RespirTech PRO™ CLINICAL REFERENCE

Otto G. Raabe, Ph.D. and Mario Romano, RCP, Comparison of RespirTech PRO™ and Ambu® SPUR Resuscitators During Simulated CPR, Submitted to *Respiratory Care*, January 1999

BACKGROUND: The cardiopulmonary resuscitation (CPR) guidelines and American Society for Testing and Materials caution against the use of automatic gas-powered resuscitators during CPR closed chest compression because the compression process may interfere with lung ventilation and airway resistance may prevent adequate ventilation. However, pressure regulated mechanical ventilators should automatically respond to intrapulmonary pressure changes to provide air to the lung at high flow rate upon demand and indicate ventilatory problems to the rescuer. This evaluation was conducted to investigate intrapulmonary pressure and ventilatory factors associated with the use of either the portable automatic RespirTech PRO gas-powered resuscitator or the manually operated Ambu SPUR self-inflating bag-type resuscitator. METHODS: Eight successive tests were conducted using these resuscitators connected to the simulated trachea of a CPR dummy by either a qualified respiratory therapist (RT) or a pulmonary physician (MD), five with the RespirTech PRO and three with Ambu SPUR. RESULTS: The results of this evaluation indicate that the simultaneous use of the RespirTech PRO during manual chest compression tends automatically to maximize pulmonary ventilation rather than interfere with it, and with only a modest increase in intrapulmonary pressure during compression. The Ambu SPUR was used after but not during chest compression strokes. DISCUSSION: Because the RespirTech PRO responds to thoracic pressure variations, it appears to provide the maximum ventilation possible during closed chest compression and responds with a full inhalation at high flow rate as soon as the compression ends. Because of its audible and visual indications of inhalation-exhalation cycling, elevated airway resistance or low tidal volume is readily observed by the rescuer. CONCLUSIONS: These results suggest that there is no contraindication associated with performing CPR closed chest compression while utilizing the RespirTech PRO as a ventilatory resuscitator. Further, the results suggest that such use would be beneficial. A revision of CPR guidelines and ASTM 920-93 should be considered.

Gregory P. Marelich, M.D., FACP, FCCP, Terry Vierra, RRT, RCP, and Bill Miller, RRT, RCP: Case Study - Good Things Come in Small Packages: VORTRAN's RespirTech PRO Resuscitator. Advance for Managers of Respiratory Care, October, 1998.

Our respiratory care department is extensively involved in testing new technologies. Given this, when we heard of the RespirTech PRO™, a disposable, gas powered resuscitator that was smaller than a shoe box, we were intrigued. Such a device is very useful in pre-hospital care because standard bag ventilation require an extra hand that isn't always available. And if the device is light, disposable and inexpensive, it 's all the more attractive.

The unit certainly represents a significant advance in respiratory care technology. Although it has a few limitations, it may have a significant impact on pre-hospital care and for temporary use within the hospital as well.

Hendrik W. Gervais, M.D.; Balthasar Eberle, M.D.; Dieter Konietzke, M.D.; Hans-Juergen Hennes, M.D.; and Wolfgang Dick, M.D: Comparison of Blood Gas of Ventilated Patients during Transport, Critical Care Medicine, August 1987.

Three modes of ventilation during the transport of 30 ventilator-dependent patients were compared using blood gas variables. Ten were ventilated with a manually operated ventilation bag (group C), and then with a tidal volume meter at the exhalation valve of the ventilation bag (group V). Another ten patients (group 0) were ventilated with a portable ventilator set to the minute volume (VE) given in ICU. VE was measured by volumetry as described above. Blood gases were analyzed in the ICU before and at the end of transport. In group C, significant decreases occurred in arterial ($p < .01$) and central venous ($p < .05$) $PC0_2$, as well as in central venous $P0_2$ ($p < .01$). Arterial ($p < .05$) and central venous ($p < .01$) and central venous ($p < .05$) $PC0_2$ decreased whereas arterial ($p < .01$) and central venous ($p < .05$) pH increased. We conclude that VE should be monitored during transport of ventilated patients.

RespirTech PRO™ CLINICAL REFERENCE

Kenneth Davis, Jr., M.D.; Robert Johnson, M.D.; Robert Campbell, R.R.T.; and Ted Tabor: Manual Ventilation During Cardiopulmonary Resuscitation, Department of Surgery, University of Cincinnati Medical Center, Cincinnati, Ohio.

Purpose: Ventilatory support during CPR is typically provided by manual ventilation with a self-inflating bag (SIB). We undertook this study to determine the efficiency of manual ventilation provided in the emergency department (ED) to intubated patients during CPR. Methods: Twenty patients arriving in the ED were manually ventilated with a disposable SIB by a member of the ED staff (R.N., resident, M.D., R.R.T.). A disposable variable orifice pneumotachometer and pressure tap were placed between the SIB and endotracheal tube. Flow and pressure signals were processed by a portable respiratory monitor (VenTrak, Novametrix, Wallingford CT) and saved to an IBM compatible computer. Personnel were blinded to the volume and pressure measurements. Tidal volume (V_t), peak inspiratory pressure (PIP), frequency (f), and I:E averaged on a minute to minute basis. Results: The mean duration of data collection was 7± 1.7 minutes. Ventilation was provided by an R.N. = 6, resident = 8, M.D. = 2, R.R.T. = 4. Results for measured variables in mean ± SD are shown below:

	Minute 1	Final Minute
V_t (mL)	571 (90)	595 (72)
PIP (cm H_20)	41 (9)	40 (12)
F (b/min)	24 (6)	20 (8)
I:E	1:2.3	1:2.9

Conclusions: These data demonstrate that during CPR, ventilatory support is typically provided at a higher f and lower V_t than suggested by AHA guidelines. Time did not effect performance, as there were no differences in values during the first minute compared to the final minute of ventilation. This study cannot relate outcome to ventilatory support. Future research should consider the use of a ventilator to provide ventilation during CPR and the effects of displaying V_t and f on caregiver performance.

Sidney S. Braman, M.D.; Steven M. Dunn, M.D.; Carol A. Amico, B.A.; and Richard P. Millman, M.D.; Providence, Rhode Island: Complication of Intrahospital Transport in Critically Ill Patients, Annals of Internal Medicine, October 1987.

To determine the frequency of hemodynamic and respiratory complications during movement within the hospital, we conducted a prospective study involving 36 critically ill, ventilator-dependent patients who needed procedures done outside the intensive care unit. During the first 20 transports, patients received ventilation through a manual resuscitation bag. Arterial blood gas measurements showed frequent changes from baseline with alterations in $PC0_2$ (< 10 torr) or pH (< 0.05) occurring on 14 occasions. In a subsequent study, 16 patients received ventilation during transit with the aid of a portable mechanical ventilator. Although 6 patients showed changes in arterial blood gas values, mean changes in $PC0_2$ and pH were significantly less than in the group that received manual ventilatory support ($p < 0.01$). Hemodynamic complications of hypotension and cardiac arrhythmia showed a significant correlation with disturbances in arterial blood gases ($p < 0.05$). Although limited by the lack of a control period, this study shows that the transport of critically ill patients may result in severe hemodynamic complications; it also suggests that these complications might be prevented by more forceful monitoring of ventilation.

James M. Hurst, M.D., F.A.C.S.; Kenneth Davis, Jr., M.D., F.A.C.S; Richard D. Branson, R.R.T.; and Jay A. Johannigman, M.D.: Comparison of Blood Gases during Transport Using Two Methods of Ventilatory Support, The Journal of Trauma, December 1989.

Transportation of critically ill patients requiring ventilatory support represents a common yet difficult problem faced by clinicians. We examined 28 patients requiring transport in a prospective, randomized fashion, comparing manual ventilation with ventilation provided by a transport ventilator. Patients were ventilated to their destination with one method and returned with the alternate method. After manual ventilation, all patients showed a marked respiratory alkalosis (pH increased from 7.39 to 7.51 and $PaC0_2$ decreased from 39 to 30 torr). After ventilation with the transport ventilator, no appreciable changes in pH or $PaC0_2$ were seen. Oxygenation remained stable with both methods. No patient suffered hemodynamic instability, although two patients in the manual ventilation group developed cardiac arrhythmias. We concluded that when ventilatory support is required during transport, a transport ventilator produces reliable control of ventilation.