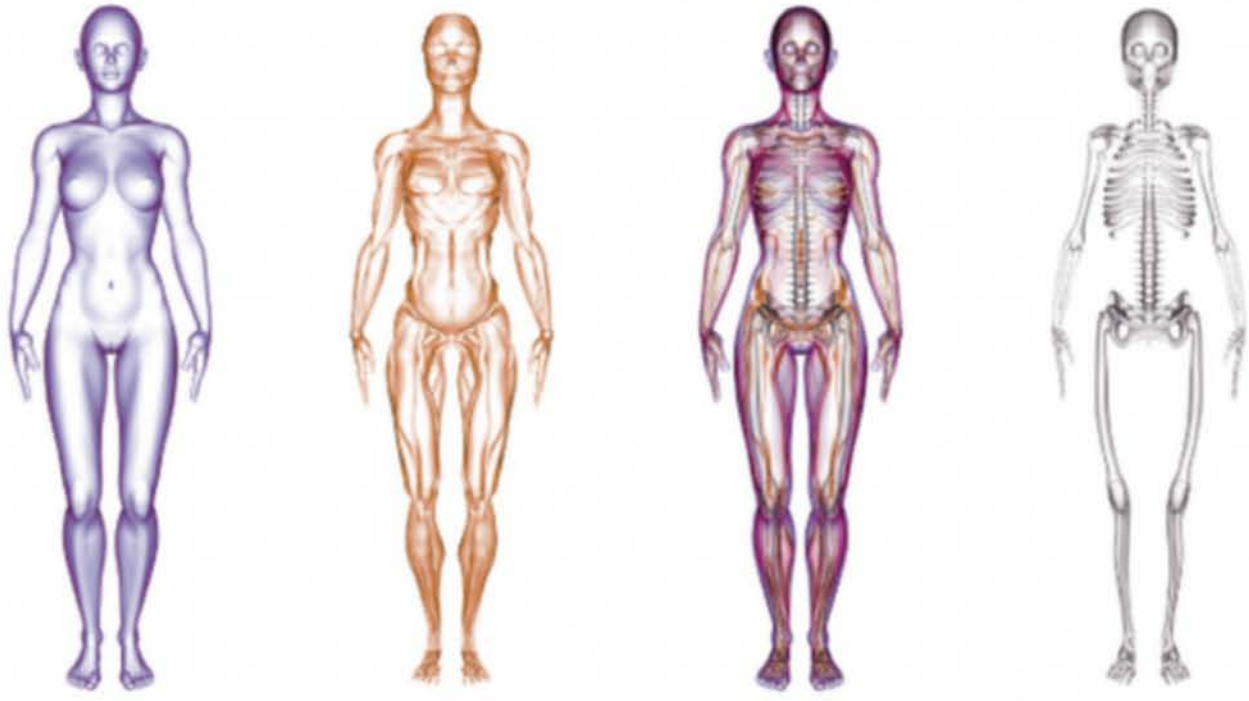
FUNDAMENTALS OF ANATOMY AND PHYSIOLOGY FOR STUDENT NURSES

EDITED BY IAN PEATE AND MURALITHARAN NAIR



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Fundamentals of Anatomy and Physiology for Student Nurses

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Short contents

Contents

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1.1, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.1, 2.3, 2.5, 2.6, 2.7, 3.1, 3.2, 3.3, 3.8, 3.10, 3.11, 3.12, 3.13, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12, 4.14, 4.15, 4.16, 5.1, 5.2, 6.2, 6.3, 6.5, 6.6, 6.7, 6.8, 6.9, 6.11, 6.12, 6.14, 6.15, 6.16, 7.1, 7.7, 7.9, 8.1, 8.2, 8.3, 8.5, 8.8, 8.9, 9.1, 9.3, 9.4, 9.5, 9.10, 9.11, 10.1, 10.2, 10.5, 10.6, 10.8, 10.9, 10.11, 11.1, 11.2, 11.3, 11.4, 11.6, 11.11, 11.12, 11.14, 11.15, 12.1, 12.2, 12.5, 12.6, 12.8, 12.9, 12.10, 12.11, 12.12, 12.13, 12.14, 12.16, 12.18, 12.19, 12.21, 12.22, 13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.7, 13.8, 13.9, 13.11, 13.12, 13.13, 13.14, 13.15, 14.1, 14.3, 14.4, 14.5, 14.6, 14.7, 14.9, 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.8, 15.9, 15.10, 15.11, 15.13, 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7, 16.8, 16.9, 16.10, 16.12, 16.13, 16.14, 16.15, 16.16, 16.18, 16.19, 16.20, 17.1, 17.2, 17.3, 17.5, 17.6, 17.7, 17.9, 17.10.

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2.2, 2.4, 2.10, 2.12, 3.4, 5.3, 5.4, 5.5, 5.6, 7.5, 7.10, 7.11, 7.12, 7.13, 11.5, 11.9, 11.10, 13.16, 14.8, 15.12.

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Introduction

The contributors to this text are all committed to the provision of high quality care. The authors are all experienced academics working in higher education, with many years of clinical experience, knowledge and skills, teaching a variety of students at various academic levels. We are confident that after you have gained a sound understanding of the anatomy and physiology of the various bodily systems you will be able to understand better the needs of the people you have the privilege to care for. High quality care for all is something we should be striving to provide but it is not possible to do this effectively if we do not fully appreciate the whole being, the whole person. This text has been formulated in such a way that we hope you enjoy reading it, and more importantly that you are hungry to learn more, that you will be tempted to delve deeper and that you grow and develop.

The companion to this book, *The Fundamentals of Applied Pathophysiology* (Nair & Peate 2009) will aid in your development and understanding. It is essential in any programme of study related to the provision of care that you are confident and competent in this field of study. It is not enough that you remember all of the facts (and there are many of these) that are associated with anatomy and physiology; you must be able to relate these to the people you care for. Some of these people may be vulnerable and at risk of harm; you have a duty to ensure that you are knowledgeable. *Fundamentals of Anatomy and Physiology for Student Nurses* will help you. The Standards for Pre Registration Nursing Education (Nursing and Midwifery Council, 2010) make it clear that you must be competent in a number of spheres in order to register successfully with the Nursing and Midwifery Council.

The human body is as beautiful on the inside as it is on the outside; the mind and the body when working in harmony is a fantastic machine capable of extraordinary things. Healthcare students work and study both in the hospital and the community setting where they will meet and care for patients with diverse altered anatomical and physiological problems. Using a fundamental approach with a sound anatomical and physiological understanding will provide healthcare students with an essential basis on which to offer care.

Anatomy and physiology

Anatomy can be defined simply as the science related to the study of the structure of biological organisms; many dictionaries use such a definition. *Fundamentals of Anatomy and Physiology for Student Nurses* focuses on human anatomy, and the definition for the purposes of this text is a study of the structure and function of the human body. This allows for reference to function as well as structure; in all biological organisms structure and function are closely interconnected. The human body operates through interrelated systems.

The term anatomy is Greek in origin and means 'to cut up' or 'to dissect'. While the first scientifically based anatomical studies (attributed to a 16th-century Flemish anatomist, doctor and artist, Vesalius) were based on observations of cadavers (dead bodies), modern approaches to human anatomy differ as they include other ways of observation, for example, with the aid of a microscope and other imaging tools. Subdivisions are now affiliated within the broader field of anatomy; the word anatomy is often preceded with an adjective that identifies the method of observation, for example, gross anatomy (the study of body parts visible to the naked eye, for example, the heart or the bones) or microanatomy (where body parts, for example, cells or tissues are only visible with the use of a microscope).

Living systems can be defined from a number of perspectives:

- At the very smallest level, the chemical level, atoms, molecules and the chemical bonds connecting atoms provide the structure upon which living activity is based.
- The smallest unit of life is the cell. Specialised bodies – organelles – within the cell carry out particular cellular functions. Cells may be specialised, for example, bone cells and muscle cells.
- Tissue is a group of cells that are similar and they perform a common function. Muscle tissue, for example, is made up of muscle cells.
- Organs are groups of different types of tissues performing together to carry out a specific activity. The stomach is an organ made up of muscle, nerve and tissues.
- A system is two or more organs working together to carry out a particular activity. The digestive system, for example, comprises the coordinated activities of a number of organs, including the mouth, stomach, intestines, pancreas and liver.
- Another system that possesses the characteristics of living things is an organism; this has the capacity to obtain and process energy, the ability to react to changes in the environment and the ability to reproduce.

As anatomy is associated with the function of a living organism it is almost always inseparable from physiology. Physiology can be described as the science which deals with the study of the function of cells, tissues, organs and organisms.

Physiology is concerned with how an organism carries out its many activities, considering how it moves, how it is nourished, how it adapts to changing environments – human and animal, hostile and friendly. It is the study of life.

Physiology is the foundation upon which we build our knowledge of what life is; it can help us to decide how to treat disease as well as helping us to adapt and manage changes imposed on our bodies by new and changing surroundings – internal and external. Studying physiology will help you understand disease (pathophysiology) arising from this; physiologists are able to develop new ways for treating diseases.

Just as there are a number of branches of anatomical study, so too are there a number of physiological branches that can be studied, for example, endocrinology, neurology and cardiology.

The chapters

There are 17 chapters. The text is not intended to be read from cover to cover, but you may find reading the first three chapters will help you come to terms with some of the complex concepts; we encourage you to delve in and out of the book. The chapters use simple and generously sized full colour art work to assist you in understanding and appreciating the complexities associated with the human body from an anatomical and physiological perspective. There are many features

contained within each chapter that assist you to build upon and develop your knowledge base; we would encourage you to get the most out of this book.

Getting the most out of your copy of *Fundamentals of Anatomy and Physiology for Student Nurses*

The text takes the reader from the microscopic to macroscopic level in the study of anatomy and physiology. The contents demonstrate the movement from cells and tissues through to systems. This approach to teaching is a tried and tested approach when helping learners understand a topic area that can sometimes be seen as complex.

This book has been written with these key principles in mind, to help inform your practice as well as your academic work. A number of features are provided to help bring to life the fascinating subject of human anatomy and physiology.

Each chapter begins with several questions that are posed to test your current knowledge and which will allow you to pre-test. Learning outcomes are provided. These will cover the content within the chapter but only you can do the learning; these outcomes are what are expected of you after reading and absorbing the information. This is a minimum of what you can learn; do not be constrained by the learning outcomes, they are only there to guide you. Where appropriate an anatomical map is provided; the anatomical map is related to the chapter you are reading, this allows you to visualise the anatomy being discussed.

Another feature in the chapter that is provided to help you consider people you care for, to help you make clinical links, are the boxes in most of the chapters called Clinical considerations. These boxes demonstrate the application to your learning citing specific care issues that you may come across when working with people in clinical settings.

At the end of the chapter you are provided with a bank of multiple choice questions that are based on the content of the chapter. Some of the answers to the questions are not found in the text; in this case you are encouraged to seek out the answers helping to develop your learning further.

Other features provided will help you measure the learning that has taken place, for example, true or false, label the diagram, find out more, crosswords or word searches; they are meant to be fun but they also aim to pull together the content of the chapter.

The feature called Conditions provides you with a list of conditions that are associated with the topics discussed in the chapter. You are encouraged to take some time to write notes about each of the conditions that have been described; this will help you relate theory to practice. You can make notes taken from other textbooks or other resources, for example, people you work with in a clinical area, or you may make the notes as a result of people you have cared for. It is important however that if you are making notes about people you have cared for you must ensure that you adhere to the rules of confidentiality.

A glossary of terms is provided at the end of every chapter. We present this to facilitate the learning of difficult words or phrases; understanding these words and phrases is important to your success as a healthcare student. When you have mastered the words your medical vocabulary will have grown and you will be in an ideal position to develop it further.

Patient notes are provided as an accompaniment to the text as a part of the web resources feature. These notes can be read at the beginning of the chapter as this will enable you to relate the issues being discussed to the people you may care for. We would suggest you revisit the patient notes several times as you work your way through each chapter – making a link from

theory to practice and practice to theory. The patient notes are there merely to help you visualise, contextualise and to think about the application of theory to practice.

The use of computers and other electronic resources now play a central role in education as well as the education of nurses and other healthcare students with many universities using virtual learning environments. The electronic resources associated with this book are designed to help enhance your learning; they are varied and informative and are visually stimulating.

The text is accompanied by a raft of electronic resources that will support your learning. These resources can be used in your own place at your own pace. The aim is to encourage further learning and to build upon what you know already. There are also links to other resources. Using the electronic resources alongside the book as well as the human resources you will meet in practice will enhance the quality of your learning. The electronic resources available cannot replace the more conventional face to face learning with other students, lecturers, registered nurses and patients; they complement it.

What's in a name?

The use of terminology is important. Sometimes the term 'the patient' has been used in this text; universally the term is used because it is easier to do so and it is commonly understood. There are some possible dangers with this as it implies the person is in receipt of medical care and this can then mean that the care provider has the upper hand. This suggestion must be avoided at all costs as those in receipt of care are participants and the person offering care should be acting as advocate.

Throughout this text we have chosen to use a multitude of words that may be used to describe the people you care for, for example, patient, person, service user. These words (and many more) are used in everyday practice and you will come across them when you are in clinical and healthcare settings. The most important thing to remember is that the people being cared for are people, not labels or names attached to them. The Patients Association (2009) suggest: 'Patients not numbers … People not statistics'.

When you are caring for people on an individual basis you must ask them what they would prefer you to call them. Some people are content with you addressing them by their first name, others may not be and you must, from the beginning of the therapeutic relationship, determine what the individual prefers; this demonstrates respect.

Just because a person becomes ill, prone to illness or vulnerable, they do not lose all their own values and beliefs, their sense of self as mother, father, lover, partner, brother or sister. How a person is addressed can impact on their health and wellbeing.

You may also note that we have used a variety of words to describe you, the reader. We have done this because we know that many people from a variety of backgrounds will read and use this text. All of us are learners and this is the perspective that we have used when writing this text.

The provision of a world-class health and social care service

The National Health Service (NHS) is the main provider (but not the only one) of health care in the United Kingdom (UK); the NHS belongs to all of us. There are thousands of healthcare workers