Reviewer’s report

Title: Asymmetrical Bioimpedance in the Anterior Circulation for Urgent Stratification of suspected Stroke (ABACUS Stroke): study protocol for a diagnostic accuracy study

Version: 0 Date: 24 Aug 2019

Reviewer: Thomas Meinel

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I read with interest the protocol "Asymmetrical Bioimpedance in the Anterior Circulation for Urgent Stratification of Stroke (ABACUS Stroke): study protocol for a diagnostic accuracy study". The authors plan on a diagnostic accuracy study of a novel device using volumetric impedance phase shift spectroscopy (VIPS). Their long-term aim is to reliably detect and triage "complex strokes" and large vessel occlusion to comprehensive stroke centers in a prehospital setting. But this study will be conducted in a ED setting.

The tool seemed promising in preliminary studies and the publication of protocols are necessary to ensure well-conducted research. The protocol is overall suitable and may be of interest to (vascular) neurologists, prehospital care teams, and ED physicians. However, the technical details of VIPS can hardly be understood by physicians. The topic does carry clinical relevance. The discussion is reasonable and proves knowledge in the area. Overall, the protocol is clearly written. However, the terms used are somewhat unusual and the compound endpoint, details of the statistics as well as methodology somewhat questionable.

Below is a list of major and minor concerns:

Major:

1) Page 25: is this a derivation cohort study or are you going to used a prespecified cutoff of the VIPS-output?

2) in the decision tree a small cortical (non-lacunar) infarct can "overrule" a ICH of 29ml in the basal ganglia. I think this should be changed, that any ICH overrules "territorial infarctions", which will almost never cause the symptoms leading to ED admission.

Minor:

1) Title: AC only? What about PC Strokes?

2) Abstract: "… stroke aetiologies including LVO" and "can identify key stroke aetiologies". Etiologies are usually referred to for TOAST classification (Large artery, small vessel,
cardioembolic … ). Doubt that the machine can do this. Would rewrite "System device may be able to identify presence of LVO in AIS".

3) Abstract: "intracerebral haemorrhage &gt; 59 or &lt; 60mls» What about 59.5??

4) Page 5 line 104 "may not be offered thrombectomy treatment": if angiography is not available, all patients should be transferred to a center where CT/MR-angiography is available. Would remove this statement.

5) Page 5 line 127 "severe anterior vessel stenosis (SSAVS)»: the usual term is intracranial artery stenose (ICAS), would rephrase to (anterior circulation) ICAS.

6) Page 6 line 132: "whether urgent stenting should be offered on a case by case basis": Despite recent WEAVE positive results, the primary treatment for ICAS is dual antiplatelet, statin therapy and aggressive risk factor management. Stenting is ultima ratio and should therefore not be mentioned here until all conservative treatment options fail.

7) Page 17: Stenosis grade SSAVS: In MRA, especially TOF, this is going to be very unreliable. Even in CTA, this is difficult. Are you doing perfusion imaging in all patients? Are you going to double-check with intracranial ultrasound?

8) Page 17 "the severity of the focal symptoms is &gt;= 6 on the NIHSS scale.": in iCAS NIHSS is often fluctuating, which one will you count? Highest/lowest/admission?

9) Page 19: What to do with posterior circulation stroke?

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