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AHRC 250.01: Respiratory Care Laboratory II

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The University of Montana – Missoula College
Respiratory Care Program

COURSE NUMBER AND TITLE: ***AHRC 250T Respiratory Care Lab II***

DATE REVISED: Spring 2015 **SEMESTER CREDITS: 2**

CONTACT HOURS: The lab will be conducted in 2 sections to allow for better utilization of facilities and equipment. Signup sheet will be posted for the following times**: Monday. 1330 – 1700hrs, Friday. 1300 – 1630hrs**

PREREQUISITE: RES 101T, 129T, 130T, 131T, 235T, 150T

FACULTY:
Nick Arthur
nicholas.arthur@umontana.edu
243-7836 (office)
Office: GH 04
Office Hours: By Appointment

RELATIONSHIP TO PROGRAM:
This course provides opportunities to apply cognitive skills gained in RES 231t to psychomotor skills through various laboratory activities and simulated hopsital experiences.

COURSE DESCRIPTION: Application of AHRC 231T, Respiratory Critical Care, to cognitive and psychomotor skills in preparation for critical care clinical rotations.

METHODS OF INSTRUCTION: Demonstrations & short lecture, cd tutorials, videos, and participation in structured laboratory activities.

STUDENT ASSESSMENT METHODS AND GRADING PROCEDURES:

APPROXIMATE BREAKDOWN
Completed Lab Checkoffs- 30%
Mid-term exam/practicum -25%
PB 840& Avea tutorial post-tests - 20%
Final lab exam/practicum -25%

GRADING SCALE

A = 4.0	95 – 100%	C- = 1.67	70 – 73%
A- = 3.67	90 – 94%	D+ = 1.33	67 – 69%
B+ = 3.33	87 – 89%	D = 1.00	64 –66%
B = 3.00	84 – 86%	D- = .067	60 – 63%
B- = 2.67	80 – 83%	F = 0.00	
C+ = 2.33	77 – 79%		
C = 2.00	74 – 76%		

Students must have a "B-" final grade in order to progress within the Respiratory Care program. Test questions will be based on unit objectives. Unit objectives are to be used as study guides.

PROFICIENCY EVALUATIONS: Evaluation is based upon the following:

1. Completion of several peer and laboratory instructor competency checks.
2. Laboratory quizzes, presentations, and assigned homework.
3. Midterm exam/practicum
4. A final exam/practicum.

METHODS TO IMPROVE COURSE: Student evaluations and faculty assessment of course content.

ATTENDANCE: Class attendance is an integral part of this course. Exam dates will be announced. Only legitimate reasons for missing an announced exam will be accepted. Failure to appear for scheduled exams will result in 15% point deduction. Expect periodic unannounced quizzes. There is no make-up for missed quizzes.
SEE: TEST/QUIZ MAKEUP

OTHER POLICIES:

ACADEMIC INTEGRITY:
All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by The University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://life.umt.edu/vpsa/student_conduct.php .

DISABILITY ACCOMODATION:
Eligible students with disabilities will receive appropriate accommodations in this course when requested in a timely way. Please speak with me after class or in my office. Please be prepared to provide a letter from your DSS Coordinator. For more information, visit the Disabilities Services website at http://www.umt.edu/dss/ or call 406-243-2243 (voice/text)
Note: Instructor reserves the right to modify syllabi and assignments as needed based on faculty, student, and/or environmental circumstances.

Cell Phones/Pagers: Due to an increasing number of students, who own and use cell phones and pagers, it has become necessary to institute a policy during class times. As you are aware, these tools are distracting to an entire class. However, some students require them for business, which allows them to further their education. Please follow these guidelines:

If the cell phone/pager in not business or emergency related, please turn it off.
Use the vibrating option on your pager.
Do not listen to the messages in class. Please leave class quietly.
CELL PHONES AND PAGERS MUST BE TURNED OFF DURING EXAM AND CLASS PRESENTATIONS.

SEATING: Many classrooms have chairs to accommodate persons with disabilities. These chairs will display the international disability symbol and are assigned to a particular student. Please refrain from using these chairs or making adjustments to them unless the chair is assigned to you. If you think you may have the need for a specific chair, please contact Disability Student Services. Thank you for your cooperation.

TEST/QUIZ MAKEUP: Make-up exams and lab experiences will only be given under extreme circumstances and then only if: a) permission is granted ***in advance*** by the course instructor, or b) a written excuse is provided by a medical doctor. The burden of proof is on the student, so you must document and prove a justifiable absence. Not following this procedure prior to the exam will automatically result in a 15% point reduction of the subsequently taken exam. Missed tests need to be made up within ***one week*** of the original date given. You are responsible for contacting the Academic Support Center, 243-7826, to schedule the make-up. Failure to do so will result in a ***ZERO*** grade for the missed test.

The faculty senate guidelines concerning the issuance of incomplete grades will be followed. Attention to critical dates such as P/NP, drop, etc. is the responsibility of the student. Students wishing to drop the class after the drop deadline will need a documented justifiable reason for doing so. Dropping the class for fear of bad grade or to protect a GPA are **not** justifiable reasons. The principles embodied in the **Student Handbook Code** will be adhered to in this course.

***Quizzes**: Failure to be present for quizzes will result in a zero being recorded and used in computing your average. There will be no make-up opportunities for missed quizzes.

Homework: It is the expectation that homework will be turned in when due. If you are not present, it is your responsibility to see that it is in my mailbox by 4:00 p.m. on the due date or a zero will be recorded and used in computing your average.

INSTRUCTOR EXPECTATIONS:
Because the course has a great deal of new material, it is very important to study consistently. Some suggestions for better study are:

1. Read the unit objectives at the beginning of each chapter-find out what you are expected to learn.
2. Reading the material before class will help you understand the lecture.
3. Look up definitions to words you do you understand.
4. Attend every class and take notes but do not try to write down everything. Concentrate on concepts.
5. Review your notes as soon after class as possible make sure you can read them!

6. Study notes/material and compare with objectives.

8. Study no more than one hour before taking a short break.
9. Relate information to prior learning/examples to develop a "picture" in your mind.
10. Ask instructor for clarification as needed during or after lecture.
11. Study regularly in a quiet place; set study hours and keep them.
12. Plan something for fun and relaxation - stress management.
13. See your instructor when you think you need help. Your instructor wants you to succeed and will have some ideas which should help.
14. Review for units exams and finals can be made easier by frequent review of chapter content reviews.
15. Be in class and don't miss pop quizzes.

LABORATORY ETIQUETTE:
Students will work in groups. Prepare and read materials/exercises before class begins. It is important to actively participate with the equipment. Get direct hands-on experience. Be courteous, the lab will be crowded and cooperation and sharing of equipment is essential. Be attentive to mini-lecture/demonstrations by your instructor. Ask questions. Complete the laboratory exercises in the time allotted and hand it in. Enjoy the lab setting. All conditions are controlled and each performance step is outlined on the checklist. Concentrate on the technical skills and equipment-related aspects.

A. REQUIRED TEXTS:

TITLE: Egan's Fundamentals of Respiratory Care, 9th Ed.
AUTHOR: Wilkins, et al **PUBLISHER :** Mosby

TITLE: Basic Laboratory Competencies for Respiratory Care, 4th Edition
AUTHOR: White **PUBLISHER :** Delmar

TITLE: Clinical Assessment in Respiratory Care, 5th Edition
AUTHOR: Wilkins et al **PUBLISHER:** Mosby

VIDEOS AT THE COT LIBRARY – Some may be shown during RES 231T

612.21	Airway Care – Mosby
612.21	Chest Tubes – Mosby
612.133	Arterial Lines – Springhouse
612.28	Tracheostomy Care – Springhouse
617.9	Chest drainage – Springhouse

LAB VIDEOS (in-class): BiPAP Vision, Drager's Airway Pressure Release Ventilation, Viasys Avea Ventilator

PB 840 & Viasys Avea VENTILATOR Tutorials in Computer Lab (loaded on 5 Computers)

COURSE OUTLINE:

I. A scrubs dress up day to ensure everyone has the appropropriate attire and equipment, including eye protection. Review of basic therapy modalities and hands on any equipment students may feel uneasy about, esp. Nebulizers (SVN & LVN), IPPB or IPV, etc. Ensure students are prepared for Basic Floor Therapy clinicals

II. Airway Management - identification, selection, and insertion/placement techniques, oral and nasal airways &trouble shooting, Combitube, LMA insertion techniques and troubleshooting, but not heavy emphasis,Endotracheal and tracheostomy tubes, placement, monitoring, general care, troubleshooting and associated competencies. Initiation of Emergency/Transport Ventilation. Chest drainage system monitoring & competency

III. Noninvasive Ventilation- Reintroduce Respironics BiPAP Vision for BiLevel; activities & competency

Introduce Respironics V60 for non invasive BiPAP ventilation.

Practice scenarios using lab manikins. Putting the critical care picture together.

Arterial line management techniques, troubleshooting and competency,

IV. Introduce Avian Transport ventilators, & Viasys Avea ventilatory modes & waveform monitoring, activities and begin competencies: Initiate Continuous MV, Monitor Continuous MV, Change a Ventilator Circuit, Ventilator Waveform, Cl & Raw interpretation, Monitor Spontaneous Ventilation Parameters.

Practice scenarios using lab manikins. Putting the critical care picture together.

V. Puritan Bennett 840 lab. Students turn in the PB 840 Tutorial post-test at beginning so they can more easily begin activities and competency. Any ventilator related competencies not already completed can be completed now.

Use PB 840 and Viaysis Avea ventilators during multiple scenarios. More trauma/transport scenarios.

COURSE OBJECTIVES:

1. Identify a variety of airway management techniques as taught in BLS, and utilize tools such as naso and oral pharyngeal airways, combitubes, LMAs, endotracheal and tracheotomy tubes.
2. Perform a variety of airway management techniques as taught in BLS, and utilize tools such as naso and oral pharyngeal airways, combitubes, LMAs, endotracheal and tracheotomy tubes.
3. Demonstrate ability to monitor and trouble shoot problems associated with all airway management techniques and tools.
4. Demonstate competencies for intubation, extubaton, nasopharyngeal and endotracheal suctioning.
5. Demonstate endotracheal tube cuff monitoring and troubleshooting.
6. Identify equipment required for treacheostomy care.
7. Demonstrate competency in tracheostomy care on the manikin.
8. Demonstate competency in oral care.
9. List indications, hazards, and complications of invasive airway tools.
10. Assemble a bag-valve-mask unit, identify it's various components, and describe complications and hazards of it's use along with troubleshooting the unit.
11. Describe methods and equipment to assess ventilatory failure in the critical patient.
12. Describe problem-solving for all advanced airway management tools as outline above.
13. Describe chest drainage system management, monitoring, and troubleshooting competencies.
14. Identify problems associated with patient transport.
15. Assemble equipment required and considerations for safe patient transport within or out of the facility and transport a manikin during a simulation exercise.
16. Demonstate competency for assembly and calibration of capnogrpahic monitoring equipment.
17. Identify capnographic waveforms and troubleshoot abnormalities.
18. List indications for arterial line placement and management concerns.
19. Prepare for and draw fake blood from the manikin arm's arterial line.
20. Apply all safety precautions to prepare the blood sample for transport to the lab.
21. Identify proper functioning of the arterial line system post-blood draw.
22. Institute life-saving procedures for emergency simulations using lab manikins and SimMan.
23. Complete the Puritan Bennett 840 cd tutorial and turn in the post-test by the designated date.
24. Demonstrate basic lab competency with the Puritan Bennett 7200 mechanical ventilator, including mode changes and waveform interpretaions using laboratory test lungs in various compliance and resistance settings.

25. Discuss the effect of changing compliance and resistance on ventilator graphics and displayed data.
26. Demonstrate competency with the Puritan Bennett 840 ventiator during “vent lab week” as outlined in the lab competency form.
27. Demonstate competencies at obtaining spontaneous ventilation parameters on mechanically ventilated patients.
28. Demonstrate competency in assembly of the Respironics BiPAP Vision for use in both CPAP and BiLevel ventilation.
29. Demonstate competencies at identifying normal and abnormal ventilator waveforms, problem solving, and troubleshooting techniques for all ventilators used during lab.
30. Demonstrate team building and team player sensibilities through participation in all scenarios with lab manikins or SimMan throughout the course.
31. Demonstrate competencies for Initiating & Monitoring mechanical ventilation; change a ventilator circuit.
32. Demonstrate competency with the Viasys Avea ventilator

RES250T – Respiratory Care Laboratory II-Student Performance Outcomes

Check Off Log Sheet (completed by Final Lab Meeting)

Student Name:

Check off	Page	Signature (PEER)	Date	Signature (Instructor)	Date
Intubation	441				
Extubation	443				
Nasotracheal suctioning	469				
Endotracheal suctioning	471				
Monitoring cuff pressure	473				
Tracheotomy and stoma care	475				
Oral Care	RES 250 Syllabus				
Monitor Chest Tubes	RES 250 Syllabus				
Arterial Puncture (if not already done)	153				
Arterial line sampling (Clinical Only)	155				
End Tidal monitoring	197				
EKG. (If not already done)	113				
Initiation of Continuous MV	599 & 601				
Monitoring Continuous MV	605				
Changing a Ventilator Circuit	RES 250 Syllabus				
Waveform, C_{STAT} & Raw Interpretation	RES 250 Syllabus				
Spontaneous Ventilation Parameters	671				
BiPAP Competency	RES 250 Syllabus & 529				
PB 840 Competency	RES 250 Syllabus				
Viasys Avea Competency	RES 250 Syllabus				

Clinical & Lab Proficiency Evaluations not in White's Lab Text:

1. **Oral Care**
2. **Monitor Chest Tube**
3. **Change a Ventilator Circuit**
4. **Ventilator Waveform, Cl & Raw Interpretations**
5. **Respironics BiPAP Vision**
6. **Puritan Bennet 840 (3 pages)**
7. **Viasys Avea (3 pages)**

Oral Care – Clinical Performance Evaluation

Student name: _____ **Name of Clinical Affiliate:** _____

Lab Date: _____ **Clinical Date:** _____, Pass ____, Fail ____

Lab Peer: _____ **Clinical Preceptor**: _____

Lab Instructor: _____

	PEER	**LAB**	**CLINICAL**
Observes Universal Precautions, esp. eye protection	_____	_____	_____
Verifies ETT position at last best position	_____	_____	_____
Checks ETT or trach cuff pressure	_____	_____	_____
Informs patient of procedure	_____	_____	_____
Positions patient (semi-Fowlers)	_____	_____	_____
Auscultate lung fields	_____	_____	_____
Obtain oral care kit or materials needed	_____	_____	_____
Suctions trachea as needed	_____	_____	_____
Suctions Oropharyngeal secretions	_____	_____	_____

What oral care solutions are being used? _____

Brush teeth 1 – 2 min. (gentle circular motions)	_____	_____	_____
Gently brush surface of tongue	_____	_____	_____
Use swab if brush causes discomfort, bleeding	_____	_____	_____
Apply mouth moisturizer; lip balm if needed	_____	_____	_____
Suction oropharynx and trachea as needed	_____	_____	_____
Move ETT and secure as indicated	_____	_____	_____
Reassess: Auscultate lungs; document ETT position	_____	_____	_____

Student's significant learning: _____ …

MONITOR CHEST TUBES - Clinical Performance Evaluation

Student Name: _____ **Name of Clinical Affiliate**: _____

Lab Date: _____ **Clinical Date: _____, Pass ____, Fail ____**

Lab Peer: _____ **Clinical Preceptor**: _____

Lab Instructor: _____

Identify:	PEER	LAB	CLINICAL
1. Collection chamber	____	____	____
2. Water seal chamber	____	____	____
3. Suction control chamber	____	____	____
---			
4. Name two primary purposes of CTs?	____	____	____
5. Where are pneumothorax CTs generally placed?	____	____	____
6. Where are fluid drainage CTs generally placed?	____	____	____
7. What pressure is the vacuum regulator set at?	____	____	____
8. What's the level in the suction control chamber?	____	____	____
9. Does the vacuum setting or the water level determine the applied suction?	____	____	____
11. Name three sources of possible system leaks:	____	____	____
12. Periodic bubbles (water seal chamber) imply?	____	____	____
13. Continuous bubbles (water seal) imply?	____	____	____
14. Why are system leaks potentially dangerous?	____	____	____
15. Precautions: transporting patients with CTs?	____	____	____

Additional Clinical Evaluations:

16. What's the purpose of CT(s) on this patient? _____

17. How much fluid is in the collection chamber and what color is it? _____

18. Any leaks present? If so, what do you attribute them to? _____

19. Can you estimate any ventilator volume loss due to leaks? _____

20. What tools are used to trouble shoot system leaks? _____

21. If "tidaling" is present, what chamber will show it? _____

22. Student significant learning: _____ . . .

Change a Ventilator Circuit - Clinical Performance Evaluation

Student name: _____ **Name of Clinical Affiliate**:_____

Lab Date: _____ **Clinical Date**: _____, Pass ____, Fail ____

Lab Peer: _____ **Clinical Preceptor**:_____

Lab instructor: _____

Refer to AARC Clinical Practice Guidelines – Ventilator Circuit Changes

1. List three bio-hazard precautions you will take to protect yourself:

   a. _____, b. _____, c. _____

2. Assembles equipment: Resuscitation bag available and ready, _____

   Aseptically prepares new circuit, _____

   Prepares HME or humidifier, _____

3. Informs the patient and nurse of the procedure. _____

4. Auscultate patient. Suction as needed (100% FIO2) before proceeding. _____

5. Drains liquid in old circuit into the circuit's fluid collection jar. _____

6. Pauses ventilator alarms. _____

7. Disconnects and ventilates the patient. _____

8. Disposes of old circuit (infectious waste requires a bio-bag). _____

9. Empties fluid collection jar into toilet and disposes of jar with circuit. _____

10. Makes an efficient and aseptic circuit change-out, within 2 minutes. _____

11. Auscultate patient. _____

12. Recheck ventilator settings and proper function. _____

List two indications (objectives) for changing a ventilator circuit:

1. _____, 2. _____

List two contraindications for not changing a ventilator circuit:

1. _____, 2. _____

VENTILATOR WAVEFORMS, Cl & Raw INTERPRETATIONS – Clinical Performance Evaluation

Student name: _____ **Name of Clinical Affiliate:** _____

Lab Date:_____ **Clinical Date:** _____, Pass _____, Fail _____

Lab Peer: _____ **Clinical Preceptor**: _____

Lab Instructor: _____

	PEER	LAB	CLINICAL
DEFINITIONS: Student accurately describes: Lung Compliance, Cl	____	____	____
Student is able to describe conditions of variable lung compliance	____	____	____
Student accurately describes Airway Resistance, Raw	____	____	____
Student is able to describe conditions of variable Airway Resistance	____	____	____
Obtains Compliance, ($\mathbf{C_{STAT}}$), value on ventilator	____	____	____
Obtains Resistance, ($\mathbf{R_{AW}}$), value on ventilator	____	____	____

WAVEFORM SELECTION & BASIC INTERPRETATIONS:

Student selects waveform options and adjusts scalars for best view	____	____	____
Assess: PATIENT EFFORT on Pressure-Time & Pressure-Volume graphics	____	____	____
Assess: AIR TRAPPING (auto PEEP) on Flow-Time graph	____	____	____
Assess: INSPIRATORY FLOW on Mandatory Breaths by Pressure-Time Graph, Identify pressure overshoot.	____	____	____
Assess: COMPLIANCE CHANGES by slope of Pressure-Volume graph	____	____	____
Assess: RESISTANCE CHANGES by Pressure-Volume hysteresis	____	____	____

CLINICAL INTERVENTIONS: Describe ventilator adjustments or therapies made based on above findings:
_____

CLINICAL CONCEPTS: What ventilator mode and settings are in place on the patient? _____
_____

Why this mode and settings are appropriate for the patient at this time? _____

_____

Student's most significant learning: _____...

NPPV Lab Exercise/Performance Evaluation

Checkoff will be from White p .529

Exercise can be completed using either the Vision BiPAP or the V60 (newest generation of the Respironics BiPAP line). *While both operate in a similar fashion, the interface and controls are significantly different and scenarios and exercises should be completed on both machines.*

Initial set up and adjustment of the two BiPAP machines is different in terms of method but involves setting and adjusting essentially the same parameters.

First: Turn on the machine and familiarize yourself with the user interface. Locate the alarm silence and reset as these will be needed during setup. Which machine uses a "soft key" interface?_____. Which machine uses a touch screen interface?_____

All NIV's must have provision for purging of exhaled CO_2 .This is assured by the presence of a _____ in the patient circuit. Both machines must determine how much leak is present in the **patient circuit**. How is this accomplished with the:

A) **Vision?**

B) **V60 ?**

Select **S/T mode** and enter the appropriate parameters **OR** perform the appropriate test to "teach" the machine about circuit leak. (We will be using a test lung for the exercises)

Once this has been accomplished, enter the following ventilator parameters:

IPAP=12 EPAP=4 F_iO_2=21% Backup RR=10 T_i = 1.25sec

Now look at the alarm screen. Identify the alarms available and determine what would be appropriate initial settings for each. **(For now set Low V_T = 300ml and Low V_E = 3L. Other alarms are at your discretion)**

Place the machine on **standby** until you are ready to connect to the test lung ("patient").

When ready, connect to the test lung and evaluate what the results of your initial settings are in terms of:

RR_____ V_T_____ V_E _____ PIP _____

Look at and analyze the waveforms associated with this setup. Adjust the scale of the waveforms to optimize the graphics. Now try decreasing the compliance characteristics of the test lung. Is there any change in Peak pressure on each breath? _____ Any change in delivered V_T? _____ Any Alarms sounding? _____

Watch the pressure waveform and note that pressure never falls below the set EPAP. EPAP prevents collapse of airways, as well as collapse of consolidated/atelectatic lung units, at end exhalation (thereby improving shunt situations and increasing FRC). Therefore, EPAP has essentially the same physiological effect as _____. Given this knowledge, the primary tools available to improve **PaO_2** during NIV are increasing _____ and/or increasing _____.

Increase the EPAP to 6. Any effect on V_T? _____ If you now increase the IPAP to 14 does the V_T return to close to its initial value? _____. So an increase in EPAP **without** a corresponding (equal) increase in IPAP will have what effect on V_E?_____and what likely effect on **$PaCO_2$**?_____ Effect **on pH**?_____

Try triggering/initiating a spontaneous breath. What are the resulting IPAP and EPAP values that you

see graphically? _____ Is the spontaneous V_T similar to those seen with mandatory breaths?_____ If not, what would account for the variability?

Return to your initial settings and allow the machine/patient to settle in. (IPAP=12 EPAP=4 F_iO_2=21% Backup RR=10) **Now increase the IPAP to 16 and evaluate** any changes in V_T _____and V_E_____. The change you have just made caused an increase in the amount of Pressure support being provided to each breath. Pressure support = IPAP - EPAP. Given the results of the changes made, what is the likely effect of an increase in pressure support in terms of the **$PaCO_2$** of your patient?

Take a look at **Rise Time**. The primary purpose of this setting is to improve patient comfort and synchrony with the machine. Make adjustments (First select the maximum value available and observe, then select the minimum available and observe). Watch the waveforms and listen to the test lung to get a sense of the resulting changes in breath delivery.
Now take a look at **I-Time**. This setting is applied to all mandatory machine breaths and determines the duration of the inspiratory phase. Make adjustments (First select the maximum value available and observe, then select the minimum available and observe). Watch the waveforms and listen to the test lung to get a sense of the resulting changes in breath delivery. **Are there any significant changes in V_T as a result of changes in I-Time? _____ Why?**

At these settings, and with this patient, what is the optimal I-time to achieve maximum V_T while providing the longest E-time possible?_____

What is the I:E ratio resulting from the optimal I-time setting determined above?_____

What effect will a longer I-Time have on Expiratory time? _____.What type of patient could be negatively impacted by a reduction in expiratory time? _____. Could you imagine any benefits to a prolonged I-Time?

The V60 has a mode called **AVAPS** (Average Volume Assured Pressure Support). AVAPS compensates for changing pulmonary mechanics (compliance/R_{aw}) by adjusting pressure support to achieve a target V_T. Select the AVAPS mode and enter the following initial settings:
V_T = 550ml $IPAP_{MAX}$ = 20 $IPAP_{MIN}$ = 12 EPAP = 4 Observe the resulting process using analysis of the waveforms and of the data displayed as the ventilator works to achieve the desired V_T. **Try increasing the target V_T to 650ml** and observe how long it takes to achieve the new V_T. **Can you see any benefits to this mode of NIV verses standard BiPAP(S/T)?**

Laboratory Performance Evaluation
PURITAN BENNETT 840 VENTILATOR

Student Name: _____

Peer: _____ Date: _____ Lab Instructor: _____ Date: _____

Peer: Pass _____ Needs review _____ Lab Instructor: Pass _____ Needs review _____

NOTE: This is a lab exercise and does not preclude White's Clinical Lab Competencies check-offs for: Initiation of Continuous Mechanical Ventilation or Monitoring Continuous Mechanical Ventilation.

INITIAL TASKS

Attach inspiratory and expiratory filters.
Connect circuit.
Turn on the PB 840, ensuring the circuit is open (no patient attachment cap).
Perform SST then select new patient

WORK THROUGH THE FOLLOWING SCENARIOS FOR LAB PRACTICE WITH A PARTNER

INITIAL SETTING: New Patient = Adult female @ IBW 65 kg,

Mode = A/C	FIO2 = 25%
Breath Delivery = Volume	Flow = 45 lpm
Rate = 12	Flow Pattern = Square
PEEP = 6	V_T = 650ml

The 840 gives you a chance to set the P_{peak} alarm/limit from the initial setup screen. Find the touch key and set appropriatly.

Did you set other appropriate Alarm and Apnea Parameters?

Record the set I:E ratio = _____:_____ 1 time = _____ E time = _____

Ventilator should be "Waiting for Patient Attachment."

Attach test lung. No springs, Raw = 5

Record the : MAP = _____ PIP = _____ VE = _____

Do Static Maneuver (Insp. Pause): C_{stat} = _____, R_{aw} = _____, P_{plat}= _____

Display waveforms and adjust scalars for: Flow/Time, V_T/Time, P/Time,

Try creating Patient triggered breaths: Notice waveform characteristics when you mimic Pt.triggered breaths. Try varying the trigger sensitivity from high to low. **How would you evaluate (using which graphics) the effort required to trigger those breaths as you vary the sensitivity?**

Connect an in-line nebulizer (dry) and set flow meter to 8-10 lpm. **What happens and why?**

What solution is there on this machine?

Results of ABG's for the patient above, on the curent settings are:
pH; 7.43 $PaCO_2$; 38 PaO_2; 95 HCO_3; 26.
Would you like to make any changes to your vent settings?

NEW PROPOSAL (same Pt.):
Mode: SIMV, PC, Rate = 10, PEEP = 5, FIO2 = 21%. I-time (T_I) = 0.8sec. Rise = 50%. PS =0

Adjust to achieve Mandatory V_T of approx. 725ml

P_I = _____ Minute Ventilation =_____ V_T =_____

Reduce I-time to 0.45sec,

Any changes in V_T _____ Peak pressure_____ V_E _____

I**f changes are noted, what do you think is responsible? (What is occuring? Can you see this graphically?)**

Decrease the mandatory rate to 4 and adjust **I-time (T_I) to 1.0sec.**
Now try mimicing patient triggered breaths and observe approximate V_T from those breaths

Add PS of 5cmH_2O. What happens to Spontaneous Vt and VE? _____

Now increase PS to 10cmH_2O. What happens to Spontaneous Vt and VE? _____

Results of ABG's for the patient above, **on the original settings for this proposal:** (SIMV, PC, Rate = 10, PEEP = 5, FIO2 = 21%. I-time (T_I) = 0.8sec. Target V_T 725ml.) are as follows: pH; 7.51 $PaCO_2$; 31 PaO_2; 65 HCO_3; 22. Pt. is only triggering 1 or 2 spontaneous breaths/min at 50 ml. each
Would you like to make any changes to your vent settings and why?

If the Pt. starts to trigger an increased number of spontaneous breaths /min (6 – 8/min) with PS =5 , spontaneous V_t of 4-5 ml/kg IBW, and seems comfortable with their WOB, what changes might you consider to your settings?

NEW PROPOSAL:
Mode: Spontaneous, PS = 5, CPAP = 5 FIO2 = 25%

Rise% = 40, Esens = 20%, Adj Vsens up one.

Use your filter to experience this mode. Note the I:E ratio depends on _____?

These would be very typical settings for a spontaneous breathing trial on the vent or to assess readyness for discontinuation of Mechanical ventilation.
Use your mouthpiece to experience this mode and to begin gathering data about yourself:

$V_{T(SPONT)}$ = _____ $RR_{(SPONT)}$ = _____

$V_{E(SPONT)}$ = _____ VC = _____

Did you get a RSBI? Where did you find it?

NEW PROPOSAL:
Mode: BiLEVEL, High PEEP = 12 Low PEEP = 4 PS = 5

%Rise = 40 Esens=25% Adj. Vsens down one

Adj. T_H (high time) to 4 sec. and T_L (low time) to 2 sec. Rate= _____

I:E ratio = _____:_____. What's different about this I:E? _____

Bi-level is a similar mode to IMV-PC except that the patient can also trigger pressure supported spontaneous breaths "on top" of mandatory breaths. Mandatory breaths are pressure controlled at what is referred to as $PEEP_{High}$, Base end expiratory pressure is now referred to as $PEEP_{Low}$. By adjusting the amount of time spent at each level of PEEP we can manipulate the mandatory I: E ratio.
How might we manipulate mandatory V_t in this mode? Hint: remember that this is a form of pressure control. How about manipulating spontaneous V_t ?

If our patient was in need of increased **Mean Airway Pressures (MAP)** in order to improve PaO_2 values, one technique we discussed was the use of **Inverse Ratio Ventilation** (2:1, 1.5:1, etc). This type of breathing pattern is not typically well tolerated by patients in typical pressure control modes. **Why might this type of Ventilatory strategy be better tolerated in Bi-Level?**

Try triggering additional breaths above $PEEP_{HIGH}$ and observe the presure supported breaths that result. These breaths will alter the ultimate "actual" I:E ratio. If time allows and if you wish too, try this mode for yourself using your filter. "Better tolorated" is a relative term and patients will need sedation in order to synchronyze with the vent when inverse ratios are used. Paralytics will not be used if pt. effort is required to meet any portion of V_E needs.

Laboratory Performance Evaluation
Lab Performance Evaluation – VIASYS AVEA

Student Name: _____

Peer: _____ Date: _____ Lab Instructor: _____ Date: _____

Peer: Pass _____ Needs review _____ Lab Instructor: Pass _____ Needs review _____

NOTE: This is a lab exercise and does not preclude White's Clinical Lab Competencies check-offs for: Initiation of Continuous Mechanical Ventilation or Monitoring Continuous Mechanical Ventilation.

INITIAL TASKS

Attach inspiratory and expiratory filters.
Connect circuit.
Turn on the Avea, ensuring the circuit is open (no patient attachment cap).
Once the EST has been completed, sellect new patient).

WORK THROUGH THE FOLLOWING SCENARIOS FOR LAB PRACTICE WITH A PARTNER

INITIAL SETTING: New Patient = Adult Male @ IBW 60 kg,
HME in use, Auto Airway Compensation: 8.0 ETT, 28 cm

Mode = SIMV
Breath Delivery = Volume
Rate = 16
PEEP = 10
FIO2 = 30%
Flow = 70 lpm
V_T = 850 ml

Record the I:E ratio = _____:_____ 1 time = _____ E time = _____

Attach test lung. No springs, Raw = 20

Did you set other appropriate Alarm and Apnea Parameters?

Decrease the peak Flow to 30 L/min.

Record the I:E ratio = _____:_____ I time = _____ E time = _____
MAP =_____ PIP = _____

What changes do you notice in the Flow/time curve? Any clinical significance?

Make appropriate adjustments to eliminate Auto PEEP ($PEEP_I$).

What Flow pattern is being delivered?

Return Peak Flow to 70 Lpm.
Peak Pressure = _____ Mean Pressure = _____

The Peak pressure being delivered is a bit high. Perform an inspiratory pause to evaluate if alveolar pressures are acceptable. P_{PLAT} = _____ Acceptable? _____

By pressing the ADV Settings soft key and then touching the Peak Flow touch key you can select a different flow pattern. **Switch to square Wave. Any changes to I:E ratio or Peak pressure as compared to a decelerating waveform? I:E_____ Peak Pressure_____**

Connect an in-line nebulizer (dry) and start treatment. **What happens and why?**

Results of ABG's for the patient above, on the curent settings are:
pH; 7.59 $PaCO_2$; 30 PaO_2; 127 HCO_3; 26.
Would you like to make any changes to your vent settings?

NEW PROPOSAL (New Patient – IBW 65kg.)
Mode: AC, PC, Rate = 12, PEEP = 5, FIO2 = 30%. I-time (T_I) = 0.9sec

Test lung: No springs, Raw = 5

Target V_T = 800ml

Record : MAP =_____ PIP = _____ V_T = _____

Add one small springs to the test lung. This will simulate a decrease in compliance.

Any notable changes to breath delivery ?

What Inspiratory Pressure is required to restore the previous V_T?_____
What is the resulting Peak Pressure of this adjustment?_____(*keep this value in mind for the following question)*

Results of ABG's for the patient above, (who is not triggering any additional breaths), on the curent settings are:
pH; 7.25 $PaCO_2$; 30 PaO_2; 61 HCO_3; 21.
Would you like to make any changes to your vent settings? Why or Why not?

NEW PROPOSAL
Mode AC, VC. Rate = 10, V_T = 600 ml, PEEP = 5, Peak Flow = 50 L/min
Test lung: No springs, Raw = 5

Record the I:E ratio = _____:_____ I time = _____ E time = _____
MAP =_____ PIP = _____

Increase **Raw on test lung to = 50**

Record the: MAP =_____ PIP = _____

Note the relative changes in recorded pressures. **How would you examine the change in R_{AW} using the ventilator graphics? Perform the necessary Pt. manouver for each of the R_{AW} values and view the appropriate graphic.(pressure, volume, or flow)**

See if you can answer the following question using only the Ventilator graphics and the "Freeze" key. **In the above two situations PIP has changed quite a bit, has P_{plat} changed significantly? What are the approximate P_{plat} values for the two R_{AW} conditions?(R_{AW} = 5, R_{AW} = 50)**

NEW PROPOSAL
Mode CPAP / PSV. PEEP = 5, PSV = 0
Test lung: You

Grab your Bio filter and give it a try**.**

If you vary your inspiratory effort does baseline pressure on the pressure waveform change significantly(other than momentarally at beginning inspiration and beginning exhalation)?

If not, how does the ventilator accomplish such a remarkable feat?

Now add PS = 10

What is baseline pressure doing now? (during breaths and between breaths)

INSPIRATORY flow doesn't seem to return to base line during these PS breaths. Is that normal?

By pressing the ADV Settings soft key and then touching the PSV touch key you can modify the Expiratory flow cycling criteria. **Adjust PSV Cycle** to optimize the comfort of your partner. Adjust additional PSV advanced settings as needed.