

An Introduction to Safe Anatomic Positioning

Courtesy of AirPal®

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Definition

Safe Anatomic Positioning: The act of positioning the supine human body, or portions thereof, in a safe and secure manner by means of a controllable, air-activated device. As a result, portions of the body or its limbs can be repositioned into a desired plane or orientation in order to perform medical procedures such as insertion of endotracheal tubes or performance of surgical procedures. The term Safe Anatomic Positioning encompasses the ability to safely and continuously adjust a patient's position and spatial orientation in order to optimize access to the anatomical location of interest, to manipulate the relationship between various anatomical features, or to adjust the overall orientation of the patient. By enabling the patient to be repositioned via a controllable device, nurses are no longer required to manually lift the patient and use linens or pillows to prop the patient into the desired position. This is safe and comfortable for the patient, helps prevent nursing injuries, and affords surgeons and anesthesiologists new levels of convenience in optimally positioning their patients.

Background on Pneumatic Patient Transfer and Repositioning Systems

Prior to the advent of pneumatically activated positioning devices, patients in the supine position might require pillows or linens to be placed under their head or under some part of the body in order to promote greater comfort or easier access to a portion of the anatomy. In addition, it was sometimes necessary to manipulate the supine orientation of the patient by tilting the entire table. Repositioning patients presented dangers to caregivers, as make-shift linen inclines were unstable and cumbersome to adjust for transfer.

In 1984, AirPal® Patient Transfer Systems, Inc. addressed the problem of lateral transfers by developing an air-assisted lateral patient transfer device that had an underside that was perforated for air release. The device was attached to an air supply that forced a constant flow of high volume/low pressure air, causing the device to inflate into a semi-rigid surface for patient transfers. Upon inflation, excess air escaped out through the perforations on the bottom of the device creating a "cushion" of air upon which the patient could be laterally moved in an almost effortless manner.

Succeeding generations of the device have undergone incremental improvements, and the product line has been expanded to include multiple widths, half pads, a patented ergonomic handle system, specialized medical fabrics and double-layered patient surfaces to enhance patient skin management. Integral stabilization bands increased the strength and durability of the product line and assisted in centering patients on the pad during inflation.

The first Safe Anatomic Positioning modules made their debut in early 2007 with the announcement of RAMP® technology (Rapid Airway Management Positioner). These pneumatically activated modules utilized hospital compressed air or nitrogen to infinitely adjust the elevation of a portion of the patient's body for medical procedures. The RAMP patient positioning module provided convenience for the OR staff and comfort for the patient.

What is the RAMP Module?

More specifically, the RAMP module is an air-assisted patient positioning device for airway management. The technology works through a system of independently adjustable inflatable surfaces. Two air chambers are used to adjust a patient's position into alignment with the airway axes. The airway axes are optimally aligned when a patient can be put into an "ear to sternal notch" position, which is achieved when the patient is placed onto their back and the chest is elevated or "ramped" at about 15 to 20 degrees. The head is then positioned relative to the chest by aligning the opening to the ear canal horizontally to the sternal notch. The AirPal RAMP uses a specialized Air Controller to adjust the position of patients. Because adjustments can be made incrementally and precisely through filling and releasing air in the chambers, the RAMP is suitable for all patients regardless of habitus. Once placed under the patient, the RAMP can be used to acquire the "ear to sternal notch" position on demand repeatedly, and be controlled by a single operator. The RAMP's lower air chamber is used to elevate the patient's chest. The RAMP's upper air chamber or "Intubation Pillow" provides adjustment to the position of the patient's head relative to the chest.

The application of patient positioning for airway management has long been regarded as paramount to procedural success. The "ear to sternal notch" position is considered optimal for intubation/extubation, maximizing airway patency, improving gas exchange with BVM (Bag Valve Mask) ventilation, and reducing the work of breathing, especially for obese and morbidly obese patients.

Integration of lateral transfers with patient positioning

When the RAMP system for airway management is integrated with the AirPal lateral TransferBase (known as the RAMP All-In-One), the system can be used to maintain the

patient's position for extended periods of time. Patients can be laterally transferred while being kept in position; maximizing the management of the airway without interruption and helping in recovery. This ability to maintain patient position when transferred is significant because it results in a lengthening of the Safe Apnea Period (the period of time until critical O₂ desaturation). This system also provides benefits cross departmentally, offering a "continuum of care" that encompasses both airway management and patient positioning.

Common Safe Anatomic Positioning Applications:

1. Pre-oxygenation prior to anesthesia/intubation
2. Airway axes alignment – assists in tracheal tube insertion/intubation procedures, improved POGO scores and glottic exposure.
3. Extubation – assists in airway tube removal and minimizes threat of tissue trauma.
4. Assists to maximize airway patency with static alignment of airway axes.
5. Reduced work of breathing with chest wall excursion and reduced internal organ pressures upon the diaphragm.
6. BVM (bag valve mask) ventilation – increased gas exchange.
7. Recovery – maximizes airway patency and facilitates patient position for emergency airway re-insertion
8. Offers compliance to Safe Patient Handling policies and procedures (bed to stretcher and “ramping”).

The "Difficult Airway"

"The principal adverse outcomes associated with the difficult airway include (but are not limited to) death, brain injury, cardiopulmonary arrest, unnecessary tracheostomy, airway trauma, and damage to teeth."

**Practice Guidelines for Management of the Difficult Airway
Anesthesiology, V 98, No 5, May 2003**

Although inspection of the oral cavity can provide some indication of a "perceived" difficult airway there is no standard definition in available literature. A difficult airway is more often discovered after multiple direct laryngoscopies and maneuvers are attempted. Difficult airways are the result of a complex interaction between patient factors (physiology), the skills of the caregiver, the setting, and patient positioning. Decidedly, once the caregiver is committed to an intubation attempt there is little room to retreat and place the patient into the "ear to sternal notch" position to improve their chance of success.

While new technologies such as video laryngoscopes have advanced the ability for visualization, they do not replicate the positive effects of positioning the patient in the "ear to sternal notch" position. While placing a patient into the "ear to sternal notch" position is beneficial, it remains non-standard due to the ad-hoc nature of placing linens behind the patient, time restraints and the inability to move, transfer, or reposition a patient once a make-shift incline is established. The AirPal RAMP changes the application and accepted protocols of patient positioning for airway management by standardizing the "ramping" procedure into an automatic, time efficient, and replicable procedure requiring just one operator. This also leads to patient habitus (obesity) no longer needing to be the major impetus for using the "ramping" technique to place a patient in the "ear to sternal notch" position, because patients of any BMI can benefit from and be accommodated by the RAMP technology.

Importance of patient positioning for airway management or other medical procedures:

“Increasing head elevation and laryngoscopy angle (neck flexion) significantly improves POGO scores during laryngoscopy...”

ANNALS OF EMERGENCY MEDICINE 41:3 MARCH 2003

Head-Elevated Laryngoscopy Position: Improving Laryngeal Exposure During Laryngoscopy by Increasing Head Elevation

Richard M. Levitan, MD; C. Crawford Mechem, MD; E. Andrew Ochroch, MD; Frances S. Shofer, PhD; Judd E. Hollander, MD

"Ideal BVM positioning is obtained by aligning the patient's external auditory meatus with the sternal notch (ear-to-sternal notch position). Ear-to-sternal notch positioning provides better alignment of the oropharyngeal axes than does the traditional "sniffing" positioning."

ACEP News September 2008

Focus On - Bag-Valve Mask Ventilation

Ann M. Weiss, MD, and Michael Lutes, MD

“Every obstetric airway should be considered a difficult airway. The practitioner should anticipate difficult anatomy and rapid desaturation. Every obstetric patient undergoing emergency intubation should be pre-oxygenated as time permits. Patients should be positioned using the ear-to-sternal notch method...”

ACEP News July 2007

Focus On: Emergency Airway Management in the Pregnant Patient

Michael Lutes, MD and Amy Slawter, MD

“RESULTS: The "ramped" position improved the laryngeal view when compared to a standard "sniff" position, and this difference was statistically significant (P=0.037). CONCLUSION: The "ramped" position is superior to the standard "sniff" position for direct laryngoscopy in morbidly obese patients.”

Obesity Surgery. November 1, 2004

Laryngoscopy and morbid obesity: a comparison of the "sniff" and "ramped" positions

Jeremy S. Collins, MB ChB; Harry J.M. Lemmens, MD, PhD; Jay B. Brodsky, MD; John G. Brock-Utne, MD, PhD; Richard M. Levitan, MD

"Some of the pitfalls of BVM ventilation are inadequate position..."

FDNY-EMS CME Journal 2009_J01 "Bag-Valve Mask Ventilation"

Doug Isaacs, M.D.

Associate Medical Director

FDNY Bureau of Training

Use of Safe Anatomic Positioning products over an extended period:

The RAMP® and other Safe Anatomic Positioning modules, including the integrated transfer platform, are manufactured with specialized medical fabrics. The fabrics have a built-in, anti-microbial system (Sure-Chek®) pioneered by our materials supplier, Herculite® Inc. The medical products at Herculite® are not ordinary coated nylon fabrics like those found on other products, but highly tested and engineered materials selected for their specific characteristics. The main body of the AirPal RAMP is constructed from Linea 70®; specifically designed for pressure management surfaces. AirPal utilizes a double-layered system for the patient surface. The top patient surface is constructed from Sure-Chek Fusion III®.

The double-layered patient surface provides multiple benefits. The top surface of Sure-Check Fusion III® has balanced stretch characteristics engineered into it from both directions. This reduces skin shear effects on the patient and aids in superior cushioning. The second top layer bridges seams and provides a smooth, even surface to enhance the pressure management features of the materials. The effect of the two fabrics protects skin from shear as the two surfaces can slide against each other. The end result is a device that can be left under a patient for extended periods of time. In fact, many customers routinely keep patients on top of the All-In-One RAMP system for the majority of their stay. As opposed to using linens to create an incline surface for a patient, the RAMP offers a surface that minimizes pressure points. Utilization of the RAMP system can provide a continuum of care that is unmatched using other methods.

General Overview of RAMP All-In-One System Operation:

The AirPal RAMP All-In-One Safe Anatomic Positioning system should be positioned under the patient prior to surgery or other procedures. For example, caregivers can place the RAMP under a physically dependent patient using a log-rolling technique, similar to changing out a

patient's linens, while they remain in bed. Prior to any transfer, the patient safety straps should be fastened to secure the patient. These straps should not be fastened too tightly, as the platform pad will be inflated during the transfer. The lateral transfer capability can be used at any point once the patient is situated on the RAMP system; even after the RAMP module has been inflated.

Protocols may vary between facilities and with the nature of the surgery and the patient's medical condition. However, basic operation of the RAMP system is straightforward and requires minimal caregiver instruction. The RAMP system utilizes hospital supplied air or nitrogen as an inflation source (an AirPal Air Supply is used separately for the transfer pad). The RAMP Air Controller is directly connected to the hospital's air supply and controls inflation of the two air chambers via dial selector and the attached air supply hoses. A "push button" located on the underside of the AirPal Air Controller regulates the flow of air for inflation purposes. A second "push button" located on the top of the AirPal Air Controller regulates the escape of air from the RAMP. The Air Controller protects from over inflation with self resetting blow off valves located within the body of the Air Controller. These blow off valves also serve as emergency vents, for quick deflation in the case of emergency during surgery. Connections to the RAMP itself are accomplished with a set of quick connect couplers. The couplers are self-sealing when disconnected, so the RAMP system can remain inflated without connection to the AirPal Air Controller.

The system in Use:

Safe Anatomic Positioning differs from conventional techniques because it is continuously adjustable as opposed to static wedges or linen props. For many patients, establishing and maintaining an airway is a routine procedure. Studies have established that the "ear to sternal notch" position is optimal for airway management, but it is often overlooked due to time constraints, non-standard procedures, and the ad-hoc method of using bulky and often unstable stacks of linens. Additionally, the use of linens to prop a patient directly contradicts the instinct to make every second count in emergency medicine. There is little time for repositioning a patient each time they are moved.

The opposite is true with the AirPal RAMP. The RAMP solves patient positioning problems for airway management by automating and standardizing the process. With the RAMP, patients can be positioned and adjusted on demand by a single operator. On average, positioning a patient with the RAMP can be achieved in seven seconds. When the patient requires transfer to a bed or operating table, the integrated AirPal Platform can be utilized while the patient remains in the "ear to sternal notch" position. This maximizes the patient's airway patency, reduces the work of breathing, and improves the exchange of gasses with BVM (bag valve mask) ventilation, all of

which contribute to a lengthening of the safe apnea period. Patients who go into code will benefit from the RAMP's ability to rapidly deflate with built-in emergency valves, while an integrated "code board slot" allows easy insertion of a code board properly aligned to the patient's chest. The code board slot is made from the same nylon-based fabric used in the RAMP. The fabric allows the code board to easily slide in place, even with the heaviest of patients. Stabilized or post surgical patients will benefit from the RAMP systems ability to laterally transfer into a recovery/ICU bed while maintaining optimal positioning for airway management; especially in those instances where an airway needs to be re-established on an emergency basis.

Benefits of Use:

- Pre-Oxygenation: Prior to anesthesia/intubation, it is common protocol to pre-oxygenate a patient. The RAMP can be used to maximize the effectiveness of O2 saturation in the patient through patient positioning. Placing a patient in the "ear to sternal notch" position will maximize airway patency through alignment of the airway axes, and reduce the work of breathing through chest wall excursion and reduced internal organ pressures on the diaphragm. The resulting increase in exchange of gasses within the lungs improves the efficiency of pre-oxygenating a patient to saturation. The RAMP system allows for safe anatomic positioning in a practical and time efficient fashion.
- Safe Patient Transfer and Positioning: Clinical trials conclude that a patient can be transferred from a stretcher to an OR Table, positioned on the OR Table and then "ramped" into the optimum "ear to sternal notch" position in under one minute. Although the efficiency of the RAMP system is impressive, another important benefit is the ability to achieve this level of efficiency while remaining compliant with facility policies for Safe Patient Handling. The RAMP is integrated with an AirPal Platform, an air-assisted lateral patient transfer device, so bed to stretcher transfers can be achieved quickly, easily, and safely. Creating an inclined surface through stacking linens puts caregivers at risk, especially when attempting to move dependent bariatric patients. With the RAMP, patient transfers can occur smoothly whether the patient is in a "ramped" position or supine.
- A Note on Spinal Support: The act of manually handling a dependent patient may induce injury to the patient's spine, especially with bariatric patients. The RAMP distributes and supports the weight evenly along the patient's spinal column. As the RAMP is inflated; it supports the natural curvature of the spine with a steady fluid upward motion. There are no pressure points associated with the supporting surface, so the patient can remain in the "ramped" position for long periods of time without compromising skin integrity.

- Airway Axes Alignment: The RAMP standardizes the placement of a patient in the "ear to sternal notch" position. When a patient is properly positioned, the three airway axes (oral, pharyngeal, laryngeal) are in optimum alignment, maximizing glottic exposure. Patient positioning is paramount to successful intubation. RAMP clinical trials concluded a 40 percent improvement in Cormack-Lehane view (50% I. grade; 25% II. grade; 25% III. grade). Given the RAMP's ability to rapidly position a patient and align the airway axes makes the application of patient positioning for extubation practical, and minimizes the chance of tissue trauma when removing an airway.

- Reduced Work of Breathing/Chest Wall Excursion: When the patient is put into a "ramped" position, chest wall excursion stretches tissues promoting venous access. Additionally, the work of breathing is reduced and internal organ pressures against the diaphragm are greatly reduced. The benefit offered with the RAMP is the ease at which the patient can be positioned and adjusted for both airway management and surgical procedures.

- Recovery: If a difficult airway is encountered during patient treatment after surgery, a RAMP system should be positioned under the patient to facilitate any emergency airway re-insertion needed. Any patient in recovery can benefit from the RAMP's ability to maximize airway management. The RAMP can accommodate patients of any habitus or BMI.

Conclusion:

Safe Anatomic Positioning systems represent a sweeping change to the commonly accepted protocols concerning patient transfers and anatomic positioning, including airway management. For example, the RAMP makes achieving alignment of the oropharyngeal and laryngeal axes routine, standardized, and efficient. Perhaps equally as groundbreaking, the system's capability to integrate a lateral transfer pad functions as a patient transfer device, even while maintaining oropharyngeal and laryngeal axes alignment. Thanks to these advances in safe anatomic positioning technology, healthcare facilities can offer a well integrated continuum of care cross-departmentally to ensure safe patient transfers, optimal airway management, and a variety of modular patient positioning capabilities.