



Acoustic Respiration Rate

RRa

Acoustic Respiration Rate (RRa™) is part of the upgradable rainbow® SET platform – the first technology to noninvasively and continuously monitor blood constituents and respiration rate.

Accurate > Easy to Use > Patient-Tolerant

When used with other clinical variables, RRa may help clinicians assess respiratory status and help determine treatment options.

HOW IT WORKS

rainbow Acoustic Monitoring™ noninvasively and continuously measures respiration rate using an innovative adhesive sensor with an integrated acoustic transducer that is easily and comfortably applied to the patient's neck.

Using acoustic signal processing that leverages Masimo's patented revolutionary Signal Extraction Technology® (SET), the respiratory signal is separated and processed to display continuous respiration rate.



Cloth rainbow Acoustic Sensor™
Breathable cloth allows air to penetrate tape for enhanced patient comfort



Acoustic Signal

“Breathing adequately is what matters most. Masimo Acoustic Respiration Rate provides clinicians with the ability to automatically and continuously monitor the breathing status of post-surgical patients in general care or post-anaesthesia settings—alerting them to the first sign of an abnormal or compromised breathing pattern that may be indicative of airway obstruction or respiratory distress.”

—Michael Ramsay, MD

Chief of the Department of Anesthesiology and Pain Management
Baylor University Medical Center, Dallas, TX



CLINICAL BENEFITS

Respiration rate is a critical vital sign that provides early detection of respiratory compromise and patient distress

- > Continuous monitoring of respiration rate is especially important for post-surgical patients receiving patient-controlled analgesia (PCA) for pain management as the sedation can induce respiratory depression and place patients at considerable risk of serious injury or death.¹⁻⁵
- > Although the Anesthesia Patient Safety Foundation (APSF) guidelines include oxygenation and ventilation monitoring in all patients receiving opioids,⁶ current methods for respiration rate monitoring can be limited by reliability or patient tolerance.^{5,7}
- > Masimo rainbow SET Pulse CO-Oximetry and rainbow Acoustic Monitoring help you meet APSF guidelines for monitoring post-operative patients.

CLINICAL ACCURACY

Masimo rainbow Acoustic Monitoring provides similar respiration rate accuracy as capnography respiration rate monitoring⁸

| Dataset | Number of Samples | Bias (brpm) | Standard Deviation (brpm) | Root Mean Square Accuracy (brpm) |
|------------------------------|-------------------|-------------|---------------------------|----------------------------------|
| Masimo RRA | 21,369 | 0.18 | 1.31 | 1.33 |
| Capnography Respiration Rate | 21,405 | 0.22 | 1.62 | 1.63 |

- > Both methods were compared to a control respiration rate obtained by a trained observer counting inspirations and expirations visually and by listening (as done during auscultation).

PERFORMANCE AND ORDERING INFORMATION

ORDERING INFORMATION

Adult Adhesive Sensors, single patient use, latex free, non-sterile, packaged 10 per box
 Weight range > 30kg
 Application Neck

ACRYLIC ACOUSTIC RESPIRATION SENSOR

Part Number 2759

CLOTH ACOUSTIC RESPIRATION SENSOR

Part Number 2902

PHYSICALLY COMPATIBLE INSTRUMENTS

Rad-87 and Radical-7 monitors with RRA compatible hardware.

PERFORMANCE

Respiration Rate Accuracy
 Respiration Rate Accuracy from 4 to 70 breaths per minute ± 1 bpm⁹

TECHNOLOGY PLATFORM



The upgradable Masimo rainbow SET technology platform features the following measurements and calculations:

- > Acoustic Respiration Rate (RRA)
- > Oxygen Saturation (SpO₂)
- > Pulse Rate (PR)
- > Perfusion Index (PI)
- > Total Haemoglobin (SpHb[®])
- > Oxygen Content (SpOC™)
- > Pleth Variability Index (PVI[®])
- > Methaemoglobin (SpMet[®])
- > Carboxyhaemoglobin (SpCO[®])

All Masimo rainbow measurements and calculations – including Acoustic Respiration Rate (RRA) – are available on the Radical-7™ and Rad-87™ monitors.

REFERENCES

- ¹ Joint Commission on Accreditation of Healthcare Organizations. Sentinel event alert: patient controlled analgesia by proxy; *JCAHO*. 2004.
- ² Institute for Safe Medication Practices. Safety issues with patient-controlled analgesia: Part I – How errors occur; *ISMP*. 2003.
- ³ Institute for Safe Medication Practices. Safety issues with patient-controlled analgesia: Part II – How to prevent errors; *ISMP*. 2003.
- ⁴ Bird M. Acute pain management: a new area of liability for anesthesiologists; *ASA Newsletter*. 2007; 71:8.
- ⁵ Weinger MB. Dangers of post-operative opioids: APSF workshop and white paper address prevention of postoperative respiratory complications; *APSF Newsletter*. 2006; 21(4):61-68.
- ⁶ Stoelting RK, et al. Dangers of post-operative opioids – is there a cure?; *APSF Newsletter*. 2009; 24(2):25-26.
- ⁷ Macknet MR, et al. Accuracy and tolerance of a novel bioacoustic respiratory sensor in pediatric patients; *Anesthesiology*. 2007; A84.
- ⁸ Masimo FDA Submission Data.
- ⁹ Respiration rate accuracy has been validated for the range of 4 to 70 breaths per minute in bench top testing. Clinical validation for up to 30 breaths per minute was also performed with the Masimo Acoustic Respiration sensor and instrument. The variation in accuracy specifications equals plus or minus 1 standard deviation which encompasses 68% of the population. Contact Masimo for testing specifications.