

CARDIOVASCULAR TEAM APPROACH SERIES

ACUTE CORONARY SYNDROME

Urgent and Follow-up Care

Volume Editors:

Eileen Handberg, PhD, ARNP-BC

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Acute Coronary Syndrome: Urgent and Follow-up Care

*The Cardiovascular Team
Approach Series*

VOLUME 3

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PUBLISHING

Minneapolis, Minnesota

© 2017 Joseph S. Alpert, Lynne T. Braun, Barbara J. Fletcher, Gerald Fletcher

Cardiotext Publishing, LLC
3405 W. 44th Street
Minneapolis, Minnesota 55410
USA

www.cardiotextpublishing.com

Any updates to this book may be found at: www.cardiotextpublishing.com/acute-coronary-syndrome-urgent-and-follow-up-care

Comments, inquiries, and requests for bulk sales can be directed to the publisher at: info@cardiotextpublishing.com.

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Library of Congress Control Number: 2017930918

ISBN: 978-1-935395-94-2

eISBN: 978-1-935395-38-6

Printed in the United States of America

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Preface

Acute Coronary Syndrome: Urgent and Follow-up Care is a must-read for all those involved in the care of ACS, including EMS, nurses, advanced practice providers as well as physicians. This volume not only reviews the causes of ACS, but also provides evidence-based acute and follow-up treatment recommendations that incorporate the perspectives of all those involved in the care of these patients.

An example of successful team-based care in treating ACS patients is the reduction in time to treatment of STEMI patients, achieving door-to-balloon times well below 90 minutes. This process begins with EMS and incorporates the emergency department in the prompt diagnostic strategy that has resulted in rapid transit of the ACS patient to the catheterization laboratory for reperfusion therapy. The process continues with strategies for long-term secondary prevention that bring together social workers, nurses, physician assistants, nurse practitioners, and physicians in transitioning patients to home. This book provides a team-focused perspective to provide updated ACS treatment recommendations across the spectrum of disease.

The participation of all members of the healthcare system in ACS care is vital to program success, and this book highlights the role of the team in carrying out successful, guideline-driven care.

Abbreviations

AACVPR	American Association of Cardiovascular and Pulmonary Rehabilitation
ABC	airway, breathing, and circulation
ABIM	American Board of Internal Medicine
ACC	American College of Cardiology
ACE	angiotensin-converting enzyme
ACEP	American College of Emergency Physician
ACS	acute coronary syndrome
ADP	adenosine diphosphate
AED	automatic external defibrillator
AHA	American Heart Association
AHRQ	Agency for Healthcare Research and Quality
AMI	acute myocardial infarction
aPTT	activated partial thromboplastin time
ARB	angiotensin receptor blocker
ASCVD	atherosclerotic cardiovascular disease
BB	beta blocker
BMI	body mass index
CABG	coronary artery bypass graft
CAD	computer-aided dispatch
CAD	coronary artery disease
CCB	calcium-channel blocker
CDC	Centers for Disease Control
CHD	coronary heart disease
CHF	congestive heart failure
CI	confidence interval

CV	cardiovascular
CVD	cardiovascular disease
D2B	door-to-balloon
DALYs	disability-adjusted life years
DM	diabetes mellitus
ED	emergency department
ELSA	English Longitudinal Study of Aging
EMS	emergency medical service
EMT	emergency medical technician
ESC	European Society of Cardiology
HCP	healthcare provider
HDL	high-density lipoprotein
HIT	heparin-induced thrombocytopenia
HRS	Health Retirement Survey
HTN	hypertension
ICS	intercostal space
IV	intravenous
IVUS	intravascular ultrasound
LAD	left anterior descending
LBBB	left bundle branch block
LDL	low-density lipoprotein
LOE	level of evidence
LVEF	left ventricular ejection fraction
MACE	major adverse cardiac events
MI	myocardial infarction
MVD	microvascular dysfunction
NCDs	noncommunicable diseases
NHANES	National Health and Nutrition Examination Survey
NSTE-ACS	non-ST elevation ACS
NSTEMI	non-ST-segment elevation myocardial infarction
PCI	percutaneous coronary intervention
RAAS	renin-angiotensin-aldosterone system
RITA	Randomized Intervention Trial of Unstable Angina
RR	relative risk
RV	right ventricle
SCAD	spontaneous coronary artery dissection
SHARE	Survey of Health, Ageing, and Retirement

SL	sublingual
STEMI	ST-segment elevation myocardial infarction
SUTTP	Stepping up to the Plate
TOS	The Obesity Society
UA	unstable angina
UFH	unfractionated heparin
URL	upper reference limit
vIVUS	virtual histology intravascular ultrasound (or virtual IVUS)
VKA	vitamin K antagonists
VSD	ventricular septal defect
VSR	ventricular septal rupture
WHF	World Heart Federation

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Epidemiology

*Garrett Ruth, MD, Garrett Brown, MD, Eileen Handberg, PhD,
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INTRODUCTION

Acute coronary syndrome (ACS) is a term used for any condition brought on by sudden, reduced blood flow to the heart. The diagnosis of an ACS includes a spectrum of disease presentation ranging from unstable angina, to non-ST-segment elevation myocardial infarction (MI), to ST-segment elevation MI. It is usually associated with coronary artery disease (CAD), most commonly atherosclerosis. All of these conditions can progress to advancing disease and eventually lead to death. In many developed countries, heart disease is the leading cause of morbidity and mortality. Although the overall mortality rate in the United States has declined, CAD claims more than one-third of the deaths in persons over 35 years of age. Population data have shown that 1 of 2 men and 1 of 3 women in the United States will present with some symptomatic CAD in their lifetime. As the population gets older, the prevalence of CAD steadily increases. The 2010 Heart Disease and Stroke Statistics review reported that 17.6 million people in the United States have CAD.¹

CARDIOVASCULAR DISEASE RISK FACTORS

CAD is localized to the heart but is a part of a larger group of atherosclerotic diseases classified as cardiovascular disease.

Acute Coronary Syndrome: Urgent and Follow-up Care © 2017

Joseph S. Alpert, Lynne T. Braun, Barbara J. Fletcher, Gerald Fletcher, Editors-in-Chief,
Cardiotext Publishing, ISBN: 978-1-935395-94-2

Cardiovascular disease refers to atherosclerosis that affects the entire arterial circulation, not just the coronary arteries. There are many manifestations including stroke, transient ischemic attack, angina, MI, and claudication. Cardiovascular disease is present in various populations but has an increased incidence in groups with specific risk factors. A growing trend of comorbidities such as obesity, hypertension, tobacco use, and cholesterol levels all contribute to the increasing overall burden of cardiovascular disease.

The prevalence of **obesity** (body mass index [BMI] ≥ 30 kg/m²) has doubled in the years 1980 to 2008, and over 2.8 million deaths per year are attributed to being overweight (BMI ≥ 25 kg/m²) or obese. In 1980, population statistics showed 5% of men and 8% of women were classified as obese. In 2008, 10% of men and 14% of women across the world were considered obese. It has also been shown that America has the highest prevalence of overweight (62%) and obese (26%) individuals (**Figure 1.1**).²

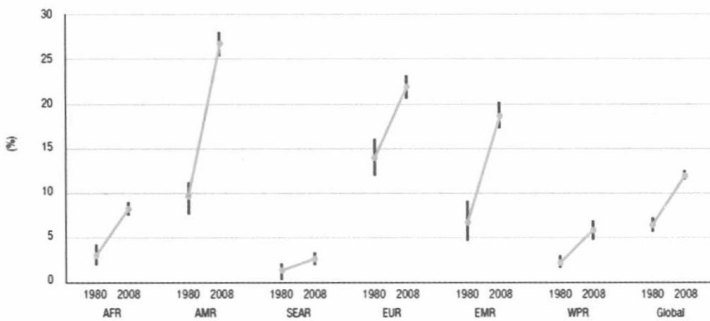


Figure 1.1

Change over time in mean BMI by WHO region, 1980 to 2008.

AFR = African region; AMR = Americas region; BMI = body mass index; EMR = Eastern Mediterranean region; EUR = European region; SEAR = South-East Asia region; WPR = West Pacific region.
(Source: Reprinted with permission from World Health Organization. World Health Statistics. 2012.)

Population studies have shown that, worldwide, 40% of people older than age 25 have **hypertension**, and the number of people with elevated blood pressure has increased from 600 million in 1980 to a billion in 2008. This number will continue to grow and has been estimated to be 1.6 billion by the year 2025. Elevated blood pressure not only contributes to cardiovascular deaths (45%) but also has been found to be a contributing factor to more than 51% of stroke deaths worldwide.

Mean cholesterol levels have improved globally since the 1980s with the advent of statins, but still remain elevated in some developed countries. These decreases have been shown to be most significant in the high-income countries (mean decrease from 5.62 to 5.19 mmol/L) compared with low-income countries (4.46–4.20 mmol/L) and middle-income countries (4.91–4.7 mmol/L). Despite these improvements, 39% of the world's population has elevated cholesterol, with percentages >50% in some higher-income countries.

Smoking and tobacco use in the United States have declined over the past 25 years. Whereas in 1965 >40% of the population smoked, in 2010, this has decreased to 19.3%.² This is the fourth lowest rate of tobacco use among the countries involved in the Organization for Economic Cooperation and Development, behind Iceland, Sweden, and Mexico. From the most recent data, countries that still have >25% of residents who smoke include Greece, Ireland, Hungary, Estonia, Spain, and Turkey.³

EPIDEMIOLOGY OF CORONARY ARTERY DISEASE

In a 2009 report that used National Health and Nutrition Examination Survey (NHANES) data, prevalence of MI was compared by gender in individuals of middle age (35–54 years) from the periods 1988 to 1994 and 1999 to 2004.⁴ Overall, both studied periods demonstrated greater prevalence in men.

However, the trend showed a decrease in men (2.5–0.7 from 1988 to 1994 and 2.2–1.0 from 1999 to 2004) and an increase in women. The NHANES report noted that data were self-reported for MI and angina and likely underestimated the actual prevalence of advanced heart disease.

Two large postmortem studies have shown a reduction in the incidence of anatomic coronary heart disease (CHD) over time. In one particular report, over 2500 autopsies were performed from the years 1979 to 1994 recording the prevalence of clinical anatomic CHD. The patients were aged 20 to 60 years, and results showed a decrease from 42% to 32% in men and 29% to 16% in women when the specific periods 1979 to 1983 and 1990 to 1994 were compared.⁵ However, in ages >60 years, there was no change in prevalence. In another study, over 3800 autopsies were performed on U.S. military personnel who died of combat or unintentional injuries in a 10-year span from 2001 to 2011. This particular cohort had an average age of 26 years and comprised 98% men. Results showed that CHD only was present in 8.5% of subjects.⁶ This was a drastic difference in those studied in previous wartime years such as the Korean War in the 1950s (77%) and the Vietnam War in the 1960s (45%).

Using the Framingham study, both initial subjects and offspring have been studied, allowing recording of statistics in relation to CAD and events detailing both recognized and silent MI, angina pectoris, unstable angina, and sudden cardiac death.^{7–9} From these data, the following conclusions were made:

- a) In people at age 40, the lifetime risk of developing CAD is 49% in men and 32% in women. For those who reach age 70, the lifetime risk is 35% in men and 24% in women.
- b) The incidence of total coronary disease rises with age; however, women lag behind men by 10 years. Related to more serious outcomes such as sudden cardiac death