



Patient breathes into analyser

1

Is this the first CO exhaled breath reading taken?

YES/NO

2

Make a note if the reading is higher than expected

Compare the reading with previous readings

*Reading is higher or the same as previous readings*

The patient may not be compliant with the smoking cessation programme

**OR**

The patient could be exposed to other sources of CO, especially if the reading has stabilised at a level over 5 ppm

*Reading is lower than previous readings*

It is likely that the patient is compliant with the smoking cessation programme, especially if the reading has stabilised at a level below 5 ppm

3

**You are suspicious:**

Could this be a case of CO poisoning?

**Ask the patient:**

*(Positive responses raise suspicion)*

*Have you smoked or been exposed to smoke in the last 12 hours? (Non-compliance with programme possible)*

*Does your work involve possible exposure to smoke, fumes or motor vehicle exhaust?*

*Do you have gas, oil or solid fuel appliances in your home? If so, have they been serviced recently?*

*Do you ever use your oven or gas stove for heating purposes as well as for cooking?*

*Has there been any change in ventilation in your home recently (eg fitting double glazing)?*

*Do you or any other occupants in your home suffer from headache, flu-like symptoms, drowsiness and/or nausea?*

*Is your home detached, semi-detached, terraced, flat, bedsit, hostel or mobile home?*

4

**You are suspicious:**

Could this be a case of CO poisoning?

**Recommend the patient:**

- does not use any appliance identified as being a possible source of CO
- contacts an appropriately registered engineer to check all household gas, oil or solid fuel appliances
- if the symptoms persist, contacts their GP or attends a hospital emergency department, especially if the patient has young children or babies or the symptoms are severe
- installs a CO alarm (BS EN 50291 compliant) or asks their landlord to install a CO alarm in the case of rented properties with solid fuel appliances

**You should:**

- notify your local PHE centre
- suggest the patient reads information on CO on NHS Choices: [www.nhs.uk/conditions/carbon-monoxide-poisoning/Pages/Introduction.aspx](http://www.nhs.uk/conditions/carbon-monoxide-poisoning/Pages/Introduction.aspx)

5

See over for notes on boxes 1–5

**Carbon monoxide and smoking**

CO is produced when tobacco products are burnt. It is found in inhaled, exhaled and sidestream smoke. CO levels in the exhaled breath of smokers and people exposed to sidestream smoke will be higher than those in non-smokers. Analysis of exhaled breath is a useful indicator of exposure to CO and to tobacco smoke.

CO can also be emitted from malfunctioning or poorly ventilated fossil or wood fuel heating and cooking appliances. Ruling out alternative sources of exposure is important – it could save your patient's life.

**Box 1 Patient's first exhaled breath reading**

If the CO reading is high enough to raise suspicion based on the information gathered about the patient's smoking habits, the questions in box 4 can be asked to ensure there is no CO exposure from other sources.

**Box 2 Patient's follow-up exhaled breath reading**

It is important to record the levels of CO present in exhaled breath each time your patient attends the clinic so that any changes in exposure levels may be noted and explained.

**Box 3 Compare carbon monoxide readings**

It is important to compare each reading with readings taken on previous clinic visits. You need to establish why expected decreases in CO levels are not occurring.

*Is the patient complying with the smoking cessation programme?*

If your patient's CO levels are decreasing as expected, it shows that they are compliant with the protocol you have given them. For smoking cessation purposes, stabilisation below 5 ppm shows compliance with the programme.

If your patient's CO levels are not decreasing as expected, and have stabilised above 5 ppm, it shows that they may be exposed to other sources of CO.

If you are concerned that your patient may be exposed to other CO sources, the questions in box 4 can be asked as a precautionary measure.

**Box 4 Sources of carbon monoxide**

The source of CO may be from tobacco smoke, the car, the workplace or in the home. Fossil or wood fuel heating appliances are the most common sources in the home. There may be more than one appliance causing the problem. It is important to ascertain if an appliance has been newly installed. Inappropriate appliance use, including generators and BBQs, can lead to a build up of CO.

It is also worth asking: *Have you recently started to re-use heating appliances/boilers after the summer break or during an unexpected cold spell?*

Recent fitting of double glazing or blocking vents will suddenly reduce ventilation and cause CO to build up in the property, if there is a source.

CO is a mimic and is notorious for simulating other more common conditions including flu-like illnesses, migraine, food-poisoning, tension headaches and depression.

CO poisoning can occur in all income groups and types of housing.

CO can leak into a semi-detached or terraced house/flat from neighbouring premises.

**Box 5 Stopping further exposure is essential**

Preventing further exposure is the most important thing you can do. If you suspect that there is another source of CO contributing to your patient's readings, advise your patient on returning home to turn off all fossil fuel appliances, open windows, make sure other occupants are safe and contact an appropriately registered engineer to check appliances. Any occupant experiencing any of the symptoms listed in box 4 should seek medical attention immediately.

Recommend the purchase of an audible CO alarm for installation in the home, but stress that an alarm is not a substitute for regular maintenance of appliances by an appropriately registered engineer. For rented homes, advise that landlords are required by law to install CO alarms in every room with solid fuel appliances.

*It is essential that you contact your local PHE centre to notify PHE of your suspicions. The centre will be able to coordinate services to help protect your patient if necessary.*

**Useful contact numbers**

999	0800 111 999	0800 408 5500	0800 300 363
Ambulance/police	National gas emergency service	Gas Safe Register	HSE (gas safety for GB)
111	0845 634 5626	0845 658 5080	0344 892 0555
NHS 111	HETAS (solid fuel)	OFTEC (oil and biofuel)	PHE 24-hour chemicals hotline