chapter 11 the cardiovascular system

chapter 11 the cardiovascular system is a crucial subject for anyone studying human anatomy and physiology. This article provides a comprehensive exploration of the cardiovascular system, as presented in Chapter 11 of most standard textbooks. You'll discover the anatomy of the heart, the intricacies of blood vessels, and the essential functions of blood circulation. The article examines heart structure, cardiac cycle, major blood vessels, types of circulation, and common cardiovascular diseases. Whether you're a student, educator, or health enthusiast, this guide delivers clear, SEO-optimized information designed to help you understand the cardiovascular system's critical role in maintaining health. Read on to gain detailed insights, practical knowledge, and key terminology all in one place.

Overview of Chapter 11 the Cardiovascular System

Chapter 11 the cardiovascular system introduces the foundation for understanding how blood circulates throughout the body. The cardiovascular system consists of the heart, blood vessels, and blood, working together to transport oxygen, nutrients, hormones, and waste products. This chapter emphasizes the importance of the cardiovascular system in sustaining life, supporting cellular function, and maintaining body temperature. Readers learn about the interconnectedness of each component, how they coordinate to ensure tissue survival, and the profound impact on overall health. The following sections delve into key structures and physiological processes covered in this essential chapter.

Heart Anatomy and Structure

Location and General Features

The heart is a muscular organ situated in the thoracic cavity, between the lungs and slightly left of the midline. It is protected by the pericardium, a double-walled sac that reduces friction during contractions. The heart’s size is comparable to a closed fist, and its unique structure enables efficient blood flow throughout the body.

Chambers of the Heart

- Right Atrium: Receives deoxygenated blood from the body via the superior and inferior vena cava.
- Right Ventricle: Pumps blood to the lungs through the pulmonary artery for oxygenation.
- Left Atrium: Receives oxygenated blood from the lungs via the pulmonary veins.

- Left Ventricle: Pumps oxygen-rich blood to the body through the aorta.

These four chambers work together in a coordinated sequence to ensure continuous circulation.

Valves of the Heart

The heart contains four main valves to prevent backflow of blood and maintain one-way circulation. The atrioventricular valves (tricuspid and bicuspid/mitral) separate the atria from the ventricles, while the semilunar valves (pulmonary and aortic) control blood flow from the ventricles into major arteries. Proper valve function is vital for effective circulation.

The Cardiac Cycle and Heart Function

Phases of the Cardiac Cycle

The cardiac cycle refers to the sequence of events during one heartbeat. It is divided into systole (contraction phase) and diastole (relaxation phase). During systole, the ventricles contract, pushing blood into the arteries. During diastole, the heart chambers relax and fill with blood. This rhythmic cycle ensures a steady and controlled flow of blood.

Conduction System of the Heart

The heart's electrical conduction system controls the timing of contractions. Key components include the sinoatrial (SA) node, atrioventricular (AV) node, bundle of His, bundle branches, and Purkinje fibers. The SA node acts as the natural pacemaker, initiating each heartbeat and coordinating the

cardiac cycle.

Cardiac Output

Cardiac output is the volume of blood pumped by each ventricle per minute. It is calculated as heart rate multiplied by stroke volume. Maintaining optimal cardiac output is essential for sufficient tissue perfusion and overall health.

Blood Vessels: Types and Functions

Arteries

Arteries are thick-walled vessels that carry oxygenated blood away from the heart, except for the pulmonary arteries which carry deoxygenated blood to the lungs. Their muscular walls help withstand high pressure from the heart’s pumping action.

Veins

Veins carry deoxygenated blood back to the heart, except for the pulmonary veins which transport oxygenated blood from the lungs. Veins contain valves to prevent backflow and rely on skeletal muscle movement for blood flow.

Capillaries

Capillaries are microscopic vessels that connect arteries and veins. Their thin walls allow for the

exchange of gases, nutrients, and waste products between blood and tissues. Capillary networks are vital for cellular respiration and nutrient delivery.

Blood Circulation Pathways

Pulmonary Circulation

Pulmonary circulation describes the movement of blood between the heart and lungs. Deoxygenated blood flows from the right ventricle to the lungs via the pulmonary artery, where it receives oxygen and releases carbon dioxide. Oxygenated blood then returns to the left atrium through the pulmonary veins.

Systemic Circulation

Systemic circulation involves the flow of oxygen-rich blood from the left ventricle throughout the body, delivering nutrients and oxygen to tissues, and returning deoxygenated blood to the right atrium. This extensive network supports all body systems.

Coronary Circulation

Coronary circulation refers to the supply of blood to the heart muscle itself. Coronary arteries branch from the aorta, ensuring the myocardium receives necessary nutrients and oxygen for effective function.

Cardiovascular Regulation and Homeostasis

Neural Regulation

The autonomic nervous system regulates heart rate and vessel diameter. The sympathetic division increases heart rate and contractility during stress or activity, while the parasympathetic division slows the heart rate during rest.

Hormonal Control

Hormones such as adrenaline, noradrenaline, and antidiuretic hormone impact cardiovascular function. These hormones can alter heart rate, blood pressure, and vascular resistance in response to physiological demands.

Blood Pressure Maintenance

Blood pressure is regulated through baroreceptors, which detect changes and initiate corrective responses. Proper blood pressure is essential for tissue perfusion and prevention of cardiovascular complications.

Common Disorders of the Cardiovascular System

Hypertension

Hypertension, or high blood pressure, is a chronic elevation of arterial pressure that can lead to heart

disease, stroke, and kidney damage. It is often asymptomatic and requires regular monitoring and management.

Atherosclerosis

Atherosclerosis is the buildup of plaque within arterial walls, restricting blood flow and increasing the risk of heart attacks and strokes. Factors such as high cholesterol, smoking, and diabetes contribute to its development.

Heart Failure

Heart failure occurs when the heart cannot pump sufficient blood to meet the body’s needs. Symptoms include fatigue, shortness of breath, and fluid retention. It is commonly caused by coronary artery disease, hypertension, or previous heart attacks.

Arrhythmias

Arrhythmias are abnormal heart rhythms resulting from irregular electrical activity. Common types include tachycardia (fast heart rate), bradycardia (slow heart rate), and atrial fibrillation. Diagnosis and treatment are essential to prevent complications.

Key Terms and Concepts

- Myocardium: Muscular tissue of the heart responsible for contractions.

- Pericardium: Protective sac surrounding the heart.
- Sinoatrial (SA) Node: Pacemaker of the heart.
- Stroke Volume: Amount of blood ejected per heartbeat.
- Baroreceptors: Pressure-sensitive cells involved in blood pressure regulation.
- Coronary Arteries: Vessels supplying blood to the heart muscle.
- Blood Pressure: Force exerted by blood against vessel walls.
- Systemic Circulation: Blood flow to the body's organs and tissues.
- Pulmonary Circulation: Blood flow between the heart and lungs.

Trending Questions and Answers about Chapter 11 the Cardiovascular System

Q: What are the main components of the cardiovascular system described in chapter 11?

A: The main components are the heart, blood vessels (arteries, veins, and capillaries), and blood.

Q: How does the cardiac cycle function in the cardiovascular system?

A: The cardiac cycle consists of systole (contraction) and diastole (relaxation), ensuring the heart pumps and fills efficiently with each heartbeat.

Q: What role do valves play in the heart's function?

A: Heart valves prevent backflow of blood, ensuring one-way circulation through the heart's chambers and major vessels.

Q: How is blood pressure regulated in the cardiovascular system?

A: Blood pressure is regulated by neural mechanisms, hormones, and baroreceptors that adjust heart rate and vessel diameter as needed.

Q: What are common cardiovascular disorders covered in chapter 11?

A: Common disorders include hypertension, atherosclerosis, heart failure, and arrhythmias.

Q: What is the importance of coronary circulation?

A: Coronary circulation supplies oxygen and nutrients directly to the heart muscle, ensuring it functions effectively.

Q: Why are capillaries important in the cardiovascular system?

A: Capillaries allow for the exchange of oxygen, nutrients, and waste products between blood and body tissues.

Q: What is the difference between pulmonary and systemic circulation?

A: Pulmonary circulation moves blood between the heart and lungs for oxygenation, while systemic circulation delivers oxygenated blood to the body and returns deoxygenated blood to the heart.

Q: How does the autonomic nervous system affect heart rate?

A: The sympathetic nervous system increases heart rate and contractility, while the parasympathetic system slows it down for relaxation.

Q: What are baroreceptors and their function in the cardiovascular system?

A: Baroreceptors are pressure-sensitive cells that detect changes in blood pressure and trigger responses to maintain homeostasis.

Chapter 11 The Cardiovascular System

Chapter 11: The Cardiovascular System: A Comprehensive Guide

Introduction:

Have you ever wondered about the tireless engine that keeps you alive, pumping blood throughout

your body day and night? That's your cardiovascular system, the remarkable network of blood vessels and the heart that's the subject of this in-depth exploration of Chapter 11. This blog post will dissect the intricacies of the cardiovascular system, covering its key components, functions, and common health concerns. Whether you're a student preparing for an exam, a health enthusiast wanting to understand your body better, or simply curious about this vital system, this guide offers a comprehensive overview of everything you need to know about Chapter 11: The Cardiovascular System. We'll delve into the heart's structure and function, explore the various types of blood vessels, and discuss the vital role of blood itself.

1. The Heart: The Powerhouse of the Cardiovascular System

The heart, a muscular organ roughly the size of your fist, sits at the center of the cardiovascular system. Its rhythmic contractions propel blood throughout the body, delivering oxygen and nutrients while removing waste products.

1.1 Cardiac Anatomy: A Closer Look

The heart is divided into four chambers: two atria (receiving chambers) and two ventricles (pumping chambers). Valves between these chambers ensure one-way blood flow. The right side of the heart pumps deoxygenated blood to the lungs, while the left side pumps oxygenated blood to the rest of the body.

1.2 The Cardiac Cycle: A Rhythmic Beat

The cardiac cycle describes the sequence of events in one heartbeat, encompassing atrial and ventricular contractions and relaxation. This coordinated process ensures efficient blood circulation. Understanding the intricacies of the cardiac cycle is crucial to comprehending the heart's function.

1.3 Electrical Conduction System: Maintaining the Rhythm

The heart's rhythmic beating is controlled by its intrinsic electrical conduction system, a network of specialized cells that generate and transmit electrical impulses. This system ensures the coordinated contraction of the heart muscle.

2. Blood Vessels: The Highways of the Body

Blood vessels form an extensive network, transporting blood to every cell in the body. They are categorized into arteries, veins, and capillaries.

2.1 Arteries: Carrying Oxygenated Blood Away

Arteries, with their thick, elastic walls, carry oxygenated blood away from the heart to the body's tissues. The largest artery is the aorta. Arterioles are smaller branches of arteries that regulate blood flow to capillaries.

2.2 Veins: Returning Deoxygenated Blood to the Heart

Veins carry deoxygenated blood back to the heart. They have thinner walls than arteries and contain valves to prevent backflow. Venules are small veins that collect blood from capillaries.

2.3 Capillaries: The Sites of Exchange

Capillaries are microscopic vessels connecting arterioles and venules. Their thin walls allow for the exchange of oxygen, nutrients, and waste products between blood and tissues.

3. Blood: The Life-Sustaining Fluid

Blood, a complex fluid tissue, plays a critical role in transporting oxygen, nutrients, hormones, and waste products.

3.1 Blood Components: Red Blood Cells, White Blood Cells, and Platelets

Blood consists of red blood cells (erythrocytes), white blood cells (leukocytes), platelets (thrombocytes), and plasma. Each component has a unique function in maintaining overall health.

3.2 Hemostasis: Stopping the Bleeding

Hemostasis is the process of blood clotting, a vital mechanism to prevent excessive bleeding after injury. Platelets play a crucial role in this process.

4. Common Cardiovascular Diseases

Understanding the cardiovascular system is essential for recognizing and preventing common health problems.

4.1 Coronary Artery Disease (CAD)

CAD is a condition where plaque buildup narrows the coronary arteries, reducing blood flow to the heart muscle. This can lead to angina (chest pain) or heart attack.

4.2 Hypertension (High Blood Pressure)

Hypertension, or high blood pressure, increases the risk of heart attack, stroke, and kidney failure. Lifestyle changes and medication can help manage this condition.

4.3 Heart Failure

Heart failure is a condition where the heart cannot pump enough blood to meet the body's needs.

Treatment focuses on managing symptoms and improving heart function.

Conclusion:

Chapter 11: The Cardiovascular System is a fascinating study of one of the body's most vital systems. Understanding its components, functions, and potential health issues allows for better self-care and proactive health management. This detailed exploration provides a solid foundation for further learning and empowers individuals to take control of their cardiovascular health.

FAQs:

1. What is the difference between systolic and diastolic blood pressure? Systolic pressure is the higher number, representing the pressure in your arteries when your heart beats. Diastolic pressure is the lower number, representing the pressure when your heart rests between beats.

2. How can I improve my cardiovascular health? Maintain a healthy diet, exercise regularly, don't smoke, manage stress, and get regular checkups with your doctor.

3. What are some warning signs of a heart attack? Chest pain or discomfort, shortness of breath, sweating, nausea, and pain in the arm, jaw, or back.

4. What is the role of cholesterol in cardiovascular health? High levels of LDL ("bad") cholesterol contribute to plaque buildup in arteries, increasing the risk of heart disease. HDL ("good") cholesterol helps remove cholesterol from arteries.

5. What are some lifestyle modifications to help prevent cardiovascular disease? A balanced diet low in saturated and trans fats, regular aerobic exercise, maintaining a healthy weight, and stress management techniques are all crucial.

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respiratory systems, as well as the properties of the blood and parenchymal cells, so that a fundamental understanding of the regulation of tissue oxygenation is achieved.

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Aaronson, Jeremy P. T. Ward, Michelle J. Connolly, 2012-11-28 This concise and accessible text provides an integrated overview of the cardiovascular system - considering the basic sciences which underpin the system and applying this knowledge to clinical practice and therapeutics. A general introduction to the cardiovascular system is followed by chapters on key topics such as anatomy and histology, blood and body fluids, biochemistry, excitation-contraction coupling, form and function, integration and regulation, pathology and therapeutics, clinical examination and investigation - all supported by clinical cases for self-assessment. Highly visual colour illustrations complement the text and consolidate learning. The Cardiovascular System at a Glance is the perfect introduction and revision aid to understanding the heart and circulation and now also features: An additional chapter on pulmonary hypertension Even more simplified illustrations to aid easier understanding Reorganized and revised chapters for greater clarity Brand new and updated clinical case studies illustrating clinical relevance and for self-assessment The fourth edition of The Cardiovascular System at a Glance is an ideal resource for medical students, whilst students of other health professions and specialist cardiology nurses will also find it invaluable. Examination candidates who need an authoritative, concise, and clinically relevant guide to the cardiovascular system will find it extremely useful. A companion website featuring cases from this and previous editions, along with additional summary revision aids, is available at www.ataglanceseries.com/cardiovascular.

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organs that can be presented to students microscopically, e.g. during a histology spot test. This guide lists the specific characteristics of the different histological specimens and also describes how to distinguish a specimen from other similar specimens. For each histological specimen, a simplified drawing and a photomicrograph of the specimen, is presented to help the student recognize the important characteristics in the microscope. Lastly, the book contains multiple “memo boxes” in which parts of the curriculum are presented as easy-to-remember mnemonics.

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because they may provide plausibility, which is one of the guideline criteria for assessing evidence on causation. This report specifically reviews the evidence on the potential mechanisms by which smoking causes diseases and considers whether a mechanism is likely to be operative in the production of human disease by tobacco smoke. This evidence is relevant to understanding how smoking causes disease, to identifying those who may be particularly susceptible, and to assessing the potential risks of tobacco products.

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vascular lumen oppose water movement due to hydrostatic pressure. Tight water regulation is necessary in the brain because it has limited capacity for expansion within the skull. Increased intracranial pressure due to vasogenic edema can cause severe neurologic complications and death.

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chapter 11 the cardiovascular system: *Communities in Action* National Academies of Sciences, Engineering, and Medicine, Health and Medicine Division, Board on Population Health and Public Health Practice, Committee on Community-Based Solutions to Promote Health Equity in the United States, 2017-04-27 In the United States, some populations suffer from far greater disparities in health than others. Those disparities are caused not only by fundamental differences in health status across segments of the population, but also because of inequities in factors that impact health status, so-called determinants of health. Only part of an individual's health status depends on his or her behavior and choice; community-wide problems like poverty, unemployment, poor education, inadequate housing, poor public transportation, interpersonal violence, and decaying neighborhoods also contribute to health inequities, as well as the historic and ongoing interplay of structures, policies, and norms that shape lives. When these factors are not optimal in a community, it does not mean they are intractable: such inequities can be mitigated by social policies that can shape health in powerful ways. Communities in Action: Pathways to Health Equity seeks to delineate the causes of and the solutions to health inequities in the United States. This report focuses on what communities can do to promote health equity, what actions are needed by the many and varied stakeholders that

are part of communities or support them, as well as the root causes and structural barriers that need to be overcome.

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chapter 11 the cardiovascular system: MRI and CT of the Cardiovascular System Charles

B. Higgins, Albert de Roos, 2006 Written by internationally eminent experts in cardiovascular imaging, this volume provides state-of-the-art information on the use of MRI and CT in the assessment of cardiac and vascular diseases. This Second Edition reflects recent significant advances in cardiovascular MRI technology and the emergence of multi-detector CT as an important diagnostic modality, particularly for ischemic heart disease. New chapters in this edition cover coronary CTA and plaque characterization. A brand-new interventional MR section covers catheter tracking and devices, endovascular interventions, MR-guided cardiac catheterization, and endovascular delivery of gene and stem cell therapy. More than 900 illustrations present diagnostic information in unprecedented detail.

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chapter 11 the cardiovascular system: The Oxford Handbook of Evolutionary Medicine Martin Brüne, Wulf Schiefenhövel, 2019-01-31 Medicine is grounded in the natural sciences, where biology stands out with regard to our understanding of human physiology and the conditions that cause dysfunction. Ironically though, evolutionary biology is a relatively disregarded field. One reason for this omission is that evolution is deemed a slow process. Indeed, the macroanatomical features of our species have changed very little in the last 300,000 years. A more detailed look, however, reveals that novel ecological contingencies, partly in relation to cultural evolution, have brought about subtle changes pertaining to metabolism and immunology, including adaptations to dietary innovations, as well as adaptations to the exposure to novel pathogens. Rapid pathogen evolution and evolution of cancer cells cause major problems for the immune system. Moreover, many adaptations to past ecologies have actually turned into risk factors for somatic disease and psychological disorder in our modern worlds (i.e. mismatch), among which epidemics of autoimmune diseases, cardiovascular diseases, diabetes and obesity, as well as several forms of cancer stand out. One could add depression, anxiety, and other psychiatric conditions to the list. The Oxford Handbook of Evolutionary Medicine is a compilation of up-to-date insights into the evolutionary history of ourselves as a species, exploring how and why our evolved design may convey vulnerability to disease. Written in a classic textbook style emphasising physiology and pathophysiology of all major organ systems, the Oxford Handbook of Evolutionary Medicine is valuable reading for students as well as scholars in the fields of medicine, biology, anthropology and psychology.

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chapter 11 the cardiovascular system: *Cardiovascular Physiology* William R. Milnor, 1990 This book provides coverage of the mammalian cardiovascular system and the physiological mechanisms that maintain normal function, from the molecular and cellular level to the integrated function of the entire human organism. The author also reviews historical developments in the field, and offers a detailed survey of hemodynamic variables and methods for measuring cardiovascular function.

chapter 11 the cardiovascular system: *Let's know Branding* Mansoor Muallim, 101-01-01 Chapter 1: Introduction to Branding Jammy: Hi Canny! I am thrilled to be here to talk about branding with you. So, let us start at the very beginning. Branding is the process of creating a unique identity for a product, service, or company. It goes beyond just a logo or a name; it is about how people perceive and connect with a business. Canny: Hi Jammy! I am excited to dive into this topic with you. So, why is branding so important? Can't an excellent product or service speak for itself? Jammy: That's a great question, Canny. While having an excellent product is essential, branding is what sets it apart from the competition. It helps create an emotional connection with the audience, building trust and loyalty. When people resonate with a brand, they are more likely to choose it over others, even if the offerings are similar. Canny: I see. So, what elements make up a brand? Jammy: A brand is like a puzzle made up of various pieces. Some of the key elements include the brand name, logo, color palette, tagline, and brand voice. These elements work together to create a consistent and recognizable identity that is the values and personality of the brand. Canny: Consistency sounds important. But how does branding affect the overall success of a business? Jammy: Excellent point, Canny. Branding plays a significant role in shaping the belief of a business.

A strong brand can command premium prices, increase customer loyalty, and attract top talent. It also helps businesses expand into new markets and launch new products more successfully. Canny: Can small businesses benefit from branding as much as larger ones? Jammy: Absolutely! Branding is essential for businesses of all sizes. In fact, for small businesses, it can be a powerful tool to stand out in a competitive market. A strong brand gives them a chance to build credibility and gain customer trust, even if they are just starting. Canny: That makes sense. But how do you create a brand strategy? Jammy: A brand strategy involves understanding your target audience, defining your brand's unique value proposition, and setting clear goals. You need to know what sets your brand apart and how you want to be perceived. It is a roadmap that guides all your branding efforts. Canny: Is there a difference between personal branding and corporate branding? Jammy: Great question, Canny! Personal branding is about creating a brand around an individual, like a celebrity or an influencer. Corporate branding, on the other hand, is about building a brand for a company or organization. Both are important, but the focus and strategies may vary. Canny: This has been so insightful, Jammy. I am starting to see how branding is a powerful tool for any business. Jammy: I am glad you find it valuable, Canny. Branding indeed has a profound impact on businesses, and I am excited to explore more with you as we delve into this subject further. Key Takeaways: Branding is the process of creating a unique identity for a business, product, or service. It goes beyond just logos and names, involving emotional connections and perceptions. A strong brand can build trust, loyalty, and command premium prices. Branding is crucial for businesses of all sizes, helping them stand out in the market. The brand strategy involves understanding the audience, defining value, and setting clear goals. There is a difference between personal branding and corporate branding, each with its focus and strategies.

chapter 11 the cardiovascular system: Edmunds' Pharmacology for the Primary Care Provider - E-Book Constance G Visovsky, Cheryl H. Zambroski, Rebecca M. Lutz, 2022-04-26 Approx.860 pagesApprox.860 pages - NEW! Thoroughly updated content reflects the latest drug information and current thinking on pharmacologic management. - NEW macro- and chapter-level organization is based on body systems rather than drug classes, for better coverage of the medications prescribed for the health problems affecting specific body systems. - NEW and UNIQUE! Chapter format begins with an overview of anatomy, physiology, and disease processes — as opposed to drug classes or drug types — and then follows the World Health Organization's Process for Rational Prescribing, using a six-step approach to drug selection and discussing first-, second-, and third-line treatments for each specific problem. - NEW! Practical learning aids include: - Black Box Warning boxes that draw attention to critical drug safety precautions. - Clinical Guidelines: Bookmark This features that identify websites where updated clinical guidelines can be found. - Medication Dosages tables that include dose ranges, maintenance doses, and, where appropriate, plans for dose escalation and de-escalation (e.g., corticosteroids). - Practice Pearls boxes that highlight good prescribing practices, safety measures, follow-up recommendations, serum blood level monitoring, referrals to specialty providers, and other key prescriber tips. - NEW! Prescribing Considerations unit addresses issues of medication adherence, prescription writing, cost, and quality assurance. - NEW! Updated coverage of pain management reflects the current realities of substance use and the opioid crisis.

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preterm birth now known to be a risk factor in remote cardiovascular disease. Despite this, hypertensive disorders remain marginally studied and management is often controversial. Chesley's Hypertensive Disorders in Pregnancy, Fifth Edition continues its tradition as one of the beacons to guide the field of preeclampsia research, recognized for its uniqueness and utility. This revision focuses on prediction, prevention, and management for clinicians, and is an essential reference text for clinical and basic investigators alike. It provides a superb analysis of the multiple topics that relate to hypertension in pregnancy, especially of preeclampsia. - Summarizes the most relevant basic and clinical studies on hypertensive disorders of pregnancy, helping researchers and students stay up-to-date - Discusses the roles of metabolic syndrome and obesity and the increasing incidence of preeclampsia - Widely acclaimed as an essential scholastic resource and enthusiastically endorsed by clinicians and scientists

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