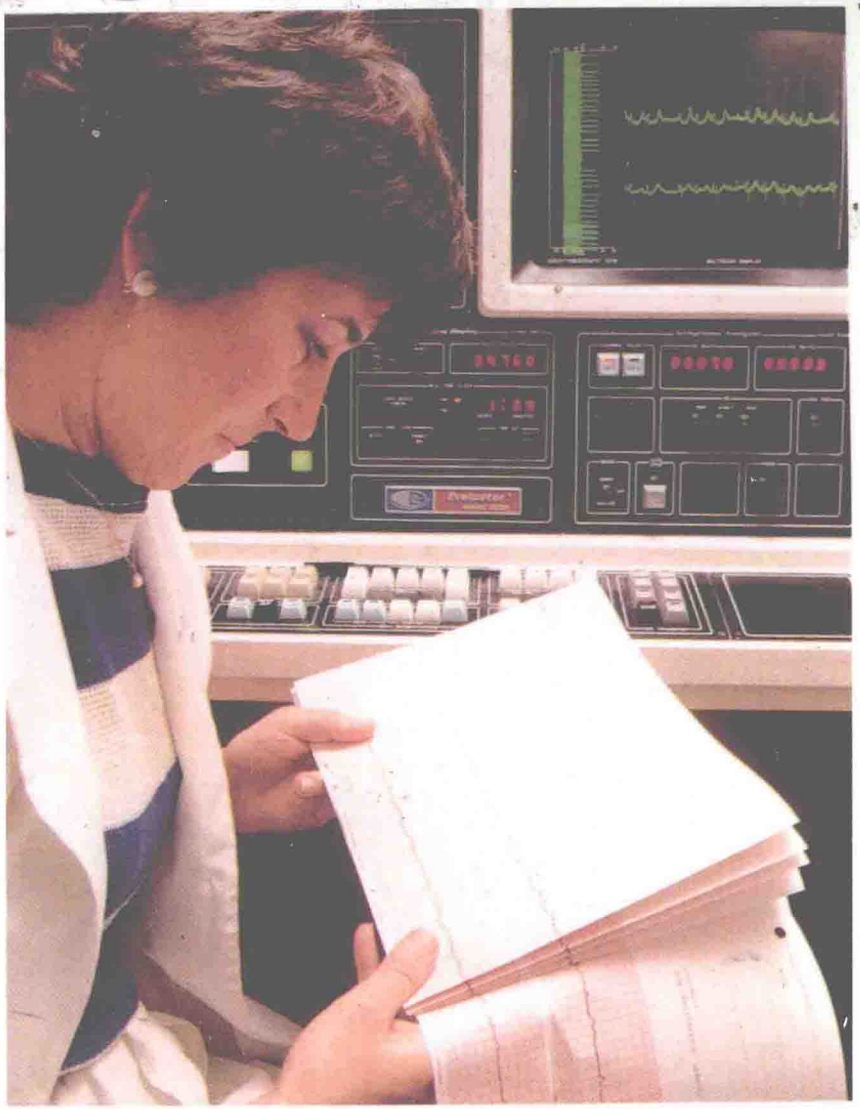
BRADY

# EKG TECHNICIAN



ROBERTA C. WEISS

BRADY

# EKG Technician

**Roberta C. Weiss, LVN, Ed.D.**
Allied Health Curriculum Specialist
Teacher Trainer, UCLA Education Extension Division

Pearson Education

**BRADY**
**PRENTICE HALL CAREER & TECHNOLOGY**
PRENTICE HALL, Upper Saddle River, New Jersey 07458

Library of Congress Cataloging-in-Publication Data

Weiss, Roberta C.
The EKG technician / Roberta C. Weiss.
p. cm.
ISBN 0-89303-702-8
1. Electrocardiography. 2. Medical technology. I. Title.
[DNLM: 1. Allied Health Personnel—education.
2. Electrocardiography. WG 140 W432e]
RC683.5.E5W38 1990
616.1'207547—dc20
DNLM/DLC
for Library of Congress 89-70794
CIP

NOTICE

The procedures and information described in this textbook are based upon consultation and research with formal authorities in the fields of cardiology, electrocardiography, nursing, and allied healthcare technology. To the best of the author's knowledge, such procedures and information reflect currently accepted clinical practice and theory; however, they cannot be considered absolute recommendations. For individual application, the policies and procedures of the institution or agency where the EKG technician is employed or attending school must be reviewed and followed. The author of this textbook, and of any supplements written specifically to go with it, disclaim responsibility for any adverse effects resulting directly or indirectly from the suggested procedures and theory, from any undetected errors, or from the reader's misunderstanding of the text. It is the reader's responsibility to stay informed of any new changes or recommendations made by his or her health care institution, agency, or educational training facility.

Editorial/production supervision and
interior design: Ed Jones
Cover design: Santora
Manufacturing buyer: Dave Dickey
Photo credit: FPG International;
photographer: T. Tracy


©1990 by Prentice-Hall, Inc.
A Pearson Education Company
Upper Saddle River, NJ 07458

All rights reserved. No part of this book may be reproduced, in any form or by any means, without permission in writing from the publisher.

Printed in the United States of America

15

ISBN 0-89303-702-8

Prentice-Hall International (UK) Limited,London
Prentice-Hall of Australia Pty. Limited, Sydney
Prentice-Hall Canada Inc., Toronto
Prentice-Hall Hispanoamericana, S.A., Mexico
Prentice-Hall of India Private Limited, New Delhi
Prentice-Hall of Japan, Inc., Tokyo
Pearson Education Asia Pte. Ltd., Singapore
Editora Prentice-Hall do Brasil, Ltda., Rio de Janeiro

*DEDICATION*

*This textbook is dedicated, with love and respect,*
*to Ms. Marla Keeth, LVN, a "teacher's teacher,"*
*for all of her love, abundant support, patience, understanding,*
*and great desire to help teach all of the students*
*who are fortunate enough to come her way.*

# Preface

This book is written in simple language, and is accompanied by basic illustrations, in order to provide the reader with a well-rounded introduction to the principles and techniques involved in working as an EKG technician.

While the author believes there are many adequate textbooks currently in use that provide the learner with advanced techniques and interpretation of electrocardiograms, it is the goal of this manual to present the student with the "basics" necessary to function as a valued member of the health care delivery team.

The text is divided into 14 chapters, beginning with basic concepts of electrocardiography and concluding with surgical and advanced interventions for the cardiac patient. In addition, the text also addresses understanding and recording of vital signs as well as performing cardiopulmonary resuscitation.

To assist readers in understanding the subject matter, each chapter is accompanied by terminal and competency objectives at the beginning and review questions at the end.

Two appendices provide practice sheets and answers for the interpretation of EKG tracings. A third appendix gives the answers to the end-of-chapter review questions. A series of tear-out flashcards, following the index, is also provided, to help the student interpret different arrhythmias.

*Roberta C. Weiss, LVN, Ed.D.*
*Van Nuys, California*



试读结束，需要全本PDF请购买 www.ertongbook.com

# Acknowledgments

I want to extend my deepest gratitude and appreciation to all those who have assisted me in the preparation and development of this textbook, including:

Ms. Phyllis Stilson, RN, my past nursing instructor and dearest friend, who provided me with the "basics" necessary in the delivery of health care for all patients

All of my teachers and professors in health care, education, and journalism who provided me with the skills and concepts necessary to write this book

Robyn Gilmore, a talented artist, and friend for almost 40 years, who worked around the clock for three days and nights, helping to formulate sketches for illustrations for this text

All EKG technician students, past and present, who showed me there was a need to develop a text simple enough to meet their individual needs

Ms. Gretchen Spence, National Director of Education for Concord Career colleges, for all of her feedback in delineating the needs of the EKG technician student

Mr. Mike Robison, equipment specialist for Mission Medical Supply, Inc., for all his help in providing me information regarding the different types of EKG machines currently in use

Finally, I want to thank Mr. Matt McNearney, Health Occupations Editor, for all of his help, understanding, cooperation, and, particularly, his willingness to take a chance on me.

# Contents

试读结束，需要全本PDF请购买 www.ertongbook.com

# Introduction to Electrocardiography

# 1

## TERMINAL OBJECTIVE

To introduce the student to the study of electrocardiography through a brief history of the concept and identification of the members of the electrocardiography department.

## COMPETENCY OBJECTIVES

Upon completion of this chapter, the student will be able to:

1. Correctly spell and define terminology related to the study of electrocardiography.
2. Give a brief account of the history of electrocardiography.
3. Describe the various careers and personnel who may work in the EKG department.
4. Describe the duties and responsibilities of the EKG technician.
5. Briefly explain the educational requirements of the EKG technician.
6. List some of the personal characteristics and qualities desirable for the EKG technician.

## HISTORY OF ELECTROCARDIOGRAPHY

Before we can go on to learn about the role or function of the electrocardiograph technician, it is important that you grasp how this precise measurement of the heart's function first came about.

The association of electricity with the heart's muscle activity, or what is more commonly known as *electrocardiography,* has been known for more than 200 years; however, it was not until the end of the nineteenth century that quantitative measurement of muscle electricity even became a possibility. Earlier, there was no instrument (or what is now referred to as a *galvanometer*) sensitive enough to detect the extremely small electrical signals associated with muscle contraction. In the case of the human heart, the problem was magnified by the fact that measurements had to be made on the surface of the body, where the signal was greatly attenuated.

Though several earlier devices were developed, the first practical recording galvanometer sensitive enough to detect the electrocardiograph was developed in Holland in 1903 by an electrical scientist by the name of William Einthoven. Einthoven's instrument, termed a "string galvanometer," consisted of an extremely fine quartz wire, much finer than a human hair, which was suspended between the poles of a powerful electromagnet. The wire was made conductive, or electrically active, by coating it with a fine layer of silver, whose ends were connected to the patient. The minute currents that would flow through the wire, resulting from the heart's electrical voltages, then caused it to deflect slightly into the magnetic field. Finally, a beam of light, which was focused onto the wire, would then cast a shadow that was magnified and projected onto a photographic plate.

Over a period of time, Einthoven communicated his discovery to his friend, Sir Horace Darwin, founder of the Cambridge Scientific Instrument Company, located in England, as well as to Professor Horalto Williams, in the United States. However, when representatives of both scientists visited Einthoven, they soon discovered that his original instrument was so bulky that it occupied two rooms and needed five people to operate it. Although both scientests indicated that the size of Einthoven's "electrical instrument" was much too large to warrant their involvement in its manufacture, based on scientific papers published by Einthoven, they did believe it demonstrated some dramatic medical benefits. Therefore, although Darwin's feelings about development of the instrument still remained "lukewarm," he also believed its manufacture could eventually assist the medical community in measuring the heart's electrical impulses. Based on this notion, he contracted with

Einthoven to transform his invention into a more practical, commercial instrument.

Meanwhile, in the United States, Professor Williams and his assistant, Charles Hindle, had already begun work on their own instrument. By 1922, the two scientists merged with Darwin's Cambridge Company and have since continued their joint development and manufacturing of what came to be known as electrocardiograph machines.

Though considered a major improvement over Einthoven's original model, the first Cambridge electrocardiograph machine weighed over 350 pounds. By 1930, after modifications were made to reduce its size, a compact instrument, weighing 30 pounds, was eventually produced. The original carbon arc lamp was replaced by a filament bulb, and the glass photographic plate was changed to a sheet film. The galvanometer itself eventually became greatly reduced in size, including the clumsy porcelain pot electrodes that were replaced by small plates of nickel-silver alloy.

While major changes had occurred in the actual size of the instrument, the next major advance was to employ a thermionic vacuum tube amplifier that would amplify the electrocardiograph signal, thereby making it so powerful that it would drive a direct-writing galvanometer.

Once the size of the instrument had been greatly reduced, discovery of the transistor's use in its manufacture was only a few years away. By the late 1940s, the use of what has come to be known as the solid-state electronic electrocardiographic instrument began to be commercially produced, evolving into what many physicians have come to depend upon for the measurement of the electrical impulses on the human heart. (See Figure 1–1.)

## DEFINING THE ELECTROCARDIOGRAPH TRACING

Before we can even begin to understand the purpose of the electrocardiograph and the role the electrocardiograph technician plays in securing this scientific measurement, it is extremely important that you understand what exactly an electrocardiographic tracing represents.

An electrocardiographic tracing, sometimes referred to as an EKG or ECG, utilizes an electronic device, called an electrocardiographic machine, in order to measure or record the electrical charges that occur during a complete heartbeat. These recordings help the physician to diagnose any irregularities or changes in the patient's heart action, and they are usually performed routinely as the patient ages as well as before or after surgery, and as a diagnostic tool in assisting the physician in caring for the patient. (See Figures 1–2 and 1–3.)

## THE EKG DEPARTMENT

While many physicians perform electrocardiograms in their office, the majority are done in the hospital or in outpatient facilities or clinics. In the hospital, the EKG department may be housed as a separate unit or as part of another department. Many smaller hospitals, for example, house

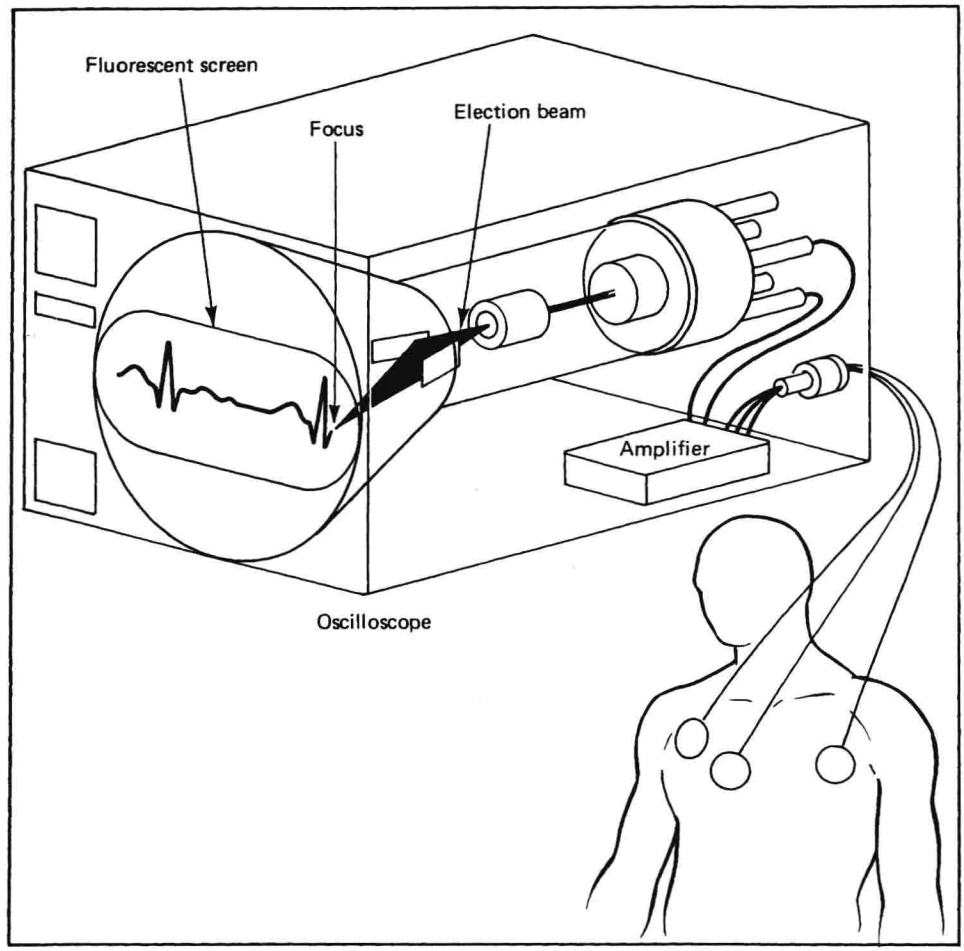



**Figure 1–1** The use of the oscilloscope as a means of recording the electrocardiogram.

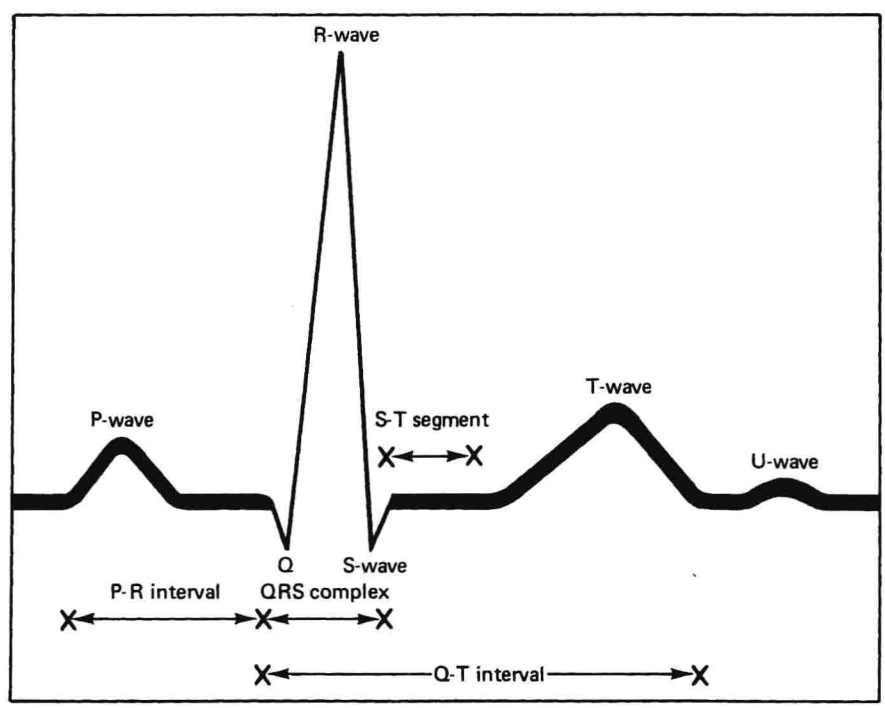



**Figure 1–2** The EKG cycle.

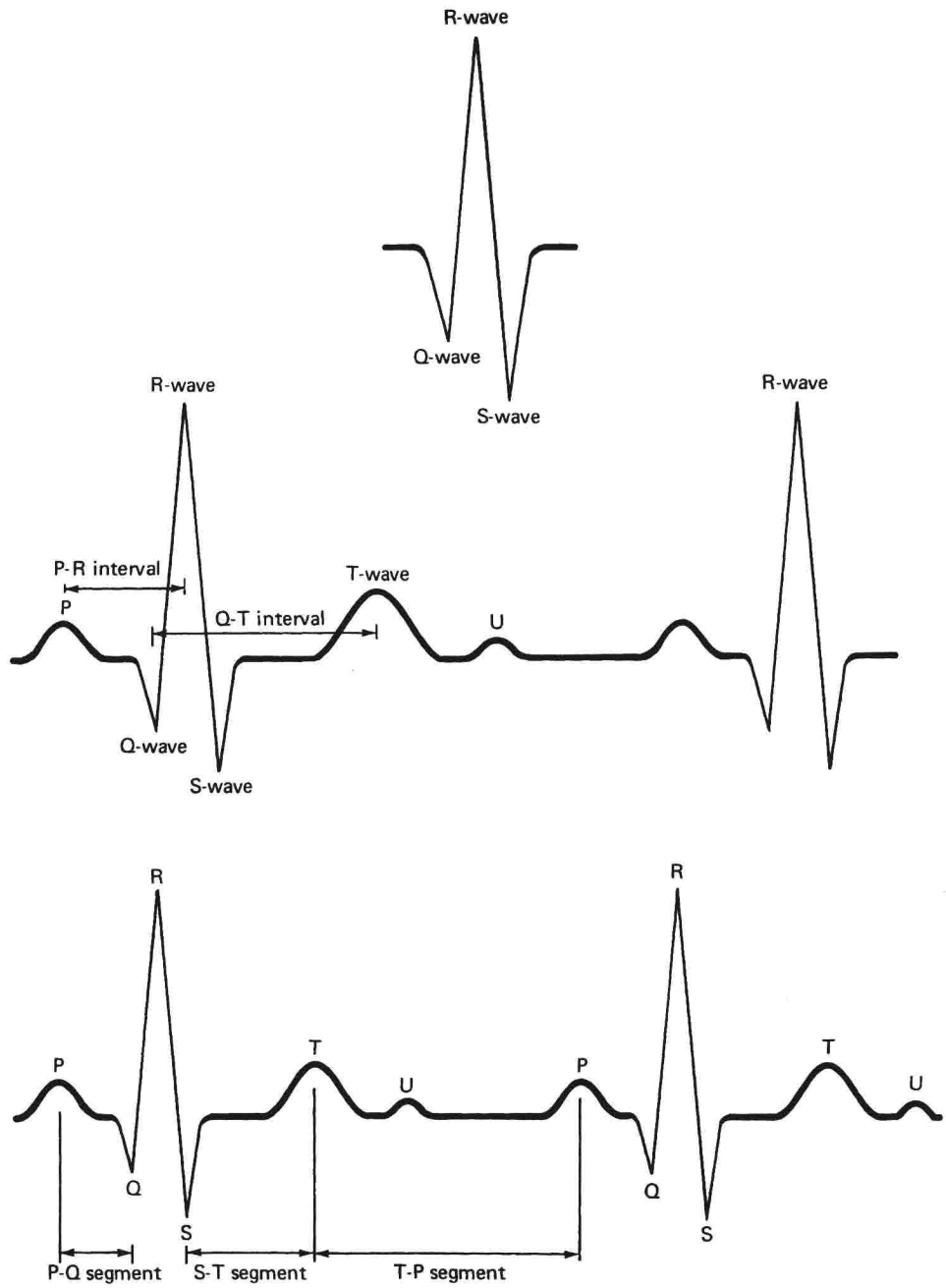



**Figure 1–3** Complexes, waves, intervals, and segments of the electrocardiogram.

both their respiratory therapy and their EKG units in one combined area, often referred to as the *cardiopulmonary department.*

## MEMBERS OF THE EKG DEPARTMENT

Both the size of the department and the number of EKGs performed will greatly affect the number of people associated with the EKG department. In most large medical facilities, such as hospitals and medical centers,

there are usually four levels of career ladder positions found within the EKG department. These levels include the EKG Technician I, the EKG Technician II, the Cardiovascular Technician, and the Cardiologist, or the medical doctor responsible for overseeing the entire department. In addition to these four major positions, there may also be other members of the staff whose role is related or more specialized but who may also be considered members of the EKG department. These include a Treadmill Technician, a Holter Recorder Scanning Technician, an Echocardiograph Technician, and a Cardiac Catheterization Technician.

### The Cardiovascular Technician

The role of the cardiovascular technician involves the responsibility of analyzing arterial and venous blood bases and acid-based variables. This individual is also responsible for collecting respiratory gases and operating certain equipment, as well as performing certain invasive and noninvasive procedures, including any emergency therapeutic procedures, as the situation may warrant.

In addition to working within the EKG department, the cardiovascular technician may also be a member of the cardiac catheterization laboratory, the coronary care or intensive care unit, and the emergency room department. When not required to perform certain diagnostic and invasive and noninvasive tests, this person's primary responsibility is to be on standby as a member of the coronary or heart emergency care team, and to assist during any emergency situations that might arise.

### The Cardiologist

As we have already stated, a cardiologist is a medical doctor specializing in the care and treatment of patients with conditions affecting the heart and the cardiovascular system. This individual is responsible for both ordering and interpreting all medical tests that might be necessary for the accurate diagnosis and treatment of heart disorders. The cardiologist is also responsible for overseeing the smooth performance of the EKG equipment, and in many case the coronary care, intensive care, and emergency room departments of a large hospital.

### The EKG Technician

The EKG technician, working under the direction of a cardiology supervisor or cardiologist, is responsible for performing routine EKGs as well as any procedures related to the position (as defined by the facility in which the technician works) as well as the training which the technician has completed. This individual is also responsible for operating certain equipment utilized in the performance of the position as well as performing certain tests that may be necessary for patient treatment within the hospital or in the medical office or clinic.

Responsibilities of the EKG technician may vary according to the level of training and the environment in which he or she is employed;

试读结束，需要全本PDF请购买 www.ertongbook.com