The clinical case for providing stop smoking support to stroke patients

What is the relationship between smoking and stroke?

Cigarette smoking is a strong independent risk factor for ischemic stroke; both intracerebral hemorrhage (ICH) and subarachnoid hemorrhage (SAH) risks are elevated.[1–5] After an initial stroke, persistent smoking results in significantly increased risk of stroke recurrence.[1,6–8]

Why intervene in secondary care?

Hospitalisation offers an opportune time to encourage patients to stop smoking for five main reasons:

- Firstly, this time is often a 'teachable moment' where patients are more receptive to intervention and are more motivated to quit.

- Secondly, abstaining from smoking at this time can improve recovery and lead to significant health benefits.

- Thirdly, the hospital's no smoking environment creates an external force to support abstinence.

- Fourthly, patients are ideally placed to be given information about treatment options, supported through tobacco withdrawal and signposted to specialist services.

- Finally, smoking cessation interventions are highly cost-effective and result in direct cost-savings to the NHS.

Smoking is associated with disease processes that are predisposed to a stroke:

- the progression of atherosclerosis by producing oxidative stress, endothelial dysfunction, inflammation, and lipid abnormalities[1,4,9]

- damage to arterial walls and rupture of small intraparenchymal arteries[10]

- decreased serum albumin levels that are associated with increased risk of stroke incidence[7]

- increase in fibrinogen concentration, a decrease in fibrinolytic activity, an increase in platelet aggregability, and polycythemia[1]

- increased risk of thrombosis; a major factor in the pathogenesis of smoking-induced cardiovascular events[1,11]

Risk of stroke is dose-related, increasing with number of cigarettes smoked per day.[1,2,6,12,13] Meta-analysis data estimates the risk of stroke increases by 12% for each increment of 5 cigarettes per day.[2,6]

What are the health benefits of stopping smoking for stroke patients?

Smoking cessation is a powerful intervention for the secondary prevention of stroke.[1,14] Stopping smoking results in a considerable reduction in risk of stroke recurrence and stroke-related morbidity and mortality.[5,7,14] Smoking cessation is associated with less progression of carotid plaque, and reduced likelihood of new plaques.[4]

While evidence suggests the risk of stroke and stroke recurrence may require 2 or more years to accrue, some benefits occur within months of quitting. Stopping smoking is associated with improved stroke specific outcomes in both the short and long-term including:[1,6]

- Significant improvements in thrombotic processes and cerebral flow soon after quitting. Within 1 to 2 months, smoking-related stroke risk due to hypercoagulability normalises to that of non-smokers.

- Significant reductions in stroke recurrence.[1,6]

- After 5 years stroke risk is reduced to that of a non-smoker in most cases.[1,2,7]

A recent study estimated the adjusted hazard ratios for stroke recurrence within 2 – 2.5 years of index stroke (with non-smokers as the reference) to be:[6]

- 1.16 (95% CI, 0.75 – 1.79) in former smokers,

- 1.31 (95% CI, 0.99 – 1.75) in quitters,

- 1.68 (95% CI, 1.14 – 2.48) in those who continued to smoke 1 to 20 cigarettes daily,

- 2.72 (95% CI, 1.36 – 5.43) in those who continued to smoke more than 40 cigarettes daily

Abstinence from smoking will also improve recovery time by eliminating the acute effects of smoking on the body and benefit a patient's long-term health by reducing the risk of developing other smoking-related disease (see below).[1,15]

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

- Increase in sympathetic tone leading to an increase in blood pressure, heart rate and peripheral vasoconstriction leading to an increased demand for oxygen and cardiac function[16] **(24 – 48 hours)**

- Formation of carboxyhaemoglobin leading to a reduction in oxygen delivery to the tissues[17] **(8 – 24 hours)**

- Formation of carboxymyoglobin leading to a reduction in oxygen storage in the muscles[18] **(8 – 24 hours)**

- Increase in red blood cell production, which leads to an increase in blood viscosity, a decrease in tissue perfusion, a decrease in oxygen delivery to the tissues and potentiation of thrombotic process[19,20]

- Hypersecretion of mucus, narrowing of the small airways, decrease in ciliary function and change in mucus rheology leading to a decrease in mucociliary transport[19,20] **(12 – 72 hours)**

- 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[19,20] **(1 week – 2 months)**

- Induction of hepatic enzymes which increases drug metabolism through both pharmacokinetic and pharmacodynamic mechanisms[21,22] **(6 – 8 weeks)**

General health benefits of stopping smoking[1]

- Within 20 minutes heart rate and blood pressure drops.

- Within 12 hours carbon monoxide levels in the blood return to normal.

- Within 24 hours the chance of a heart attack decreases.

- Within 2 weeks to 3 months circulation improves and lung function increases.

- Within 1 to 9 months lungs regain normal ciliary function, reducing infection risk.

- Within 1 year risk of heart attack is reduced by half.

- By 10 years the risk of lung cancer is approximately half that of a smoker. The risk of cancers of the mouth, throat, bladder, kidney and pancreas also decrease.

- By 15 years risk of heart attack is that of a non-smoker.

Stop smoking support is effective

Smoking cessation interventions have been proven effective for hospitalised patients in general[23] and specifically for stroke patients.[24–28] Smoking cessation interventions for hospitalised patients increase the rate of long-term quitting if they include:[23,27,29,33]

- **in-hospital behavioural support,**

- **stop smoking medication, and**

- **follow-up following discharge from hospital**

All inpatient settings should introduce **systems to address tobacco use with hospitalised patients and ensure best practice intervention** is received to support this high-risk patient population with quitting.[27,29–32] These systems screen and document the smoking status of all patients and provide support with quitting as a priority during their admission, including the initiation of a first line stop smoking pharmacotherapy including nicotine replacement therapy (NRT), varenicline and a referral system to link patients to specialised stop smoking support.

Vaping

E-cigarettes provide nicotine without combustion and are popular among UK smokers as an alternative to smoking. While electronic cigarettes are not risk-free, Public Health England estimates they are 95% safer than smoking cigarettes.[34] There is also evidence to indicate that e-cigarettes are effective in helping patients stop smoking.[34,35] Evidence on safety and the role vaping plays in supporting quitting is reviewed regularly. Policies related to the use of electronic cigarettes in inpatient settings will vary by trust and organisation.

Best practices for managing tobacco withdrawal in the smokefree inpatient setting

Most regular smokers will experience tobacco withdrawal symptoms within hours of their last cigarette and can range from mild to severe.[36] Withdrawal symptoms include aggression and hostility and can affect the care of the patient.

Recognising and managing withdrawal among hospitalised patients who smoke and offering immediate assistance should be a priority in all inpatient settings. Providing NRT to a patient will ease tobacco withdrawal symptoms and will also support long-term quitting. A combination of the patch (NRT patch can take 20–40 minutes to reach therapeutic dose) with a short-acting NRT product (e.g. gum, inhaler, spray) is a recommended evidence-based practice for managing tobacco withdrawal in inpatient settings.[33,37]

Tobacco withdrawal symptoms include:[36]

- Urges to smoke or cravings
- Restlessness or difficulty concentrating
- Irritability, aggression, anxiety, crying, sadness or depression
- Difficulty sleeping or sleeping disturbances
- Increased appetite and weight gain
- Coughing
- Mouth ulcers
- Constipation
- Light headedness

Providing 'Very Brief Advice' to hospital patients: the '3 As'

The NHS Long Term Plan has committed that all people admitted to hospital and high-risk outpatients who smoke will be offered NHS-funded tobacco treatment services by 2023/24.[32]

NICE outlines a care pathway for supporting smoking cessation in the inpatient setting that can be adopted for stroke patients.[33,38,39] In essence, the care pathway incorporates a very brief intervention using the 3As model:

ASK and record smoking status

ADVISE the patient:

– the best way of quitting is with a combination of support and stop smoking medication

– support with stopping smoking and/or managing any tobacco withdrawal symptoms (temporary abstinence) is available

– of the personal health benefits of stopping smoking

ACT on the patient response:

– prescribe NRT for patients in withdrawal

– monitor withdrawal and adjust pharmacotherapy accordingly

– refer to specialised stop smoking support (hospital-based, local stop smoking service)

References

1. U.S. Department of Health and Human Services. The health consequences of smoking – 50 years of progress. A report of the surgeon general. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health; 2014

2. Pan B, Jin X, Jun L, et al. The relationship between smoking and stroke: a meta-analysis. Medicine (Baltimore). 2019;98(12):e14872.

3. Shah RS, Cole JW. Smoking and stroke: the more you smoke the more you stroke. Expert Rev Cardiovasc Ther. 2010;8(7):917–32.

4. Stein JH, Smith SS, Hansen KM, et al. Longitudinal effects of smoking cessation on carotid artery atherosclerosis in contemporary smokers: the Wisconsin smokers health study. Atherosclerosis. 2020 Dec;315:62–7.

5. Markidan J, Cole JW, Cronin CA, et al. Smoking and risk of ischemic stroke in young men. Stroke. 2018;49:1276–8.

6. Chen J, Li S, Zheng K, et al. Impact of smoking status on stroke recurrence. J Am Heart Assoc. 2019 16;8(8):e011696.

7. Epstein KA, Viscoli CM, Spence JD, et al. Smoking cessation and outcome after ischemic stroke or TIA. Neurology. 2017 Oct 17;89(16):1723–9.

8. Callaly E, Ni Chroinin D, Hannon N, et al. Rates, predictors, and outcomes of early and late recurrence after stroke: the North Dublin population stroke study. Stroke. 2016;47:244–6.

9. Howard, G, Wagenknecht LE, Burke GL, et al. Cigarette smoking and progression of atherosclerosis: the atherosclerosis risk in communities (ARIC) study. JAMA. 1998;279(2):119–24.

10. Powell JT. Vascular damage from smoking: disease mechanisms at the arterial wall. Vasc Med. 1998;3:21–8.

11. Feigin VL, Roth GA, Naghavi M, et al. Global burden of stroke and risk factors in 188 countries, during 1990–2013: a systematic analysis for the global burden of disease study 2013. Lancet Neurol. 2016;15:913–24.

12. Myint PK, Welch AA, Bingham SA, et al. Smoking predicts long-term mortality in stroke: the European prospective investigation into cancer (EPIC) – Norfolk prospective population study. Prev Med. 2006;42(2):128–31.

13. Bhat VM, Cole JW, Sorkin JD, et al. Dose-response relationship between cigarette smoking and risk of ischemic stroke in young women. Stroke. 2008;39(9):2439–43.

14. U.S. Department of Health and Human Services. Smoking cessation: a report of the surgeon general. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health; 2020.

15. Doll R, Peto R, Boreham J, et al. Mortality in relation to smoking: 50 years' observations on male British doctors. BMJ. 2004;328(7455):1519.

16. Warner DO. Perioperative abstinence from cigarettes: physiologic and clinical consequences. Anesthesiology. 2006;104:356–67.

17. Rietbrock N, Kunkel S, Worner W, et al. Oxygen-dissociation kinetics in the blood of smokers and non-smokers: interaction between oxygen and carbon monoxide at the hemoglobin molecule. Nanunyn Scmiedebergs Arch Pharmacol. 1992;98:528–34.

18. Akrawi W, Benumof JL. A pathophysiological basis for informed preoperative smoking cessation counselling. J Cardiothorac Vasc Anesth. 1997;11(5):629–40.

19. Ambrose J. The pathophysiology of cigarette smoking and cardiovascular disease. J Am Coll Cardiol. 2004;43(10):1731–7.

20. Moller A, Tonnesen H. Risk reduction: perioperative smoking intervention. Best Pract Res Clin Anaesthesiol. 2006;20(2):237–48.

21. Zevin S, Benowitz NL. Drug interactions with tobacco smoking: an update. Clin Pharmacokinet. 1999;36(6):425–38.

22. UK Medicines Information (UKMi). What are the clinically significant drug interactions with cigarette smoking? UKMi; 2020. Available from: https://www.sps.nhs.uk/articles/what-are-the-clinically-significant-drug-interactions-with-tobacco-smoking/

23. Rigotti N, Clair C, Munafo MR, et al. Interventions for smoking cessation in hospitalised patients. Cochrane Database Syst Rev. 2012; Issue 5. Art. No.: CD001837.

24. Lee MJ, Park E, Kim HC, et al. Timely interventions can increase smoking cessation rate in men with ischemic stroke. J Korean Acad Nurs. 2016 Aug;46(4):610–7.

25. Mohiuddin SM, Mooss AN, Hunter CB, et al. Intensive smoking cessation intervention reduces mortality in high-risk smokers with cardiovascular disease. Chest. 2007;131:446–52.

26. Edjoc RK, Reid RD, Sharma M. The effectiveness of smoking cessation interventions in smokers with cerebrovascular disease: a systematic review. BMJ Open. 2012;2(6):e002022.

27. Mullen KA, Manuel DG, Hawken SJ, et al. Effectiveness of a hospital initiated smoking cessation programme: 2-year health and healthcare outcomes. Tob Control. 2017;26:293–9.

28. Ovbiagele B, Saver JL, Fredieu A, et al. In-hospital initiation of secondary stroke prevention therapies yields high rates of adherence at follow-up. Stroke. 2004;35(12):2879–83.

29. Reid RD, Mullen KA, Pipe AL. Systematic approaches to smoking cessation in the cardiac setting. Curr Opin Cardiol. 2011;26(5):443–8.

30. Reid RD, Pipe AL, Quinlan B. Promoting smoking cessation during hospitalization for coronary artery disease. Can J Cardiol. 2006;22(9):775–80.

31. Evison M, Pearse C, Freya H, et. al. Feasibility, uptake and impact of a hospital-wide tobacco addiction treatment pathway: results from the CURE project pilot. Clin Med (Lond). 2020;20(2):196–202.

32. National Health Service (NHS). The NHS long term plan. London: NHS; 2019. Available from: https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/

33. National Institute for Clinical Excellence (NICE). Smoking: acute, maternity, and mental health services (PH48). London: NICE; 2013. Available from: https://www.nice.org.uk/guidance/ph48/

34. McNeill A, Brose LS, Calder R, et al. Vaping in England: an evidence update including mental health and pregnancy, March 2020: a report commissioned by Public Health England. London: Public Health England; 2020.

35. Hartmann-Boyce J, McRobbie H, Lindson N, et al. Electronic cigarettes for smoking cessation. Cochrane Database Syst Rev. 2020, Issue 10. Art. No.: CD010216.

36. National Centre for Smoking Cessation and Training. Practitioner training (elearning). Available from: https://elearning.ncsct.co.uk/england

37. Lindson N, Chepkin SC, Ye W, et al. Different doses, duration, and modes of delivery of nicotine replacement therapy for smoking cessation. Cochrane Database Syst Rev. 2019, Issue 4. Art. No.: CD013308.

38. National Institute for Clinical Excellence (NICE). Smoking cessation in secondary care: NICE pathway. London: NICE; 2019. Available from: https://pathways.nice.org.uk/pathways/smoking-cessation-in-secondary-care

39. National Institute for Health and Care Excellence (NICE). Cardiovascular disease prevention [PHG25]. London: NICE; 2010. Available from: https://www.nice.org.uk/guidance/PH25