From the Chief Medical Officer
Dr Michael McBride

Department of
Health, Social Services and Public Safety
www.dhsspsni.gov.uk

AN ROINN
Sláinte, Seirbhísí Sóisialta agus Sábháilteachta Poiblí

MÄNNYSTRIE O
Poustie, Resydènter Heisin an Fowk Siccar

HSS MD 45/2010

Castle Buildings
Stormont Estate
Belfast BT4 3SQ
Tel: 028 90 520658
Fax: 028 90 520574
Email:michael.mcbride@dhsspsni.gov.uk

To:
General Practitioners
Trust Medical Directors, for cascading to:
Trust A&E Departments,
Obstetricians and
Paediatricians
Pharmacists
Community Pharmacists
Trust Directors of Nursing, for cascading to:
District Nurses,
Health Visitors and
Community Nurses

cc:
Director of Public Health, PHA
Dr Lorraine Doherty, PHA
Chief Environmental Health Officers
Health and Safety Executive NI
Chief Building Control Officers
Director of Nursing, PHA

Your Ref:
Our Ref: HSS MD 45/2010
Date: 21 December 2010

Dear Colleagues

CARBON MONOXIDE POISONING: ONGOING VIGILANCE TO ENSURE RECOGNITION AND PREVENTION

Carbon monoxide (CO) poisoning causes a number of deaths and hospital admissions each year in Northern Ireland. It is probable that there are many more cases of poisoning which are not recognised by the patient or the doctor as the symptoms are similar to those of many other conditions and their onset can be insidious.

In the current cold weather spell it is likely that some people will be using heating appliances that may have not been serviced for some time and which may carry the risk of carbon monoxide leaks. It is important that people are aware of how important it is to make sure their heating systems are safe; that heating appliances are properly maintained and serviced, and that they are not at risk of carbon monoxide poisoning.

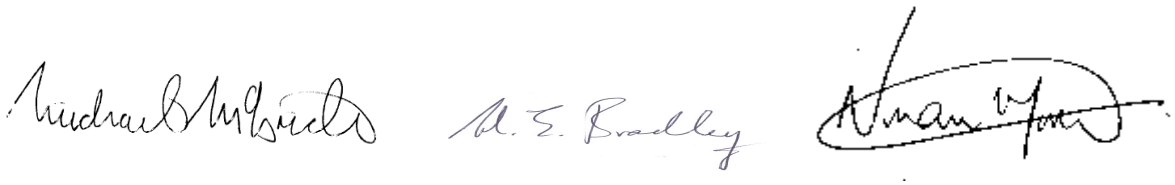
Our purpose in writing to you is to:

- inform you of the web-based information for the public prepared by DHSSPS entitled *"Carbon monoxide: Are you at risk?"* which you can share with your patients, available at: http://www.nidirect.gov.uk/carbon_monoxide_guide.pdf
- remind you that the incomplete combustion of all fossil fuels can pose a risk of CO exposure, and describe the main sources in the home;
- alert you to the signs and symptoms which might suggest exposure in your patients or customers and remind you of the information contained in the recently circulated PHA algorithm, which is available at Diagnosing poisoning: Carbon monoxide (CO) | HSC Public Health Agency;
- alert you to the Health and Safety Executive for Northern Ireland's Carbon Monoxide campaign website, available at http://watchout.hseni.gov.uk/; and
- offer advice on how cases should be managed.

As you may be aware, the Health and Safety Executive for Northern Ireland has recently run a Carbon Monoxide Awareness Campaign which involves a number of stakeholders including DHSSPS, the Public Health Agency and the Northern Ireland Fire and Rescue Service. This has highlighted the risk of carbon monoxide poisoning from fossil fuels.

We hope that these measures will help ensure a greater awareness on the part of health professionals and the public of this issue and ultimately help prevent future cases of carbon monoxide poisoning.

Yours sincerely



DR MICHAEL McBRIDE
Chief Medical Officer

MARTIN BRADLEY
Chief Nursing Officer

DR NORMAN MORROW
Chief Pharmaceutical Officer

This letter is available at www.dhsspsni.gov.uk and also on the DHSSPS Extranet which can be accessed directly at http://extranet.dhsspsni.gov.uk or by going through the HPSS Web at http://www.n-i.nhs.uk and clicking on DHSSPS.

From the Chief Medical Officer
Dr Michael McBride

Department of
Health, Social Services and Public Safety
An Roinn
Sláinte, Seirbhísí Sóisialta agus Sábháilteachta Poiblí
www.dhsspsni.gov.uk

CARBON MONOXIDE POISONING

Sources of carbon monoxide

Carbon monoxide is an odourless, colourless gas produced by the incomplete combustion of carbon-containing fuel: gas (domestic or bottled), coal, coke, oil and wood. Stoves, fires and boilers, water heaters, paraffin heaters and room heaters are all potential sources. Caravans, boats and mobile homes are also at risk as they often use portable appliances which use these fuels. Exhaust fumes from engines or generators can also contain high levels of CO.

The main causes of poisoning are unsafe installation or inadequate maintenance leading to poor combustion of fuel; inadequate removal of waste products as a result of blocked and partially-blocked flues and chimneys, and insufficient ventilation. Such faults can occur in all types of property and the idea that carbon monoxide poisoning is limited to poorer homes and student accommodation is false. Newly-occupied houses with gas-powered heating systems are sometimes the site of accidents.

Carbon monoxide can also seep into properties via shared flues and chimneys, so people may be poisoned by carbon monoxide leaking from adjoining property. Construction errors, such as the venting of gas fires into cavity walls, can lead to poisoning of people living above those using the fire. Integral garages can be a source of carbon monoxide if car engines are run without adequate ventilation.

How to diagnose carbon monoxide poisoning

The diagnosis of carbon monoxide poisoning is not at all easy as the symptoms are similar to those caused by other conditions. Unless poisoning is suspected, the diagnosis will be missed. The onset of symptoms is often insidious and may not be recognised by either the patient or the doctor. The commonest symptoms and signs and an indication of their approximate frequency in carbon monoxide poisoning are shown below:

- headache: 90% of cases
- nausea and vomiting: 50% of cases
- vertigo: 50% of cases
- alteration in consciousness: 30% of cases
- subjective weakness: 20% of cases

Whilst exposure to high concentrations of carbon monoxide leads to collapse and death, chronic exposure to lower concentrations may lead to symptoms and signs suggestive of influenza or food poisoning. What appears to be the classic symptoms of food poisoning of a whole family may in fact be the result of carbon monoxide poisoning. Prolonged exposure to low concentrations that produce only minor symptoms may, in some cases, be associated with serious lasting neurological effects. These include difficulties in concentrating and emotional lability.

Clues to the diagnosis

The following are suggestive of domestic CO poisoning:

- more than one person in the house is affected;
- symptoms are better when away from the house, e.g. on holiday, but recur on returning home;
- symptoms are related to cooking, with a stove in use; and
- symptoms are worse in winter, with heating in use.

The following signs may be recognised in the home:

- in many cases there will be black sooty staining on or around an appliance (e.g. a stove, boiler or fire), such as on the walls;
- the accumulation of smoke or excessive condensation in rooms owing to faulty flues – although you cannot smell CO, you may be able to smell other combustion products; and
- yellow or orange, instead of blue, flames from gas appliances or boiler pilot lights (excluding 'decorative' flame fires).

Clinical signs

If chronic poisoning is suspected a neurological examination should be conducted. This should include tests of fine movement and balance, (finger-nose testing, movement, Romberg's test, gait and heel-toe walking), a mini mental state examination and testing of short-term memory with serials 7s. Cherry red skin colour is not a common sign of poisoning. This occurs when carboxyhaemoglobin (COHb) concentrations exceed about 20% and is rarely seen.

Investigations

Expired Air CO and Pulse CO-Oximetry

Rapid measurement of expired air CO and pulse CO-oximetry are useful in diagnosis. CO can be measured in expired air and this test is used in smoking cessation clinics. Monitors are available that convert CO concentration into COHb concentration from the standard equilibration curve. If such devices are used, they must be used quickly: there is no point in taking a measurement if the patient has spent hours away from the source of CO. Measurements taken the next day at the surgery may be misleading.

Recent advances in pulse oximeters allow them to take readings for CO levels. Whilst there are some concerns if a traditional pulse-oximeter is used, owing to the similar light absorbance of COHb and oxyhaemoglobin and the likely display of false high oxygen saturations, those designed for use in detecting blood CO levels (pulse CO-oximeters) are a useful aid to diagnosis.

Carboxy-Haemoglobin (COHb)

COHb can be measured in blood by any clinical chemistry laboratory. Venous blood should be taken into anti-coagulant and sent to the laboratory. COHb should be measured directly: measuring PO_2 and calculating the percentage saturation of haemoglobin with oxygen will be misleading as the PO_2 in CO poisoning may well be normal.

For interpretation of blood sample results and more detailed advice on CO poisoning refer to TOXBASE, contact the Northern Ireland Regional Medicines and Poison Information Service or the National Poisons Information Service (NPIS).

Management

- Remove patient and co-habitants from source of CO.
- Give 100% oxygen – a tightly fitting mask with an inflated face-seal is necessary for the administration of 100% oxygen.
- Consider referring for hyperbaric oxygen therapy.
- Contact the Public Health Agency which will co-ordinate Environmental Health, Health and Safety, Social and other services to protect your patient and others.

Indications for Hyperbaric Oxygen Therapy (HBOT)

There is debate about the added value provided by HBOT. While this is advocated by some clinical experts, systematic reviews have not provided conclusive evidence of benefit. Advice on management of patients with serious CO poisoning, especially those with the following features, can be obtained from Northern Ireland Regional Medicines and Poison Information Service or the NPIS:

- the patient has lost consciousness at any stage;
- the patient has neurological signs other than headache;
- myocardial ischemia/arrhythmia has been diagnosed by ECG; and/or
- the patient is pregnant.

HBOT use should be considered on a case-by-case basis. Expired air CO and blood COHb are poor guides to prognosis and the need for hyperbaric oxygen therapy.

Prevention is better than cure

The following simple rules will reduce the risk of carbon monoxide poisoning.

- Ensure that all appliances that use gas or fossil fuels are properly installed and regularly serviced by an accredited engineer.
- Ensure that there is adequate ventilation in any room were such appliances are used,
- Ensure that chimneys or flues are clean and not obstructed,
- Do not use unflued appliances in small closed rooms,
- fit a carbon monoxide alarm that meets British or European Standards,
- ensure adequate ventilation in any setting where carbon monoxide might be produced and accumulate e.g. garages,
- if moving into new premises, either your own or rented, ensure that the above checks have been carried out,
- if you have any unexplained symptoms, be very suspicious and seek medical advice.

People to consult

For information on appliances and servicing:
Gas Safe Register (gas) www.gassaferegister.co.uk
Tel: 0800 408 5500
OFTEC (oil) www.oftec.org
Tel: 0845 65 85 080

NIACS (all fuels) Northern Ireland Association of Chimney Sweeps www.niacs.co.uk

Northern Ireland Coal Advisory Service (solid fuel)
www.coaladvisoryservice.com
Tel: 0845 712 5300

Advice on the management of poisoning

Contact the Northern Ireland Regional Medicines and Poison Information Service on **028 90 632032**.

Refer to TOXBASE or the National Poisons Information Service (NPIS) on **0844 892 0111** for the interpretation of blood sample results and for more detailed advice on CO poisoning.

Public Health Agency: Health Protection Duty Room 02890553994/ 7

Refer to the algorithm available on the website of the Public Health Agency

Last points

Audible CO alarms are available (European Standard EN 50291, showing a British Standards Kitemark or LPCB – Loss Prevention Certification Board logo) and should be recommended. These alarms are available in homeware or DIY stores, and the alarm manufacturer's instructions for installation and maintenance should be followed. You can also buy CO detection patches and 'black-spot' indicators, but these will not wake you and warn you if dangerous levels of CO develop. It is important to remember that fitting an audible CO alarm is not an alternative to having appliances, flues and chimneys serviced and tested.

Leaflets and further information

1. *Carbon Monoxide: Are you at risk?* New leaflet for the general public, available at www.nidirect.gov.uk/carbon_monoxide_guide.pdf

2. NI Direct 'Tips and Advice: Coping With Winter Weather': www.nidirect.gov.uk/news-nov10-tips-and-advice-on-coping-with-winter-weather

3. NHS Choices information on CO poisoning: www.nhs.uk/carbonmoxide

4. Health Protection Agency information on CO: www.hpa.org.uk/carbonmonoxide

5. *Gas Appliances – Get them checked. Keep them safe.* Leaflet produced by the Health and Safety Executive (HSE), available by calling the HSE information line on 0845 345 0055 or at www.hse.gov.uk/pubns/indg238.pdf

6. HSE has also prepared a series of short videos on gas safety, which help to highlight typical scenarios and symptoms of CO poisoning: www.hse.gov.uk/campaigns/worksmart/videos

7. The Health and Safety Executive for Northern Ireland (HSENI) in partnership with relevant stakeholders launched its CO awareness campaign on 1 November 2010. www.hseni.gov.uk/watchout. It has also produced a public information sheet: *Domestic*

Gas Health and Safety, available from HSENI through its helpline 08000320121 and http://www.hseni.gov.uk/domestic_gas_leaflet.pdf.