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# Management of hyperpyrexia, hyperglycaemia, and hypertension in acute ischaemic stroke

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## disclosures

- Speaker's fees and consultancy for Bayer and Boehringer Ingelheim
- (co-)Chief investigator PRECIOUS and MR ASAP

## **learning objectives**

- obtain insight in the frequency, causes, and treatment options of frequent medical complications after ischaemic stroke
- obtain knowledge of the evidence underlying suggested or recommended treatment options
- be able to implement recommendations in guidelines in routine clinical practice

## medical complications in first days after stroke

- infection 30%
- temperature  $> 37,5^{\circ}\text{C}$  33 – 50%
- hyperglycaemia 30 – 40%
- hypertension 75%

some complications more frequent with

- higher age
- more severe deficit

**all associated with poor outcome**

## American guidelines recommend

- antibiotics for infections
- antipyretic drugs for subfebrile temperatures or fever
- treatment of hyperglycaemia
- treatment of severe hypertension before i.v. thrombolysis



too late?



prevention better?

## ESO guidelines

- no recommendation possible for treating hyperthermia as a means to improve functional outcome and/or survival
- routine prevention of hyperthermia not recommended
- new randomised trials warranted

## conclusions & recommendations

- in patients with fever, the presence of an infection should be assessed and infections should be treated;
- there is no evidence yet that the **prevention** of dysphagia, infections, or fever or treatment of hyperglycaemia or hypertension improve functional outcome;
- the RCT **PRECIOUS** assesses whether the prevention of complications improves outcome;
- early antihypertensive treatment is tested in RCTs

## **literature**

- den Hertog H, van der Worp B, van Gemert M, et al. Therapeutic hypothermia in acute ischemic stroke. *Expert Rev Neurother* 2007; 7: 155–164.
- den Hertog HM, van der Worp HB, van Gemert HMA, et al. The paracetamol (Acetaminophen) in stroke (PAIS) trial: a multicentre, randomised, placebo-controlled, phase III trial. *Lancet Neurol* 2009; 8: 434–440.
- de Jonge JC, Wallet J and van der Worp HB. Fever worsens outcomes in animal models of acute ischaemic stroke: a systematic review and meta-analysis. *European Stroke Journal* 2019;
- Greer DM, Funk SE, Reaven NL, et al. Impact of fever on outcome in patients with stroke and neurologic injury: a comprehensive meta-analysis. *Stroke* 2008; 39: 3029–3035.
- Hesse K, Fulton RL, Abdul-Rahim AH, et al. VISTA Collaborators. Characteristic adverse events and their incidence among patients participating in acute ischemic stroke trials. *Stroke* 2014; 45: 2677–2682.
- Kalra L, Irshad S, Hodson J, et al. Prophylactic antibiotics after acute stroke for reducing pneumonia in patients with dysphagia (STROKE-INF): a prospective, cluster-randomised, open-label, masked endpoint, controlled clinical trial. *Lancet* 2015; 386: 1835–1844.
- Kumar S, Selim MH and Caplan LR. Medical complications after stroke. *Lancet Neurol* 2010; 9: 105–118.
- Luitse MJ1, Biessels GJ, Rutten GE, Kappelle LJ. Diabetes, hyperglycaemia, and acute ischaemic stroke. *Lancet Neurol*. 2012; 11: 261-71.
- Middleton S, McElduff P, Ward J, et al. Implementation of evidence-based treatment protocols to manage fever, hyperglycaemia, and swallowing dysfunction in acute stroke (QASC): a cluster randomised controlled trial. *Lancet* 2011; 378: 1699–1706.
- Ntaios G, Dziedzic T, Michel P, et al. European Stroke Organisation (ESO) guidelines for the management of temperature in patients with acute ischemic stroke. *Int J Stroke* 2015; 10: 941–949.
- Powers WJ, Rabinstein AA, Ackerson T, et al. 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke*. 2018; 49: e46-e110.
- Saini M, Saqqur M, Kamruzzaman A, et al.; VISTA Investigators. Effect of hyperthermia on prognosis after acute ischemic stroke. *Stroke* 2009; 40: 3051–3059.
- Warusevitane A, Karunatilake D, Sim J, et al. Safety and effect of metoclopramide to prevent pneumonia in patients with stroke fed via nasogastric tubes trial. *Stroke* 2015; 46: 454–460.
- Westendorp WF, Nederkoorn PJ, Vermeij J-D, et al. Post-stroke infection: a systematic review and meta-analysis. *BMC Neurol* 2011; 11: 110.
- Westendorp WF, Vermeij J-D, Zock E, et al. The Preventive Antibiotics in Stroke Study (PASS): a pragmatic randomised open-label masked endpoint clinical trial. *Lancet* 2015; 385: 1519–1526.