

The RSBI Index

A Comparison of Two Collection Methods

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Background: The RSBI (rapid shallow breathing index) as measured by Yang and Tobin in 1991 has long been a clinically accepted standard in assessing the readiness of a patient to be liberated from mechanical ventilation. The evolution of technology over the last decade has given the bedside clinician an opportunity to measure RSBI without disconnection from mechanical ventilation. Based on these developments, we theorized that measurement of the RSBI through the mechanical ventilator would compare favorably to the standard hand-held spirometer method.

Method: The RSBI via each method was observed 15 minutes apart for each sample after the clinician assessed the patient for liberation readiness and stability. The ventilators used in the study were the Servo i, Servo 300, and the Puritan-Bennett 840 ventilators.

Hand-held spirometer method: The patient was removed from the ventilator and attached to a hand-held spirometer with a one-way valve. The first 30 seconds of spontaneous breathing were disregarded, and the spirometer was reset. The practitioner then recorded the respiratory rate and minute volume for the next 60 seconds. The patient was then placed back on the ventilator.

Mechanical ventilator method: The ventilator mode was changed to CPAP, and pressure support ventilation was set to 0. The PEEP and FiO₂ were not altered. The first 60 seconds of spontaneous breathing were disregarded, and the practitioner recorded the respiratory rate and minute volume for the next 2 minutes. The RSBI was then calculated at the end of the 2 minute period. The patient was then placed back on the original ventilator parameters.

Results: We observed the RSBI using both the hand-held spirometer method and the mechanical ventilator method on 32 patients for a total number of 38 observations. 32 observations were made on the Servo ventilators, while 6 observations were made on the PB840 ventilator.

The results were analyzed by using paired t-test, Pearson correlation coefficient and Spearman's rho methodologies. Overall, there was a positive correlation between kit and ventilator scores for both Pearson Correlation coefficient (.77) and Spearman's rho (.69). We did not observe any statistically significant differences between hand-held spirometer scores and ventilator scores. This positive correlation was applicable for both the single-observation and the multiple observation patients within the study.

Conclusions: RSBI results were unaffected by choice of method in this study. The high positive correlation and lack of statistically significant differences between hand-held spirometer and ventilator scores illustrate the ability of current technology to measure the RSBI index accurately through mechanical ventilation. In addition, the ability to measure RSBI via mechanical ventilator addresses the issues of patient safety, infection control, cost containment, and reproducibility of an index considered to be a clinical standard since 1991.

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Results: RSBI Scores for Individual Patient Observations

| Pair | N of Patients | Mean Comparison | | | Correlation Test | | | |
|--------|---------------|-----------------------|----------------|--------------|------------------|--------------|--------------------------------|--------------|
| | | Paired-Samples T Test | | | Pearson | | Spearman's rho (Nonparametric) | |
| | | Mean | Std. Deviation | p (2-tailed) | Correlation | p (2-tailed) | Correlation | p (2-tailed) |
| Kit | 27 | 57.98 | 26.64 | .85 | .72 | .000 | .67 | .000 |
| Servo | | 58.77 | 28.76 | | | | | |
| Kit | 5 | 72.40 | 48.68 | .95 | .99 | .000 | 1.00 | .000 |
| PB 840 | | 72.20 | 43.91 | | | | | |

Results: RSBI Scores with More than One Observation for Several Patients

| Pair | N of Observations | Mean Comparison | | | Correlation Test | | | |
|--------|-------------------|-----------------------|----------------|--------------|------------------|--------------|--------------------------------|--------------|
| | | Paired-Samples T Test | | | Pearson | | Spearman's rho (Nonparametric) | |
| | | Mean | Std. Deviation | p (2-tailed) | Correlation | p (2-tailed) | Correlation | p (2-tailed) |
| Kit | 32 | 58.6 | 25.94 | .72 | .75 | .000 | .69 | .000 |
| Servo | | 59.9 | 27.55 | | | | | |
| Kit | 6 | 70.2 | 43.88 | .85 | .99 | .000 | .94 | .005 |
| PB 840 | | 70.7 | 39.46 | | | | | |