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2nd Edition

William V. Wojciechowski

Entry-Level Exam Review for Respiratory Care: Guidelines for Success

Second Edition

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William V. Wojciechowski

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Entry-Level Exam Review for Respiratory Care: Guidelines for Success
by William V. Wojciechowski

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Dedication

To my children, Alison, Maria, and Matthew,
who raise more questions than are found in this book,
and whose answers are found in no book.

Contents

Chapter-Matrix Table

Chapter	Matrix Section	Pages/Questions	Pages/Analyses
2	All matrix sections	27–45/1–140	48–81/1–140
3	IA1 to IA2	90–101/1–95	134–158/1–95
3	IB1 to IB10	104–119/96–210	158–182/96–210
3	IC1 to IB2	123–129/211–250	182–191/211–250
4	IIA1 to IA2	199–212/1–111	235–256/1–111
4	IIB1 to IIB3	215–229/112–211	257–278/112–211
5	IIIA1 to IIID10	288–303/1–110	331–354/1–110
5	IIIE1 to IIIG2	307–325/111–235	354–381/111–235
6	All matrix sections	387–404/1–140	407–436/1–140

Chapters 3, 4, and 5 have been restructured. The questions are no longer randomly interspersed throughout each chapter, as in the first edition. In this edition, questions and analyses are presented in sequential order according to the Entry-Level Examination Matrix. For example, Chapter Three, “Clinical Data,” has three sections: IA, IB, and IC.

All the questions referring to the matrix category IA appear in sequence. No questions from matrix categories IB or IC are included in that portion of the chapter. Each matrix area is segregated within its corresponding chapter. The analyses pertaining to the questions are also sequenced in the same manner.

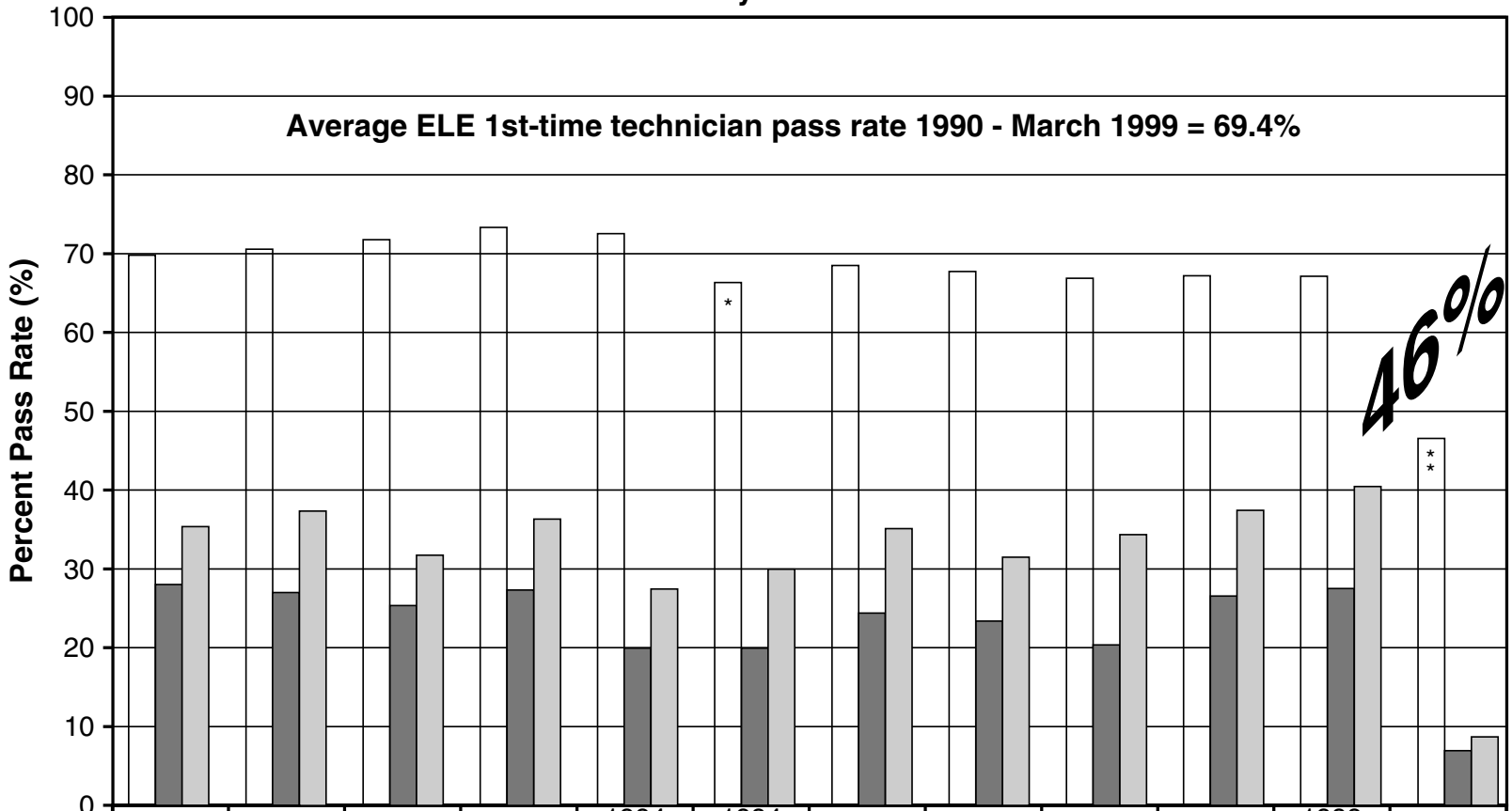
Preface

The purpose of the second edition of *The Entry-Level Exam Review for Respiratory Care: Guidelines for Success* is to assist Entry-Level Examination candidates to prepare for the credentialing exam based on the expanded matrix introduced in July 1999. Every five years, the *National Board for Respiratory Care* (NBRC) conducts a job analysis for the Entry-Level and Advanced Practitioner Examinations. Respiratory therapists, department heads, educators, and physicians throughout the United States complete thousands of job-analysis surveys. These surveys ascertain the specific tasks performed by certified and registered respiratory therapists. The questions, therefore, are job related. The job analysis also ensures the content validity of the credentialing examinations. Each five-year cycle results in more application and analysis questions, with fewer recall questions appearing on the exam. First-time technicians taking the 1999 revised Entry-Level Examination had only a 46.5% pass rate (refer to the table on page x). This new edition can help you prepare for a better exam performance with these features:

- Organization is centered on the 1999 NBRC Exam Matrix in a question/answer format that provides the student with analyses for each answer.
- Pretest and posttest evaluations identify baseline competencies and areas of continued remediation.
- Matrix scoring forms appear in every chapter, along with the complete NBRC examination content outline for reference and review.
- CD-ROM software provides a practice test environment that simulates the actual computerized NBRC exam. Students are able to take the test in learning or test modes, with answers and analyses provided. A timing function is also available to more closely resemble the actual exam.

There is no substitute for preparation and practice. This book has been designed as a tool to help you progress through the credentialing process. Good luck in your professional endeavors.

NBRC Entry-Level Exam Data



	1990	1991	1992	1993	1994 March	1994 July/Nov	1995	1996	1997	1998	1999 March	1999
First-Time Technicians	70.6	71.1	72.2	73.6	72.7	66.6	68.47	67.83	66.8	67	66.9	46
Repeat Technicians	28.4	27.2	25.4	27.3	20	19.9	24.2	23	20	26.1	26.9	6.2
Repeat Therapists	35.7	37.6	31.8	36.3	27.2	29.8	34.8	31.2	34	37	39.9	7.8

*ELE exam revised based on 1993 job analysis: 1st-time technician pass rate: 65.1%
*ELE exam revised based on 1997 job analysis: 1st-time technician pass rate: 46%.

Acknowledgments

I wish to take this opportunity to extend my appreciation to my colleagues who contributed to the writing of *The Entry-Level Examination Review for Respiratory Care: Guidelines for Success* second edition. I am certain that the composite of their clinical experiences and educational expertise will greatly benefit the candidates who use this book to prepare for the NBRC Entry-Level Examination.

Sincere thanks and gratitude are extended to Deanna Winn for her painstaking efforts and patience that she displayed throughout the typing of the manuscript. The fact that she maintained an amiable attitude despite the hardships was inspirational. Her amiability is now a known attribute of her character. How she relishes compiling an art manuscript amazes me further (inside joke).

Special thanks to Fred Hill, MA, RRT for meticulously reviewing the entire manuscript and making insightful suggestions. Special thanks is also extended to Helen A. Jones, RRT, for contributing Chapter 1, which sets the tempo for the remainder of the book.

I am also grateful for the professional assistance provided by Patty Gaworecki, Tara Carter, Doris Smith, and Dawn Gerrain of Delmar Thomson Learning.

Lastly, I welcome suggestions and critiques of all varieties from the reading audience in an effort to enhance the utility of this book.

W. V. W.

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INTRODUCTION

Text Objectives

The objectives of this text are as follows:

1. preparing candidates for the National Board of Respiratory Care (NBRC) Entry-Level Examination
2. providing Entry-Level Examination candidates the opportunity to complete a computer-based practice examination
3. assisting respiratory care students in entry-level and advanced practitioner programs to prepare for course examinations
4. preparing practitioners for legal credentialing (state) examinations
5. streamlining the credentialing examination preparation process by focusing the candidate's attention on the Entry-Level Examination Matrix
6. determining entry-level content areas requiring remediation
7. presenting an organized approach to examination preparation
8. reinforcing learning by providing several cross-references for each question
9. clarifying theoretical and clinical aspects of entry-level respiratory care via analysis of each question
10. providing a self-assessment mechanism for credentialed respiratory care practitioners
11. supplementing hospital in-service programs
12. assisting respiratory care educators with developing evaluation instruments for course examinations
13. assisting respiratory care educators with the development of Entry-Level Examination review sessions

Organization of Book Content

This book consists of six chapters:

Introduction
Chapter 1: Examination Preparation
Chapter 2: Pretest
Chapter 3: Clinical Data
Chapter 4: Equipment
Chapter 5: Therapeutic Procedures
Chapter 6: Posttest

How to Use Each Chapter

Introduction

The introduction provides the following information: (1) states this text's objectives, (2) explains how to use this review book, (3) describes the makeup and content areas contained in the NBRC Entry-Level Examination, (4) provides information on how to prepare for the Entry-Level Examination, and (5) describes the three levels of questions contained on the Entry-Level Examination.

Refer to the matrix of the examination to be familiar with the concepts that are presented on the credentialing examination. You should focus on the specific material described in each matrix item. Doing so will make your study time more efficient. Do not neglect this critical step in the credentialing examination review process. To assist you with this task, all the questions in this book have been categorized into their content areas via the Entry-Level Examination Matrix Scoring Form located in Chapters 2 through 6. You should use the scoring of your results on these forms to develop a prescription for study. Collate your results, and focus your attention on the areas that require remediation.

Chapter 1 • Test Preparation

Embarking on a credentialing examination review process requires a positive attitude. The content of the first chapter in this review book focuses your attention on the task at hand. As formidable an undertaking as the review process seems, a number of practical and relatively easy plans of action are presented to help alleviate your anxiety and stress. Suggestions are provided for organizing a realistic timetable for using the examination review material presented in this text. You are encouraged to make the effort to implement the strategies provided for your use.

Chapter 2 • Pretest (140 Items, Analyses, and References)

The pretest should be performed without the benefit of advance preparation. You should simply take the pretest to establish a baseline for the measurement of your progress through this study guide. Make sure that you allow yourself three hours of uninterrupted time to complete the pretest. That length of time is provided by the NBRC for this credentialing examination. Place yourself in a quiet, well-lit, ventilated area. Be seated on a chair with a back support at a desk or table.

The pretest offers you the opportunity to identify Entry-Level Examination content areas that might require remediation. The pretest parallels the Entry-Level Examination. The items on the pretest match the testing categories found on the Entry-Level Examination. Table I-1 indicates the content areas and the item distribution comprising the pretest.

Table I-1: Pretest Content Areas and Item Distribution

Content Areas	Number of Items
I. Clinical Data	25
II. Equipment	36
III. Therapeutic Procedures	79
TOTAL	140

After completing the pretest, use the answer sheet provided in the book to determine your score. Use the Entry-Level Examination Matrix Scoring Form, located after the analyses, to score each content category and determine content areas that require remediation. Review and study the analyses of the questions you have answered incorrectly, as well as the analyses of the questions that you might have gotten correct by answering with an "educated" guess. In other words, also review the analyses of any questions of which you are unsure.

After studying each question and analysis, refer to the Entry-Level Examination Matrix located within Chapter 2. The matrix outlines all the tasks that fall within the purview of the Entry-Level Examination. You must become familiar with the range of knowledge and cognitive areas for which you are responsible on this credentialing examination. The manner in which to achieve this familiarity is to study the Entry-Level Examination Matrix, as well.

When you have reviewed the appropriate matrix categories, read and study the material indicated by the references. The references are provided to offer you a more detailed account of the concept associated with each question and analysis. By reading the matrix designation before proceeding to the references, you will be more focused on the information pertinent to the matrix category and will be less likely to go off on tangents as you read material in the references. After you have thoroughly reviewed the questions, analyses, matrix designations, and references, proceed to the next chapter.

Chapter 3 • Clinical Data (250 Items, Analyses, and References)

Chapter 3 enables you to evaluate your knowledge in the four categories within this content area:

A. Reviewing patient records and recommending diagnostic procedures
B. Collecting and evaluating clinical information
C. Performing procedures and interpreting results
D. Assessing and developing a therapeutic plan and recommending modifications

Among the four categories encountered in the content area of clinical data, there are 68 matrix designations. Twenty-five of these matrix items are included on the NBRC Entry-Level Examination.

Because there is no way to determine which 25 items relating to clinical data will appear on the Entry-Level Examination, the candidate needs to experience questions from each matrix item. This chapter provides you with practice questions that encompass virtually all the possible types that might be encountered on the actual examination.

In addition to thoroughly studying the questions, analyses, and references for the questions that were either incorrectly answered or answered correctly by guessing, you are encouraged to note the matrix designation of those questions and refer to the Entry-Level Examination Matrix for a clear description of the concept being tested. Remember to use the Entry-Level Examination Matrix Scoring Form associated with this chapter to help identify areas of strength and weakness regarding Clinical Data.

Again, as with all the other chapters, use the answer sheet provided at the beginning of each assessment. You should strive to achieve a score of 75% in this chapter, or 187 correct answers.

Chapter 4 • Equipment (211 Items, Analyses, and References)

This chapter offers you the opportunity to evaluate your understanding of the two categories within this content area:

A. Selecting, obtaining, and assuring equipment cleanliness
B. Assembling, checking, and correcting equipment malfunctions; performing quality control

These two categories are represented by 90 matrix designations. Only 36 items from this section appear on the Entry-Level Examination.

This chapter offers you the opportunity to sample the entire gamut of matrix items, because the assessment presented here contains 211 items regarding equipment. Again, you are urged to completely review the materials that require remediation and cross-reference the items to the Entry-Level Examination Matrix. Use the answer sheet located in front of the test, and employ the Entry-Level Examination Matrix Scoring Form found after the analyses. A score of 75% would result from correctly answering 158 of the 211 items presented.

Chapter 5 • Therapeutic Procedures (235 Items, Analyses, and References)

This chapter enables you to evaluate your comprehension of the seven categories within this content area:

A. Educating patients and maintaining records, communication, and infection control
B. Maintaining an airway and removing bronchopulmonary secretions
C. Assuring ventilation and oxygenation
D. Assessing patient response
E. Modifying therapy/making recommendations based on patient's response; recommending pharmacologic agents
F. Resuscitating in various emergency situations
G. Assisting physician; conducting pulmonary rehabilitation and home care

Chapter 5 provides you with 235 sample questions from this content area. Therefore, to achieve a score (75%) on this assessment, you must minimally answer 176 questions correctly. The Entry-Level Examination Matrix contains 90 matrix designations from the seven content categories found with Therapeutic Procedures. Only 79 items appear on the NBRC Entry-Level Examination, however. As before, careful attention to the remediation process and cross-referencing the questions to the Entry-Level Examination Matrix should prepare you well for this content area.

Chapter 6 • Posttest (140 Items, Analyses, and References)

The posttest is intended to provide you with feedback related to the remediation performed in response to the results obtained on the pretest. The posttest is structured to parallel the NBRC Entry Level Examination in terms of content area and item distribution. The following table demonstrates the organization of the posttest.

Chapter 6 contains a posttest tailored after the Entry-Level Examination. This evaluation tool represents the culmination of a substantial effort on your part and an exhaustive review of the Entry-Level Examination Matrix. The posttest content areas and item distribution are listed in Table I-2.

Table I-2: Posttest Content Areas and Item Distribution

Content Areas	Number of Items
I. Clinical Data	25
II. Equipment	36
III. Therapeutic Procedures	79
TOTAL	140

The posttest should indicate the degree of progress you have made while studying this review book. The posttest should be approached seriously and with confidence, which should have developed over the last few weeks. As with the pretest, the posttest should also be graded immediately, and, for the final time, remediation (questions, analyses, and matrix) and cross-referencing must follow.

Entry-Level Examination Structure

The examination matrix is a detailed content outline describing the content categories that will appear on the Entry-Level Examination. You should become familiarized with the examination matrix. Keep in mind that the items appearing on the credentialing examination have been developed from this outline.

The Entry-Level Examination Matrix provides you with the information that is evaluated on this credentialing examination. The matrix of this test helps evaluate whether the candidate possesses the cognitive skills necessary to function as a Certified Respiratory Technician (CRT) at the entry level.

Entry-Level Examination Matrix

The Entry-Level Examination Matrix is composed of three major content areas:

I. Clinical Data
II. Equipment
III. Therapeutic Procedures

Each of these content areas is divided into a number of subcategories. The subcategories are subdivided into more specific content elements. The complete Entry-Level Examination Matrix follows in Table I-3. Become familiar with this matrix as you prepare for the examination.

NBRC Certification Examination for Entry-Level Certified Respiratory Therapists (CRTs)

Content Outline—Effective July 1999

I. Select, Review, Obtain, and Interpret Data

SETTING: In any patient care setting, the respiratory care practitioner reviews existing clinical data and collects or recommends obtaining additional pertinent clinical data. The practitioner interprets all data to determine the appropriateness of the prescribed respiratory care plan and participates in the development of the plan.

	RECALL	APPLICATION	ANALYSIS
	7	**14**	**4**
A. Review existing data in patient record, and recommend diagnostic procedures.	**2***	**3**	**0**
1. Review existing data in patient record;			
a. patient history [e.g., present illness, admission notes, respiratory care orders, progress notes]		x**	x
b. physical examination [e.g., vital signs, physical findings]		x	x
c. lab data [e.g., CBC, chemistries/ electrolytes, coagulation studies, Gram stain, culture and sensitivities, urinalysis]			x
d. pulmonary function and blood gas results			x
e. radiologic studies [e.g., X-rays of chest/upper airway, CT, MRI]			x
f. monitoring data			
(1) pulmonary mechanics [e.g., maximum inspiratory pressure (MIP), vital capacity]			x
(2) respiratory monitoring [e.g., rate, tidal volume, minute volume, I:E, inspiratory and expiratory pressures; flow, volume, and pressure waveforms]			x
(3) lung compliance, airway resistance, work of breathing			x
(4) dead space to tidal volume ratio (V_D/V_T)			x
(5) non-invasive monitoring [e.g., capnography, pulse oximetry, transcutaneous O_2/CO_2]			x
g. results of cardiovascular monitoring			
(1) ECG, blood pressure, heart rate			x
(2) hemodynamic monitoring [e.g., central venous pressure, cardiac output, pulmonary capillary wedge pressure, pulmonary artery pressures, mixed venous O_2, $C(a-\bar{v})O_2$, shunt studies ($\dot{Q}s/\dot{Q}t$)]			x
h. maternal and perinatal/neonatal history and data [e.g., Apgar scores, gestational age, L/S ratio, pre/post-ductal oxygenation studies]		x	x
2. Recommend the following procedures to obtain additional data:			
a. X-ray of chest and upper airway, CT scan, bronchoscopy, ventilation/ perfusion lung scan, barium swallow			x
b. Gram stain, culture, and sensitivities			x
c. spirometry before and/or after bronchodilator, maximum voluntary ventilation, diffusing capacity, functional residual capacity, flow-volume loops, body plethysmography, nitrogen washout distribution test, total lung capacity, CO_2 response curve, closing volume, airway resistance, bronchoprovocation, maximum inspiratory pressure (MIP), maximum expiratory pressure (MEP)			x
d. blood gas analysis, insertion of arterial, umbilical, and/or central venous pulmonary artery monitoring lines			x
e. lung compliance, airway resistance, lung mechanics, work of breathing			x
f. ECG, echocardiography, pulse oximetry, transcutaneous O_2/CO_2 monitoring			x
B. Collect and evaluate clinical information.	**3**	**7**	**0**
1. Assess patient's overall cardiopulmonary status by inspection to determine:			

*The number in each column is the number of item in that content area and the cognitive level contained in each examination. For example, in category I.A., two items will be asked at the recall level, three items at the application level, and no items at the analysis level. The items could be asked relative to any tasks listed (1–2) under category I.A.

**Note: An "x" denotes the examination does NOT contain items for the given task at the cognitive level indicated in the respective column (Recall, Application, and Analysis).

	RECALL	APPLICATION	ANALYSIS
a. general appearance, muscle wasting, venous distention, peripheral edema, diaphoresis, digital clubbing, cyanosis, capillary refill			x
b. chest configuration, evidence of diaphragmatic movement, breathing pattern, accessory muscle activity, asymmetrical chest movement, intercostal and/or sternal retractions, nasal flaring, character of cough, amount and character of sputum			x
c. transillumination of chest, Apgar score, gestational age			
2. Assess patient's overall cardiopulmonary status by palpation to determine:			
a. heart rate, rhythm, force			x
b. asymmetrical chest movements, tactile fremitus, crepitus, tenderness, secretions in the airway, tracheal deviation, endotracheal tube placement			x
3. Assess patient's overall cardiopulmonary status by percussion to determine diaphragmatic excursion and areas of altered resonance			x
4. Assess patient's overall cardiopulmonary status by auscultation to determine the presence of:			
a. breath sounds [e.g., normal, bilateral, increased, decreased, absent, unequal, rhonchi or crackles (rales), wheezing, stridor, friction rub]			x
b. heart sounds, dysrhythmias, murmurs, bruits			
c. blood pressure			x
5. Interview patient to determine:			
a. level of consciousness, orientation to time, place, and person, emotional state, ability to cooperate			x
b. presence of dyspnea and/or orthopnea, work of breathing, sputum production, exercise tolerance, and activities of daily living			x
c. physical environment, social support systems, nutritional status			x
6. Assess patient's learning needs [e.g., age and language appropriateness, education level, prior disease and medication knowledge]			x
7. Review chest X-ray to determine:			
a. position of endotracheal or tracheostomy tube, evidence of endotracheal or tracheostomy tube cuff hyperinflation			x
b. presence of, or changes in, pneumothorax or subcutaneous emphysema, other extra-pulmonary air, consolidation and/or atelectasis, pulmonary infiltrates			x
c. position of chest tube(s), nasogastric and/or feeding tube, pulmonary artery catheter (Swan-Ganz), pacemaker, CVP, and other catheters		x	x
d. presence and position of foreign bodies			x
e. position of, or changes in, hemidiaphragms, hyperinflation, pleural fluid, pulmonary edema, mediastinal shift, patency, and size of major airways			x
8. Review lateral neck X-ray to determine:			
a. presence of epiglottitis and subglottic edema			x
b. presence or position of foreign bodies			x
c. airway narrowing			x
9. Perform bedside procedures to determine:			
a. ECG, pulse oximetry, transcutaneous O_2/CO_2 monitoring, capnography, mass spectrometry			x
b. tidal volume, minute volume, I:E			x
c. blood gas analysis, $P(A\bullet a)O_2$, alveolar ventilation, V_D/V_D, $\dot{Q}s/\dot{Q}t$, mixed venous sampling			x
d. peak flow, maximum inspiratory pressure (MIP), maximum expiratory pressure (MEP), forced vital capacity, timed forced expiratory volumes [e.g., FEV_1], lung compliance, lung mechanics			x
e. apnea monitoring, sleep studies, respiratory impedance plethysmography			x
f. tracheal tube cuff pressure, volume			x
10. Interpret results of bedside procedures to determine:			
a. ECG, pulse oximetry, transcutaneous O_2/CO_2 monitoring, capnography, mass spectrometry			x
b. tidal volume, minute volume, I:E			x
c. blood gas analysis, $P(A\text{-}a)O_2$, alveolar ventilation, V_D/V_T, $\dot{Q}s/\dot{Q}t$, mixed venous sampling			x
d. peak flow, maximum inspiratory pressure (MIP), maximum expiratory pressure (MEP), forced vital capacity, timed forced expiratory volumes [e.g., FEV_1], lung compliance, lung mechanics			x
e. apnea monitoring, sleep studies, respiratory impedance plethysmography			x
f. tracheal tube cuff pressure, volume			x