

Preparing for Mass Casualty Respiratory Failure: Can Laypeople Set Up the Lap Top Ventilator (LTV®)?

Recent news reports and governmental agencies warn us of an impending pandemic of Avian Flu (H5N1). The American Association for Respiratory Care (AARC) recently released *Guidelines for Acquisition of Ventilators to Meet Demands for Pandemic Flu and Mass Casualty Incidents*.

According to the AARC guidelines:

“Mechanical ventilators, used in critical care settings, are complex micro-processor driven devices designed to support a wide range of medical conditions, acuities, ventilation modes, flow rates and pressure settings. The high cost of purchasing and maintaining such critical care ventilators makes stockpiling these devices financially impractical.

A simple ventilator setting error can cause patient injury or death. The extensive training and competency requirements necessary to operate these ventilators safely and effectively impedes the use of support personnel who may be called upon to assist respiratory therapists if a pandemic or other mass casualty event hits the country.”

The new LTV 1200, manufactured in the United States by VIASYS Healthcare/Pulmonetic Systems, includes “presets” to facilitate the rapid initiation of mechanical ventilation by emergency personnel. If the patient is a new patient, the user simply selects infant, pediatric or adult and the LTV safely sets all controls and alarms. *Since the LTV 1200 includes the preset feature, if a pandemic occurs, would it be possible for a layperson to set up the ventilator appropriately?*



Procedure:

Participants were time-tested using a 13 point score sheet (Attachment A). Prior to testing, all participants signed a form attesting that they had no prior experience or instruction regarding the LTV (Attachment B).

Testing was done in two phases. Phase I occurred at a local fire station using the first draft of the **LTV 1200 Emergency Set-Up Card**. Participants were mostly male (85%) Emergency Medical Technicians (EMTs). Phase II occurred at a small shopping center using the second draft of the **LTV 1200 Emergency Set-Up Card**. Participants in Phase II were 60% male, and almost all were laypeople (there was 1 nurse).



Phase 1 Testing: Jamie Thomson, EMT, Firefighter. Addison Michigan Fire Department

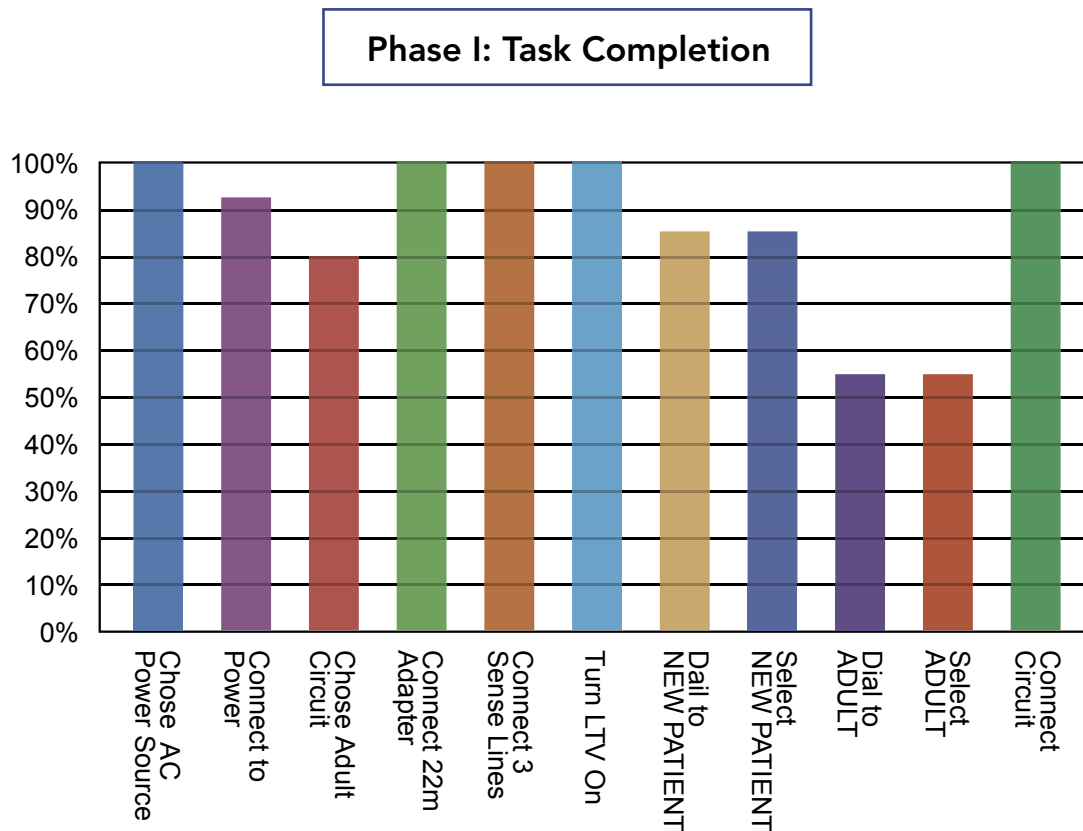
Testing occurred at a large table. On the table rested an adult test lung, labeled “ADULT PATIENT”. Participants were informed that the “patient” already had a breathing tube in his mouth. There was a large box (**GO Pack®**) on the floor next to the table. The box contained the following items:

- LTV 1200 Emergency Set-Up Card
- LTV 1200 Ventilator
- A/C Adapter
- Lithium Ion Battery
- Adult Circuit
- Pediatric Circuit
- Filter

Participants were told that they could use a nearby electrical outlet, if desired, and that the LTV was a mechanical ventilator that could breathe for the patient. Participants were instructed that their job was to read and follow the instructions so they could connect the LTV to the patient as quickly as possible. A 13 point score sheet was completed for each participant (Attachment B). A stopwatch was started when the participant opened the **GO Pack**, and stopped when the circuit was connected to the test lung (“patient”). Participants were tested individually and privately, out of sight of waiting participants. Upon completion, participants were asked not to tell others anything about the testing.

Results, Phase I:

We tested 20 participants from the Addison Michigan Fire Department. The majority were EMTs (n=10). There were also Paramedics (n=4), First Responders (n=1), and laypeople (n=5).



Participants were easily able to choose the A/C power source, connect the 22mm adapter, turn the LTV on, and connect the circuit to the patient (test lung). 85% of the participants were able to select a new patient, and 80% chose the proper (adult) circuit. However, only 55% of the participants were able to dial the appropriate patient type (adult), and only 55% pressed the Select button to confirm the adult patient selection. The average time to complete the test was 4:09.

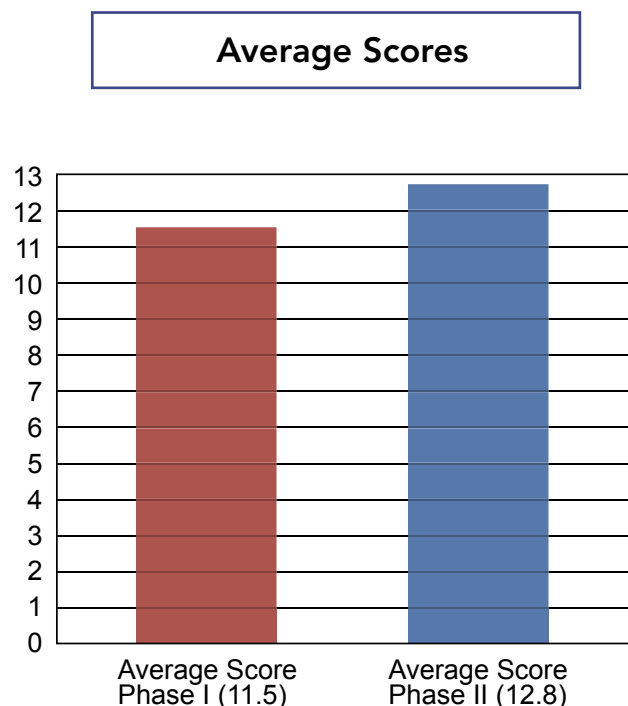
While observing the testing, it was noted that participants had trouble choosing between the pediatric and adult circuits. This difficulty became more pronounced as dusk fell, since the font on the circuit packaging was small and difficult to see in less than optimal light conditions. It was also difficult for participants to see the clear plastic 22 mm adapter inside the clear plastic circuit bag.

The participants also had difficulty dialing and selecting the proper patient size. The first draft of the **LTV 1200 Emergency Set-Up Card** had only one drawing to indicate how to dial the proper patient size and how to press the Select button to confirm the choice. Several participants pressed the Select button before rotating the knob to the proper patient size.

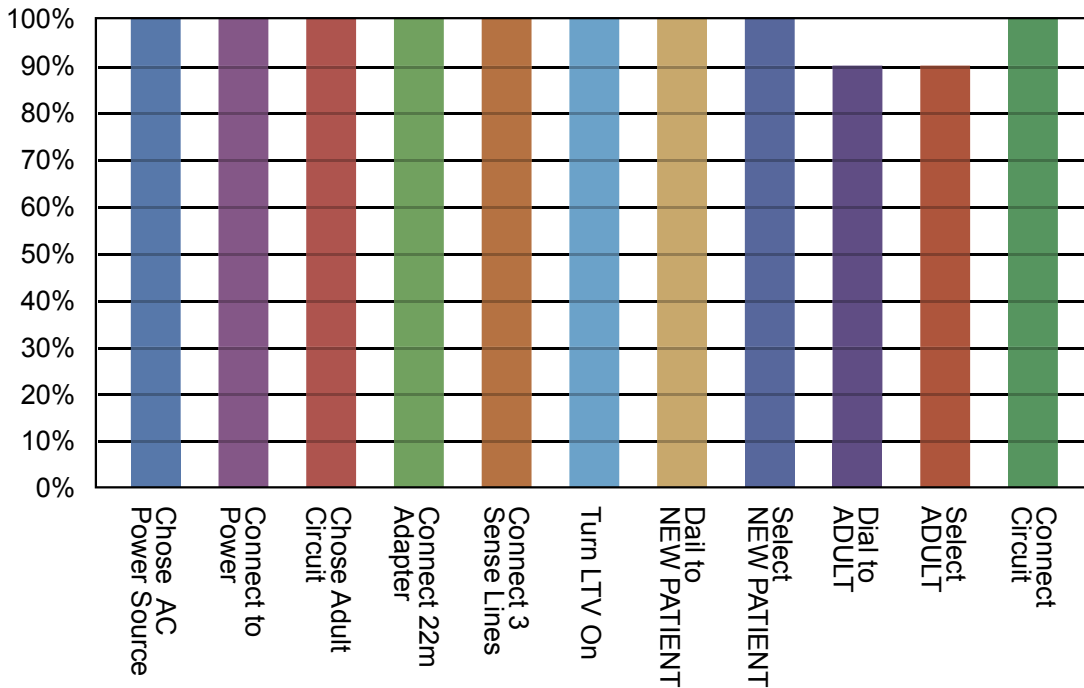
Based on the Phase I test results, we decided to revise the **LTV 1200 Emergency Set-Up Card** a bit. We increased the font size significantly, changed from 5" x 7" cards to 8.5" x 11" cards and we chose colors with more contrast to increase visibility in low light conditions. We colored-coded the circuit connection drawing, and added an additional drawing to show that the Leur Locks on the sense lines needed to be screwed on in a clockwise direction. We also colored the 22 mm adapter to show it more prominently inside the circuit package. We made dialing to the proper patient size (infant, pediatric or adult) and pressing the Select button into two separate steps -- each with an illustration. Finally, we placed large labels indicating the patient type (adult or pediatric) on the circuit packaging.

Results, Phase II:

In order to reach people who were not healthcare workers, Phase II testing occurred at a local shopping center using the same protocol as Phase I testing. 19 laypeople and one nurse were tested. The changes made to the **LTV 1200 Emergency Set-Up Card** clearly enhanced the participant's performance, as evidenced by an increase in the average score from 11.5 to 12.8 on the 13 point scale.



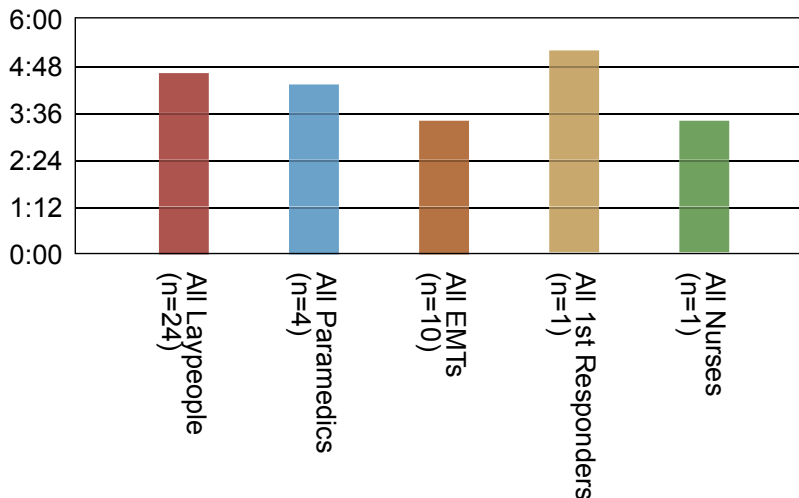
Phase II: Task Completion



In Phase II, 100% of the participants were able to chose the best power source (A/C power), connect to the power source, chose the appropriate circuit (adult), connect all 3 sense lines, turn the LTV on, select a new patient, and connect the circuit. Only 2 out of 20 participants failed to select the proper patient type (adult).

Overall, as might be expected, those with a healthcare background (Nurse, EMT, Paramedic) were generally faster at performing the tasks.

Average Time for Completion (Phase I & II)



Conclusions:

A total of 40 participants were tested (20 in Phase I, 20 in Phase II). The average score for the total participant group was 12.2 on the 13 point scale.

This study confirms that 90% of the Phase II participants were able to properly attach the appropriate circuit to the LTV 1200, to choose the correct patient type which establishes appropriate control and alarm settings, and to begin ventilation of the test lung. Participants were able to accomplish these tasks in under 5 minutes, completely independently. It bears repeating that all of the Phase II participants had no training or instruction on the LTV, and 19 of the 20 were laypeople.

During a pandemic or mass casualty, using the LTV 1200 may enable laypeople to assist respiratory therapists and other clinicians in caring for ventilator patients.

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ATTACHMENT A

SCORE SHEET

Date	
Scoring Sheet for (name)	
Layperson, First Responder, EMT, Paramedic, LPN, RN, RRT	
Highest educational level attained	
Choose appropriate power source (AC power)	
Connected LTV to power source	
Choose appropriate circuit (adult)	
Connect 22 mm tubing to LTV	
Connect sense lines (1 point each, 3 points total)	
Turn LTV on	
Dial to NEW PATIENT	
Select NEW PATIENT	
Dial to proper patient size (ADULT)	
Select ADULT	
Connect circuit to patient (ADULT)	
TOTAL (13 possible)	
TIME	

Notes:

ATTACHMENT B

I, _____, attest that I have never worked with an LTV ventilator before.

I attest that I have never received any instruction about the LTV ventilator.

Signed _____ Date _____