy directed at dissolving a clot (e.g., administration of streptokinase or urokinase to dissolve an arterial clot in a patient with an acute myocardial infarction resulting from clots in the coronary vessels).
thrombotic mediators Chemical substances produced by the body that cause an abnormal vascular condition, resulting in a clot developing inside a blood vessel in the body.
time constant The product of compliance (C) and resistance (R).
time cycling When the ventilator ends inspiration after measuring a specific time that has elapsed during the inspiratory phase.
time triggering The beginning of inspiration initiated by a ventilator when it detects that a certain period of time has elapsed. Time is commonly based on a rate or frequency control setting.
tracheoesophageal fistula A congenital malformation resulting in a tubelike opening between the trachea and esophagus.
tracheomalacia Erosion of the tracheal wall, often associated with excessive pressure from an endotracheal or tracheostomy tube cuff, which reduces effective blood flow through the tracheal wall, resulting in injury to the tissue.
train-of-four monitoring An electrophysiological technique used to assess the effectiveness of neuromuscular blocking agents. An electrical current consisting of four impulses is applied to the peripheral nerve over 2 seconds, and the muscle contractions (twitches) produced provide information about the level of muscle paralysis.
transairway pressure The difference between airway pressure and alveolar pressure.
transcutaneous monitoring A noninvasive method of indirectly assessing ABGs. Unlike pulse oximetry and capnography, which rely on spectrophotometric analysis, transcutaneous monitoring uses modified blood gas electrodes to measure the oxygen and carbon dioxide tensions at the skin surface.
transpulmonary pressure The difference between alveolar pressure and pleural pressure.
transpyloric Across the pyloric region of the stomach.
transrespiratory pressure The difference between airway opening pressure and body surface pressure ($P_{TR} = P_{awo} - P_{bs}$).
transthoracic pressure The difference between alveolar pressure and body surface pressure; also called *trans–chest wall pressure.*
trigger variable The phase variable that begins inspiration.
tubing compliance (C_T) System compressibility; reflects the amount (in milliliters) of gas compressed in the ventilator circuit for every centimeter of water pressure generated by the ventilator during the inspiratory phase. (C_T = Change in volume divided by change in pressure [$\Delta V/\Delta P$] in mL/cm H_2O).

U

upper airway pressure Term used to describe airway opening pressure.
upper inflection point A point of significant change in the upper slope of a static pressure–volume curve at the end of lung inflation near total lung capacity (TLC). The change indicates a point at which large numbers of alveoli are being overinflated.
user interface The dials, knobs, controls, and touch screen devices used by the ventilator operator to determine how the ventilator will function.

V

ventilation The movement of air into and out of the lungs.
ventilator-associated pneumonia (VAP) Pneumonia that develops 48 hours after a patient has been placed on mechanical ventilation.
ventilator flow sheet A regularly performed check of the patient–ventilator system, usually done by the respiratory therapy staff; includes patient assessment data, monitored information, and ventilator parameters or parameter changes. Can be handwritten or computer based and is usually performed every 2 to 4 hours, unless an unusual event requires earlier checking.
vital capacity (VC) The total amount of air that can be exhaled after a maximum inspiration. The sum of the inspiratory reserve volume, the tidal volume (V_T), and the expiratory reserve volume.
volume-controlled ventilation Mechanical ventilatory mode in which a specific tidal volume is set and delivered for each breath.
volume cycled Inspiration ends when a preset volume is delivered to the patient.
volume limiting A maximum volume set by the clinician that is set and cannot be exceeded.
volume triggering When the ventilator detects a small drop in volume in the patient circuit during the latter part of exhalation and begins inspiration.
volutrauma A form of lung injury associated with excessive volume delivery by a ventilator, resulting in tissue injury at the alveolar level.

W

weaning The process of discontinuing ventilation and liberating the patient from the ventilator.

Z

zero end-expiratory pressure (ZEEP) A baseline pressure of zero during the expiratory phase of mechanical ventilation.

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