EFFECTS OF TOBACCO ON THE CARDIOVASCULAR SYSTEM

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EFFECTS OF TOBACCO ON THE CARDIOVASCULAR SYSTEM

I. GOAL OF MODULE: Provide students with knowledge about the harmful effects of tobacco on the cardiovascular system, the mechanism underlying tobacco effects on the cardiovascular system, and skill to address smoking and to provide smoking cessation counseling for patients with cardiovascular diseases.

II. TARGET AUDIENCE

a. Undergraduate students
b. 3rd semester—*Course or Subject: General Medicine or Cardiology*

III. LEARNING OBJECTIVES

- Describe the epidemiological burden of smoking and cardiovascular diseases
- Describe the risk of cardiovascular diseases associated with smoking and secondhand tobacco smoke and their pathophysiology mechanism
- Provide smoking cessation counseling for patients with cardiovascular diseases

IV. CURRICULUM STANDARDS ADDRESSED:

India: 3rd semster when clinical subjects start. Under Medicine and its allied specialities there are 15 hours alloted to cardiovascular disease, where in:

- Coronary artery, circulation, pathology of atheroma and coronory occlusion—3 hours
- Ischaemic heart disease—2 hours
- Peripheral vascualr disease—2 hours

Objectives are:

- Students shall be able to diagnose common clinical disorders, know modes of management including drugs, propose investigations, and manage acute emergencies.
- Students will develop skills (history taking, clinical examination, and other instruments of examination) to diagnose various disorders and also assist common bed side investigative and managemnet procedures.

V. MINI-LECTURES

MINI LECTURE 1: EPIDEMIOLOGY OF CVD AND SMOKING

CORE SLIDES

1. Cardiovascular Diseases (CVDs) as a Leading Cause of Global Death
2. Smoking-attributable Deaths: The Global Context
3. Smoking-attributable Deaths in the Asia Pacific Region
4. Mortality from CVD in India
5. Smoking as a CVD Risk Factor
6. Smoking Attributable CVD Deaths in India
7. Cost-effectiveness of Smoking Cessation for CVD Prevention

8. Cardiovascular Risks of Secondhand Smoke

OPTIONAL SLIDES

1. Constituents of Cigarette Smoke that Contribute to CVD
2. Smoking and Acute Myocardial Infarction (AMI)
3. Factors Associated with Risk of AMI

MINI LECTURE 2: SMOKING AND CVD DISEASES: THE MECHANISMS

CORE SLIDES

1. Smoking and CVD: Causation
2. Pathophysiology of Cigarette Smoking and CVD (1)
3. Pathophysiology of Cigarette Smoking and CVD (2)
4. Secondhand Smoke and CVD: the Underlying Mechanism

OPTIONAL SLIDES

1. Pathophysiology of Cigarette Smoking and CVD: Hemodynamic Effects
2. Pathophysiology of Cigarette Smoking and CVD: Endothelial Injury and/or Dysfunction
3. Pathophysiology of Cigarette Smoking and CVD: Thrombosis
4. Pathophysiology of Cigarette Smoking and CVD: Inflammation
5. Gene–Environment Interaction in the Causation of CHD

MINI LECTURE 3: SMOKING CESSATION FOR CVD PATIENTS

CORE SLIDES

1. Cessation in CVD: Clinical Management (1)
2. Cessation in CVD: Clinical Management (2)
3. Cessation in CVD Patients
4. Cessation Reduces CVD Morbidity and Mortality
5. Benefits of Cessation for Reducing CVD Risk Factors

OPTIONAL SLIDES

1. Cessation Medication for CVD Patients
2. Benefits of Quitting and CVD Mortality
3. Cessation and CVD Prevention

VI. CASE DISCUSSION / CLINICAL SCENARIO

CASE SCENARIO—asking patient about smoking

Overview

In this module, students are asked to practice integrated communication during case discussion under supervision of instructors, in order to develop their smoking cessation skills. Students will be trained to routinely ask about patients' smoking status in every case. After obtaining patients' current smoking status, students will then practice how to assess patients' readiness to quit, advise and assist patients to quit smoking, and also arrange follow ups to monitor patients' smoking cessation progress. Students will also learn how to deliver efficient encouragement and provide proper explanation about the harm of tobacco on health and to help patients on their smoking cessation attempts.

Introduction

It is proven beyond a doubt that tobacco has direct and indirect association with various cardiovascular conditions, particularly, CAD, hypertension, stroke and vascular diseases. Both tobacco use in general and nicotine in particular also have an impact on the working of the heart, which in turn causes various clinical conditions.

Learning Objective

Upon the completion of this skills laboratory practice, students are expected to be able to:

- Routinely ask all patients about their smoking status
- Assess patients' readiness to quit
- Advise patients with cardiovascular problems to quit smoking
- Assist the patients to quit
- Arrange follow ups on patients' smoking cessation progress
- Explain the harm of smoking on the cardiovascular system

Asking the patients' smoking history

The health consequences of cigarette smoking are well known as is also the fact that there is no part of the human body that is not affected by tobacco.

In a survey done by QTI, 77% of Indian doctors did not routinely ask patients about smoking. Research studies show that if doctors have a reminder to ask about smoking, e.g. smoking status is part of the vital signs, doctors are three times more likely to advise patients to quit. Simple advice from a physician has been shown to increase abstinence rates significantly (by 30%) compared to no advice (Fiore, et al. 2000).

There are several important factors that should be considered when we are asking the patients'smoking history, i.e. 1) ask the smoking status of all patients (including women and

teenagers); 2) if a patient does not smoke, they should be asked if they have ever smoked (because even after quitting, a smoker can start again); 3) questions should be delivered in a non-critical manner; 4) evaluate the patients' smoking history as to how many cigarettes they smoke daily, do they use any other forms of tobacco; and 5) make a note of the patients' smoking status in the medical record (maybe you can indicate patients' smoking status in your patients' card). Women and children should not be excluded and they should also be asked about passive smoking.

Case Scenario

A 45 year old man has a history of chest pain on climbing steps or exerting. The pain is on the left and radiating to the left arm and jaw. He has been experiencing dyspnoea while climbing steps for two weeks. He has been a hypertensive for 5 years and on medication. He has been a smoker for the last 20 years and smokes between 15 and 20 cigarettes a day. He consumes alcohol only socially. Patient is a manual labourer and his wife is a home maker. He has two small children in school.

Vital Signs:

Blood Pressure: 150/90 mm of Hg
Pulse: 86/min
Body Weight: 75kg
Temperature: 98.6 F
Smoking Status: Smoker Ex-Smokers Never Smoke (Circle one)
Smoking Status of spouse: Smoker Ex-Smokers Never Smoke (Circle one)

Checklist for Case Scenario

S.No.	Aspects	Please tick if student has covered this aspect
	Ask	
1.	• Ask patients whether he/she smokes or not	
2.	• If the patient doesn't smoke, ask whether he/she ever smoked before	
3.	• If the patient smokes, ask how many cigarettes he/she takes per day	
	Advise	
4.	• Advise patient to quit smoking	
5.	• Personalize advice by using the tobacco user's health status/disease	
	Assess	
6.	• Assess patient's readiness to quit.	
	Assist	
7.	• Assist the patient to quit by giving him/her pamphlets, brochures	
	Arrange for Follow-up	
8.	• Arrange to follow up on tobacco use	

Points for Discussion

Harmful effect of smoking on cardiovascular system, mechanism by which smoking causes CVDs, and the benefits to be gained through smoking cessation.

1. Tobacco cessation has been found to be the best intervention in patients with cardiovascular disease to reduce risk of further complication more effectively when compared to drugs. Tobacco cessation reduces the risk by 50% and is the most cost effective intervention. Stopping smoking, therefore, may have a greater effect on reducing the risk of mortality among patients with coronary heart disease (CHD) who smoke than the effect of any other intervention or treatment *(Critchley and Capewell 2003). The reduction in risk arising from cholesterol lowering therapies (such as statins) has been estimated at around 35% and from blood pressure reduction as about 30% while smoking cessation reduces the risk of subsequent mortality and further cardiac events by 50% *(Critchley and Capewell 2003).

2. Interaction with Drugs: Use of β blockers in cardiac patients and smoking increases the toxicity or side effects of the drugs. Therefore even smoking a single cigarette would be detrimental to the health of the patients. Tobacco use also reduces the efficacy of the cardiac drugs taken by the patients.

3. Numerous studies have shown that smoking cessation increases the life span of the person. Many face cardiovascular events very early in life, even as early as late 20s to 30s, when their life is at the starting point. They will especially benefit from smoking cessation in increasing their life span.

4. Smoking also increases the risk and number of secondary cardiovascular events. Smoking cessation is an accepted and major component of cardiac rehabilitation programmes since there appears to be a clear beneficial effect of smoking cessation on prognosis even after occurrence of CHD due to a decreased risk of secondary cardiovascular disease (CVD) events *(Twardellaa et al. 2004). Thus it also becomes cost effective since the number of hospitalisations also decreases.

References for Case Study

*Critchley JA; Capewell S. Mortality risk reduction associated with smoking cessation in patients with coronary heart disease: a systematic review. JAMA. 2003; 290(1):86–97.

*Twardellaa D, Küpper-Nybelena J, Rothenbachera D, Hahmannb H, Wüstenc B, Brennera H. Short-term benefit of smoking cessation in patients with coronary heart disease: estimates based on self-reported smoking data and serum cotinine measurements. Eur Heart J. 2004; 25:2101–8.

FACT SHEET TO SUPPORT DISCUSSION (STUDENT HANDOUT)

Effects of Smoking on Cardiovascular Health

1. Non-communicable diseases (NCD) accounted for 47% of the total diseases burden in the world.[1]
2. Total death burden of NCD = 60% of global deaths in 2008.[2]
3. CVDs (coronary heart disease,stroke, and others) currently account for 170 lakh deaths, i.e.. 30% of total global deaths.
4. 80% of deaths and 85% of disease burden already occur in developing nations.[3]
5. Tobacco increases risk for coronary heart disease, including sudden death, cerebrovascular disease, and peripheral vascular disease such as aortic aneurysm.[4]
6. The relationship between smoking and coronary heart mortality and morbidity is most pronounced in younger individuals.[4]
7. Smoking increases the risk of complications for hypertensives—nephrosclerosis and malignant hypertension.[4]
8. Passive smoking increases the coronary death rate among never smokers by 20% to 70%.[4]
9. Passive smokers have a significantly increased risk of stroke and myocardial infarction.[4]
10. Smoking induces a localized inflammatory response in the lungs, induces a systemic inflammatory response and contributes to the development and progression of atherosclerosis plaque.[5]
11. A current smoker has three times the risk to experience non-fatal MI compared with a never smoker.[6]
12. Components of cigarette smoke diminish the ability of the blood to carry oxygen and increase the physiologic demands of the myocardium.[5]
13. Young smokers are at higher risk of AMI compared to older smokers.[6]
14. Secondhand smoke increases platelet aggregation that leads to thrombosis, endothelial dysfunction, and inflammation.[7]
15. It is estimated that smoking may contribute to 53% of MIs among urban males in India.[8]
16. Tobacco cessation interventions by cardiac physicians could motivate smokers in quitting and help in attaining better cardiovascular health outcomes.[9]
17. The excess risk of CHD caused by smoking is reduced by about half after one year of smoking abstinence and then declines gradually.[5]
18. After 15 years of abstinence, the risk of CHD is similar to that of persons who have never smoked.[5]
19. Smoking cessation markedly reduces the risk of recurrent infarction and cardiovascular death.[10]

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Tobacco and Peripheral Vascular Diseases

1. Cigarette smoking independently increases the risk for coronary atherosclerotic disease, cerebrovascular disease, and peripheral vascular disease.
2. Tobacco smoke dramatically changes vascular endothelial cell and tissue morphology, which then leads to a loss of endothelial barrier function within minutes.
3. Long-term exposure of endothelial cells to tobacco smoke extracts induces necrosis that may trigger a pro-inflammatory status of the vessel wall.
4. There are significant effects on microcirculation during a smoking session in young healthy smokers with a relatively limited exposure.
5. The association of smoking with peripheral atherosclerotic disease appears to be stronger than that with coronary atherosclerotic disease or atherosclerotic cerebral vascular disease.
6. Analysis of studies revealed association of smoking with aortic aneurysmal disease was 2.5 times greater than that with coronary disease and 3.5 times greater than that with cerebral vascular disease.
7. Current smokers have 4.13 times higher risk of having peripheral arterial disease compared with never smokers.
8. In a systematic review including 17 studies, smoking increased the risk of symptomatic peripheral arterial disease by 2.6 fold.

9. Passive smokers can present acute endothelial dysfunction after exposure to cigarette smoke in a manner similar to active smokers.
10. Studies in never-smoking older Chinese women exposed to SHS revealed the increased risk of having intermittent claudication by 1.87 fold and peripheral atherosclerotic disease by 1.47 fold, with significant dose-response relationships for both the number of cigarettes and duration of exposure.
11. Coronary endothelial dysfunction may be reversible within one month after smoking cessation in healthy young smokers.

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REFERNCE LIST FOR MODULE

Mini Lecture 1—Epidemiology of CVD and Smoking

1. World Health Organization. The Global Burden of Disease: 2004 Update. Geneva: World Health Organization; 2008.
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Mini Lecture 2—Smoking and Cardiovascular Diseases: the Mechanisms

1. Burns DM. Epidemiology of smoking-induced cardiovascular disease. Prog Cardiovasc Dis. 2003; 46(1):11–29.
2. US Department of Health and Health Services and Centers for Disease Control. Chapter 3: Cardiovascular diseases. In: Health consequences of tobacco use: a report of the Surgeon General. Washington, D.C.: United States Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004.
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Mini Lecture 3—Smoking Cessation for CVD Patients

1. Graham I, Atar D, Borch-Johnsen K, Boysen G, Burell G, Cifkova R, et al. European guidelines on cardiovascular disease prevention in clinical practice: full text. Fourth Joint Task Force of the European Society of Cardiology and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of nine societies and by invited experts). Eur J Cardiovasc Prev Rehabil. 2007; 14(Suppl 2):S1–113.
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VII. INSTRUCTOR KEY RESOURCES/REFERENCES

Mini Lecture 1

1. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 2006; 3(11):e442.
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Mini Lecture 2

1. Burns DM. Epidemiology of smoking-induced cardiovascular disease. Prog Cardiovasc Dis. 2003; 46(1):11–29.
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Mini lecture 3

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VIII. INSTRUCTOR WEB-SITE RESOURCES

http://www.whoindia.org/EN/Section102/Section201_888.htm

IX. SAMPLE EXAMINATION QUESTIONS

Short Answers

1. By what mechanism does tobacco affect the cardiovascular system?
2. What cardiovascular problems can occur due to smoking or chewing tobacco?
3. Does passive smoking affect the cardiac system? If so, how?

Multiple Choice Questions:

1. The total death burden of NCDs globally in 2008 was
   a. 50% b. 45% c. 60% d. 75%

2. Among the total deaths in India, CVD accounts for
   a. 55% b. 29% c. 68% d. 37%

3. Passive smoking increases coronary heart disease among non smokers from
   a. 25% to 30%. b. 35% to 40%
   c. 45% to 50% d. 15% to 20%

4. Which among the following is a false statement?
   Smoking causes:
   a. Endothelial dysfunction b. coronary vasoconstriction
   c. Accelerates atherosclerosis d. decrease in myocardial workload

5. Secondhand smoke causes
   a. Thrombosis b. inflammation
   c. endothelial dysfunction d. all of the above

6. After …….. years of abstinence, the risk of CHD of a smoker becomes similar to that of persons who have never smoked
   a. 5yrs b. 10yrs c. 15yrs d. 20yrs