

This section presents a synopsis of a selection of recently published articles of interest to those nurses working in the field of cardiovascular nursing. The aim of this round-up is to provide a brief overview, rather than a detailed critique, of the research papers selected. A full reference is provided for those who wish to look at the research in further detail.

Protecting against cardiac muscle damage after revascularisation

Chouchani ET, Methner C, Nadtochiy SM, et al (2013) Cardioprotection by S-nitrosation of a cysteine switch on mitochondrial complex I. *Nat Med* 19: 753–9

Coronary revascularisation procedures can restore coronary blood flow after myocardial infarction, but the mitochondria in the cells in the affected cardiac muscle release high levels of chemicals called reactive oxygen species, which can also damage the cardiac tissue. This process is known as oxidative stress. Cardiac muscle is rich in mitochondria, which provide the continuous energy that cardiac cells need to function.

This small collaborative study investigated the effects of a molecule called mitochondria-selective S-nitrosating agent (MitoSNO) in reducing the production of reactive oxygen species in the mitochondria of mouse heart tissue by injecting MitoSNO into mice after inducing a myocardial infarction. The researchers injected the MitoSNO before reperfusion started and tracked the injected MitoSNO molecules to see whether they targeted the mitochondria. The researchers also injected MitoSNO 10 minutes after reperfusion to see whether the timing of the injection was important.

The study found that the MitoSNO travelled to the mitochondria when injected, and that injecting MitoSNO just before the reperfusion procedure helped protect against damage from reperfusion. Around 30% of the target cardiac tissue was damaged in the mice not receiving MitoSNO, but only 10% in the mice receiving MitoSNO. Later injection of the molecule did not appear to protect the heart.

The researchers suggested that the protective mechanism could be due to the interaction of MitoSNO with a molecule called mitochondrial complex I, which

slowed the response of the mitochondria during the first few minutes of the reperfusion, and so reduced the production of reactive oxygen species.

Long-term cardiovascular impact of intensive weight loss programme

Wing RR, Bolin P, Brancati FL et al; The Look AHEAD Research Group (2013) Cardiovascular effects of intensive lifestyle intervention in type 2 diabetes. *New Engl J Med* 369(2): 145–54

Weight loss is advised for overweight or obese people with type 2 diabetes to reduce cardiovascular risk, but the long-term impact of intensive weight control on cardiovascular disease among this group is uncertain.

This United States study investigated whether intensive weight loss decreased cardiovascular morbidity and mortality among 5145 overweight or obese people with type 2 diabetes who were allocated to either an intensive intervention with reduced energy intake and increased physical activity (intervention group), or support and education (control group). The initial programme lasted 6 months, after which time the frequency of the interventions was reduced.

The trial assessed a composite of cardiovascular death, myocardial infarction, stroke, or admission to hospital with angina over 9 years' follow-up, when the trial was stopped early on the basis of a futility analysis. A futility analysis is made when the evidence show the results at the end of the trial are clearly going to be negative. Although the intervention group had greater weight loss, greater reductions in glycated haemoglobin and greater improvements in fitness and cardiovascular risk factors compared with the control group, there was no significant difference in the number of patients affected by the composite of cardiovascular outcomes (403 patients in the intervention group versus 418 in the control group). Therefore, the findings from this particular study concluded that an intensive weight loss intervention did not reduce the rate of

cardiovascular events in overweight or obese adults with type 2 diabetes.

In an accompanying editorial, Gerstein (2013) suggested that the difference in results between the two groups may have been weakened by the reduced use of cardioprotective drugs in the intervention group, and the cardiovascular effect of weight loss may have lessened after the first few years.

Gerstein HC (2013) Do lifestyle changes reduce serious outcomes in diabetes? *New Engl J Med* 369(2):189–90

Adequate sleep helps reduce cardiovascular risk

Hoevenaer-Blom M, Spijkerman AMW, Kromhout D, Verschuren WMM (2013) Sufficient sleep duration contributes to lower cardiovascular disease risk in addition to four traditional lifestyle factors: the MORGEN study. *Eur J Prev Cardiol* online ahead of print: DOI: 10.1177/2047487313493057.

Short sleep duration has been associated with a higher incidence of overweight, obesity, hypertension, raised cholesterol and triglyceride levels. Both short and long duration of sleep have also been linked with future cardiovascular events (Bjorvatn et al, 2007; Cappuccio et al, 2011).

This prospective cohort study, called the Monitoring Project on Risk Factors for Chronic Diseases (MORGEN), carried out by researchers in the Netherlands investigated whether the addition of sleep duration to four lifestyle factors (physical activity, cholesterol, diet and alcohol intake) contributed to an increased association with cardiovascular disease (CVD). The researchers enrolled 6672 men and 7967 women aged between 20 and 65 years who had no evidence of CVD at the start of the study. The study recorded data on physical activity, diet, alcohol intake, smoking and sleep duration between 1993 and 1997.

During 10–14 years' follow up, 607 composite CVD events (combining fatal CVD, nonfatal myocardial infarction and stroke) occurred. The study found that people who adhered to the combination of

Belinda Linden is a cardiac nurse in Devon

the four traditional lifestyle factors had a 57% lower risk of CVD (fatal and non-fatal) and a 67% lower risk of fatal events. But when sufficient sleep (defined as seven or more hours of sleep each night) was added to compliance with the other four lifestyle factors, the overall protective benefit was further increased to a 65% lower risk of composite CVD and an 83% lower risk of fatal events. Sufficient sleep duration alone also reduced the risk of composite CVD by about 22% and of fatal CVD by about 43% when compared with those having insufficient sleep.

This study concluded that having enough sleep and adhering to all four traditional healthy lifestyle factors is linked to a lower CVD risk. Therefore the authors propose that sufficient sleep should be included as an additional way to reduce the risk of cardiovascular disease.

Cappuccio FP, Cooper D, D'Elia L, Strazzullo P, Miller MA (2011) Sleep duration predicts cardiovascular outcomes: a systematic review and meta-analysis of prospective studies. *Eur Heart J* 32(12): 1484-92

Bjorvatn B, Sagen I, Øyane N, N et al (2007) The association between sleep duration, body mass index and metabolic measures in the Hordaland Health Study. *J Sleep Res* 16(1): 66-76

Post-traumatic stress disorder and coronary heart disease

Vaccarino V, Goldberg J, Rooks C et al (2013) Posttraumatic stress disorder and incidence of coronary heart disease: A twin study. *J Am Coll Cardiol*. Online ahead of print: doi: 10.1016/j.jacc.2013.04.085.

Post-traumatic stress disorder (PTSD) is an anxiety state that affects some people who have been subjected to severe psychological trauma. People with PTSD may experience amnesia or they commonly relive the event with recurrent flashbacks and nightmares. The US Department of Veterans Affairs estimates that PTSD afflicts about 31% of Vietnam veterans (Dohrenwend et al, 2006)

This study from Atlanta in the United States, evaluated the link between PTSD and coronary heart disease (CHD) among 562 male middle-aged twins (340 identical and 222 fraternal) who were Vietnam veterans from the Vietnam Era Twin Registry. CHD was defined as having a myocardial infarction, being admitted to hospital with heart-related symptoms, or undergoing a revascularisation procedure

for CHD. By using twins in the study, the researchers were able to control for the genetic and environmental impacts on CHD and PTSD.

The 13-year study found that the incidence of CHD was 22.6% in twins with PTSD (177 individuals) and 8.9% in those without PTSD (425 individuals). Positron emission tomography (PET) scans, which measure coronary blood flow and identify areas of reduced blood flow at rest and following stress, showed that people with PTSD had almost twice as many areas of reduced blood flow as those without PTSD. The effects of PTSD on CHD remained strong even after accounting for factors such as smoking, physical activity, alcohol intake, hypertension, diabetes, obesity, depression and other psychiatric conditions.

This is the first long-term study to measure the association between PTSD and CHD using objective clinical diagnoses combined with cardiac imaging techniques. Further research is needed to understand the mechanisms underlying the link between PTSD and CHD to guide effective prevention and treatment for these conditions.

Dohrenwend BP, Turner JB, Turse NA, Adams BG, Koenen KC, Marshall R (2006) The psychological risks of Vietnam for U.S. veterans: a revisit with new data and methods *Science* 313(5789): 979-82

Potent statin treatment helps coronary atherosclerosis regression

Puri R, Nissen SE, Ballantyne CM et al (2013) Factors underlying regression of coronary atheroma with potent statin therapy *Eur Heart J* 34(24): 1818-25

Studies have shown that statin therapy, especially when given in high doses over a long period, can significantly inhibit the progression of atherosclerosis in patients with angina or acute coronary syndrome (Tian et al, 2009). The reasons for this, however, are not fully understood.

This study aimed to identify the factors underlying the regression of atherosclerosis after high doses of statin therapy among patients with coronary artery disease. The researchers used intravascular ultrasound scanning to monitor any changes in coronary atheroma for 1039 patients who had been treated with either 40 mg rosuvastatin or 80 mg atorvastatin daily for 2 years.

They found that the patients who were treated with rosuvastatin had significantly greater reductions in low-density lipoprotein (LDL) cholesterol than those treated with atorvastatin (47% versus 40%), and also greater increases in high-density lipoprotein (HDL) cholesterol (13% versus 10%). These changes in the lipid profile were also linked with significantly improved regression of coronary total atheroma volume (minus 6.4 mm³ versus -4.4 mm³), particularly among those with greater coronary total atheroma volume at the start of the study, and among people with type 2 diabetes. More regression in the proportion of atheroma volume occurred with rosuvastatin compared with atorvastatin among women, and among patients with baseline or higher levels of LDL or HDL cholesterol.

The research team concluded that patients at high cardiovascular risk are more likely to benefit from the regression of coronary atherosclerosis with potent statin therapy, especially among those with greater baseline coronary atheroma volume at the start of the study.

Tian J, Gu X, Sun Y et al (2009) Effect of statin therapy on the progression of coronary atherosclerosis. *BMC Cardiovasc Disord*. <http://www.biomedcentral.com/1471-2261/12/70> (accessed 15 July 2013)

Perceived stress and coronary artery disease

Nabi H, Kivimäki M, Batty GD et al (2013) Increased risk of coronary heart disease among individuals reporting adverse impact of stress on their health: The Whitehall II prospective cohort study. *Eur Heart J*. doi: 10.1093/eurheartj/eh216

Over the past 30 years, researchers have investigated the role of psychosocial stress in the development of cardiovascular disease. The Whitehall II study was established in 1985 as a longitudinal study of the socioeconomic gradient in health and disease among civil servants, and has suggested that stress can have an adverse effect on health (Bell et al, 2004).

In this latest analysis of the Whitehall II study, researchers from France, Finland and the UK followed up 7268 men and women for 18 years from 1991. The participants were initially asked how much they felt that stress had affected their health. Their answers were allocated into three groups: 'not at all', 'slightly or

moderately,' or 'a lot or extremely.' They were also asked about their perceived levels of stress and other lifestyle factors, such as smoking, alcohol intake, diet, and physical activity.

The average age of the participants was 49.5 years. Information about their blood pressure, diabetes, weight, marital status, age, sex, ethnicity and socioeconomic status was also collected. Over the follow-up period, there were 352 fatal and non-fatal myocardial infarctions.

After adjusting for sociodemographic factors, the people who had initially said that their health had been affected 'a lot or extremely' by stress (8%, n=584) had more than twice the risk of a fatal or non-fatal heart attack, compared with those reporting no effect of stress on their health (39%, n=2835). After adjusting for cardiovascular and psychological risk factors, the risk was reduced, but was still 49% higher than in the people who reported that stress had no effect on their health.

The study concluded that there is an independent association between a person's perception of the influence of stress on their health, and their risk of a heart attack. This is the first study investigating people's perceptions of how stress is affecting their health and its association with their risk of subsequent heart disease. The authors suggest that further studies of stress should include people's perceptions of its impact on their health because the

ability to cope with stress differs greatly between individuals.

Bell R, Britton A, Brunner E et al (2004) *Work, Stress and Health: the Whitehall II Study*. Public and Commercial Services Union on behalf of Council of Civil Service Unions/Cabinet Office, London

Effect of regular physical activity on body fat distribution

Jonker JT, de Mol P, de Vries ST et al (2013) Exercise and type 2 diabetes mellitus: changes in tissue-specific fat distribution and cardiac function. *Radiology*. doi: 10.1148/radiol.13121631

Type 2 diabetes occurs when the body does not produce enough insulin, the hormone that regulates the movement of glucose into the cells, or when the cells resist the effects of insulin. The disease can lead to a wide range of complications, including damage to the eyes and kidneys, and atherosclerosis. The World Health Organization (2011) predicts that diabetes to be the seventh leading cause of death worldwide by 2030.

Physical activity is recommended for people with diabetes, as it has shown a consistent beneficial effect on carbohydrate metabolism and insulin sensitivity. The effects of exercise on the different fat deposits in the body, however, are unclear. This study assessed the effects of exercise on the accumulation of fat around specific organs and on cardiac function among 12 people with type 2 diabetes

independent of other lifestyle changes. The participants underwent magnetic resonance imaging scanning before and then 6 months after 3.5–6.0 hours of moderate-intensity exercise each week. At the end of the exercise programme the participants carried out a 12-day trekking expedition.

Magnetic resonance imaging results showed that the exercise programme led to a significantly decreased fat volume in the abdomen, liver, and around the heart, but there was no change in cardiac function apparent on the imaging scan. The fat content in the liver also decreased substantially after exercise, which is important for people with type 2 diabetes, who are often overweight or obese. The researchers suggest that reducing liver fat content and visceral fat volume with physical exercise should help to reverse the adverse effects of lipid accumulation in areas such as the heart and arterial vessel wall.

These findings point to an important role for magnetic resonance imaging in identifying appropriate treatment for patients with type 2 diabetes. This study may lead to more advanced imaging techniques to identify which treatment strategies are most effective.

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World Health Organization (2011) *Global Status Report on Non-communicable Diseases 2010*. Geneva, World Health Organization