

## The Clinical Case for Smoking Cessation for CARDIOVASCULAR PATIENTS

### ***What is this initiative aiming to achieve?***

The aim of this initiative is to provide clinical support for temporary abstinence with a view to prompting a permanent quit supported by a referral to local NHS Stop Smoking Services. To gain maximum benefit, hospital associated abstinence needs to lead to permanent quitting. However, temporary abstinence beginning immediately around the time of admission and lasting until a patient has recovered may still have worthwhile benefits.

### ***Why intervene in secondary care?***

Hospitalisation offers an opportune time to encourage patients to stop smoking for four main reasons.

- Firstly, this time is often a “teachable moment” where patients are more receptive to intervention and are more motivated to quit.
- Secondly, the hospital’s no smoking environment creates an external force to support abstinence.
- Thirdly, patients are ideally placed to be given information about treatment options, supported through withdrawal and signposted to specialist services.
- Fourthly, abstaining from smoking at this time can lead to significant health benefits.

### ***What is the relationship between smoking and cardiovascular diseases?***

Smoking is associated with processes that lead to both atherosclerosis and thrombosis.

#### ***Processes leading to atherosclerosis<sup>1</sup>***

- (1) Increased availability of free radicals leading to oxidative stress.
- (2) Decrease in vasodilatory function through reducing the availability of nitric oxide (NO).
- (3) Increase in inflammatory response. Smoking has been associated with an increased level of peripheral blood leukocytes and multiple inflammatory markers including C-reactive protein, interleukin-6 and tumour necrosis factor alpha.
- (4) Increase in serum cholesterol, triglyceride and low density lipoprotein (LDL) levels.
- (5) Decrease in serum high density lipoprotein levels.

#### ***Processes leading to thrombosis<sup>1</sup>***

- (1) Increased availability of free radicals leading to oxidative stress.
- (2) Increased activation and spontaneous aggregation of platelets mediated by reduced sensitivity to NO.
- (3) Alterations in antithrombotic and prothrombotic factors e.g. increase in fibrinogen levels, increase in tissue factor (TF) and decrease in TF pathway inhibitor-1.
- (4) Alterations in fibrinolysis.

## **What are the health benefits of quitting for cardiovascular disease patients?**

Successful quitting will not only benefit a patient's long term health by reducing the risk of developing other diseases<sup>2</sup>, but smoking abstinence may also help a patient recover quicker by eliminating the acute effects of smoking on the body and there is an evidenced benefit of quitting in terms of cardiovascular outcomes (see below).

### **Main acute effects of smoking on the body (estimated time of recovery, if known)**

- (1) Increase in sympathetic tone leading to increase in blood pressure, heart rate and peripheral vasoconstriction leading to an increased demand for oxygen and cardiac function. <sup>3</sup> (24-48 hrs)
- (2) Formation of carboxyhaemoglobin leading to reduction in oxygen delivery to the tissues. <sup>4</sup> (8-24 hrs)
- (3) Formation of carboxymyoglobin leading to reduction in oxygen storage in the muscles <sup>5</sup> (8-24hrs)
- (4) Increase in red blood cell production, which leads to increase in blood viscosity, a decrease in tissue perfusion, a decrease in oxygen delivery to the tissues and potentiation of thrombotic process. <sup>1;6</sup>
- (5) Hypersecretion of mucus, narrowing of the small airways, decrease in ciliary function and change in mucus rheology leading to a decrease in mucociliary transport <sup>1;6</sup> (12-72 hours)
- (6) Changes in functioning of a range of immune cells (pro- and anti-inflammatory cytokines, white blood cells, immunoglobulins) which lead to decreased immunity and are associated with atherosclerosis <sup>1;6</sup> (1week-2 months)
- (7) Induction of hepatic enzymes which increases drug metabolism through both pharmacokinetic and pharmacodynamic mechanisms <sup>7</sup> (6-8 weeks)

### **Cardiovascular health benefits associated with smoking cessation**

**Heart disorders:** smoking cessation has been associated with:

- (1) 36% risk reduction of all cause mortality after an MI (RR 0.64 (95%CI 0.58-0.71)).<sup>8</sup>
- (2) 21% risk reduction of all cause mortality in heart failure patients (RR 0.79 (95%CI 0.63-0.98)).<sup>9</sup>
- (3) 21% risk reduction of re-hospitalisation in heart failure patients due to MI or CHF (RR 0.79 (95%CI 0.69, 0.91)).<sup>9</sup>
- (4) Decreased risk of re-hospitalisation and all cause mortality for patients with acute coronary syndrome or decompensation heart failure.<sup>10</sup>
- (5) After one year, the excess risk of coronary heart disease caused by smoking is reduced by half. After 15 years of abstinence, the risk is similar to a non-smoker.<sup>11</sup>

**Vascular disorders:** smoking cessation has been associated with

- (1) Reduced risk of abdominal aortic aneurysm<sup>12</sup>
- (2) Improvement in ankle pressure, exercise tolerance and reduced risk of amputation in patients with intermittent claudication. <sup>11;13</sup>
- (3) Reduced risk of progression to critical leg ischemia, myocardial infarction and death from vascular causes in patients with intermittent claudication.<sup>13</sup>
- (4) Reduced rate of re-stenosis after angioplasty.<sup>14</sup>
- (5) Reduced risk of revascularisation and all cause mortality after a coronary artery bypass graft.<sup>15</sup>
- (6) Reduced risk of myocardial infarction, revascularisation and angina pectoris after venous coronary bypass surgery.<sup>16</sup>
- (7) Reduced risk of infarction and death after successful percutaneous coronary revascularisation.<sup>17</sup>

## ***The 3A's***

### ***How to approach smoking cessation with patients***

Smoking cessation interventions have been proven effective for hospitalised patients in general<sup>18</sup> and specifically for cardiac patients.<sup>10</sup> Smoking cessation interventions for hospitalised patients increase the rate of long term quitting if they include regular behavioural support and pharmacotherapy, which is continued at least 1 month after discharge.

The DH guidance "Stop Smoking Interventions in Secondary Care"<sup>19</sup> outlines a care pathway for supporting smoking cessation that can be adopted for cardiovascular patients. In essence, the care pathway incorporates a very brief intervention using the 3A's:

**ASK** and record smoking status

**ADVISE** the patient of the personal health benefits of quitting

**ACT** on the patient response

- prescribe NRT for patients in withdrawal
- monitor withdrawal and adjust pharmacotherapy accordingly
- refer to local NHS Stop Smoking Service

### ***How was this information sheet put together?***

This information is a summary of the current scientific evidence on the association between cigarette smoking and cardiovascular outcomes. This area has been extensively reviewed and studies were identified by searching reference lists and citations of included reviews, by typing keywords into Google Scholar and by searching the Report of the US Surgeon General on the health benefits of smoking cessation.<sup>11</sup>

## Reference List

- (1) Ambrose J. The pathophysiology of cigarette smoking and cardiovascular disease. *Journal of the American College of Cardiology* 2004; 43(10):1731-1737.
- (2) Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ* 2004; 328:1519.
- (3) Warner DO. Perioperative abstinence from cigarettes: physiologic and clinical consequences. *Anesthesiology* 2006; 104:356-367.
- (4) Rietbrock N, Kunkel S, Worner W, Eyer P. Oxygen-dissociation kinetics in the blood of smokers and non-smokers: interaction between oxygen and carbon monoxide at the hemoglobin molecule. *Nanunyn Schmiedebergs Arch Pharmacol* 1992; 98:528-534.
- (5) Akrawi W, Benumof JL. A pathophysiological basis for informed preoperative smoking cessation counselling. *Journal of cardiothoracic and vascular anesthesia* 1997; 11(5):629-640.
- (6) Moller A, Tonnesen H. Risk reduction: perioperative smoking intervention. *Best practice and research clinical anaesthesiology* 2006; 20(2):237-248.
- (7) Zevin S, Benowitz NL. Drug interactions with tobacco smoking. An update. *Clinical Pharmacokinetics* 1999; 36(6):425-438.
- (8) Critchley JA, Capewell S. Smoking cessation for the secondary prevention of coronary heart disease. *Cochrane Database of Systematic Reviews* 2003; Issue 4(Art.No.:CD003041.DOI:10.1002/14651858.CD003041.pub2.).
- (9) Suskin NS, Sheth T, Negassa A, Yusuf S. Relationship of current and past smoking to mortality and morbidity in patients with left ventricular dysfunction. *Journal of the American College of Cardiology* 2001; 37(6):1677-1682.
- (10) Mohiuddin SM, Mooss AN, Hunter CB, Grollmes TL, Cloutier DA, Hilleman DE. Intensive smoking cessation intervention reduces mortality in high-risk smokers with cardiovascular disease. *Chest* 2007; 131:446-452.
- (11) USDHHS. The Health Benefits of Smoking Cessation. U S Department of Health and Human Service, Centres for Disease Control, Centre for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health 1990; DHHS Publication No. (CDC) 90-8416.
- (12) Rasmussen TE, Hallett JW, Tazelaar HD, Miller VM, Schulte S, O'Fallon WM et al. Human leukocyte antigen class II immune response genes, female gender, and cigarette smoking as risk and modulating factors in abdominal aortic aneurysms. *Journal of vascular surgery* 2002; 35(5):988-993.
- (13) Quick CRG, Cotton LT. The measured effect of stopping smoking on intermittent claudication. *British Journal of Surgery* 2005; 69(S6):S24-S26.
- (14) van Berkel TFM, Boersma H, Roos-Hesselink JW, Erdman RAM, Simoons ML. Impact of smoking cessation and smoking interventions in patients with coronary heart disease. *European Heart Journal* 1999; 20:1773-1782.
- (15) van Domburg RT, Meeter K van Berkel DFM, Veldkamp RF, van Herwerden LA, Bogers JJC. Smoking cessation reduces mortality after coronary artery bypass surgery: a 20-year follow up study. *Journal of the American College of Cardiology* 2000; 36(3):878-883.
- (16) Voors AA, van Brussel BL, Thijs Plokker HW, Ernst MPG, Ernst NM, Koomen EM et al. Smoking and cardiac events after venous coronary bypass surgery: A 15-Year follow-up study . *Circulation* 1996; 93:42-47.

- (17) Hasdai D, Garratt KN, Grill DE, Lerman A, Holmes DR. Effect of smoking status on the long-term outcome after successful percutaneous coronary revascularization. *New England Journal of Medicine* 2009; 336:755-761.
- (18) Rigotti N, Munafo 'MR, Stead LF. Interventions for smoking cessation in hospitalised patients. *Cochrane Database of Systematic Reviews* 2007; Issue3.Art.No.:CD001837.DOI:10.1002/14651858.CD001837.pub2.
- (19) Department of Health. Stop smoking interventions in secondary care. 2009. [www.dh.gov.uk/publications](http://www.dh.gov.uk/publications)