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The use of B-FAST criteria as a predictor for treatment with mechanical thrombectomy

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Introduction

The project aims to investigate to what degree the recommended criteria for transporting patients with presumed cerebral large vessel occlusion (LVO) and predefined clinical findings (B-FAST) are followed in the Western Norway Health Authority Region (Helse Vest).
The B-FAST-criteria are an abbreviation for five acute neurological symptoms that according to the procedures in Helse Vest require thrombectomy treatment:

- **B**= Eye deviation
- **F**= Paresis in the face
- **A** = Paresis in the extremities
- **S** = Loss of sight
- **T** = Loss of speech function (aphasia or dysarthria).

Patients with symptom **B** and one of the four FAST symptoms fulfils the recommended criteria, and shall therefore be transported directly to the nearest Intervention Centre for mechanical thrombectomy (1).

The research project will be related to the Regional Center for Emergency Medical Research and Development (RAKOS), which in 2018 received the task from Helse Vest to implement predefined criteria for prehospital selection of patients that might benefit from treatment with mechanical thrombectomy (1).

Background and Project relevance

According to statistics from Norwegian Centre for Stroke Registry, *Norsk Hjerneslagsregister,* 8840 patients admitted to 50 Norwegian hospitals suffered a cerebral stroke in 2018 (2). Among these, 86% suffered an ischaemic stroke and 13% suffered a haemorrhagic stroke (2). Patients with acute ischaemic stroke can effectively be treated with intravenous thrombolysis (IV altepase) and/or endovascular (mechanical) thrombectomy (3) if initiated within defined time limits. The aim with these treatments is to increase the revascularization rate by removing the blood clot, and these two treatments have shown to be superior to other techniques (3).

Treatment with mechanical thrombectomy can be used when the patient suffer from a large cerebral vessel occlusion and thrombolysis is ineffective to facilitate reperfusion (4). The technique involves physical extraction of the blood clot and has a much higher reperfusion rate than treatment with thrombolysis (3). However, according to guidelines from the Norwegian Institute for Health (FHI), mechanical thrombectomy is only effective within a short time frame of 6 hours after the ischaemic stroke occurred (4). Other studies even suggest that treatment up to 24 hours after stroke onset may be effective (5). In my study area, which involves collecting data from all patients diagnosed with ischaemic stroke and patients with stroke symptoms transported with Air Ambulance in Helse Vest, treatment with thrombectomy is only performed in Intervention Centres at Stavanger University Hospital (SUH) and Haukeland University Hospital (HUH) (6). In stroke treatment, the term "time is brain" is frequently used, reflecting that the outcome after an ischaemic stroke is strongly associated with timely reperfusion treatment (3). Therefore, it is important to only select patients with large vessel occlusions (present B-FAST criteria) who could benefit from treatment with mechanical thrombectomy. Many patients with smaller vessel occlusions can successfully be treated with thrombolysis at their nearest local hospital with lower transport time than to the nearest Intervention Centre. As a consequence of this, an investigation to what degree the criteria for prehospital selection are followed is highly relevant for good patient outcomes.

Methods and Data Collection

The investigation is a retrospective register study where I will collect patient data from the Norwegian Centre for Stroke Registry (NHR) covering the Western Health Region (Helse Vest) and from all three Air Ambulance bases in Helse Vest. The inclusion criteria in the study are present B-FAST or FAST neurological symptoms in patients admitted to hospital. NHR contains data from all patients admitted to hospital who suffered an acute ischaemic stroke, and provides information about which treatment they received, patient outcome, gender, age and related risk factors (2). More specifically, I will collect data in a six-month period from all patients that suffered an ischaemic stroke, and patients that were transported with Air Ambulance due to symptoms of stroke in Helse Vest in the period 1st July to 31st Decmber 2020. From this population, I will further look into those patients who had present B-FAST criteria and investigate to what degree they were transported directly to the nearest Intervention Centre for thrombectomy treatment. We estimate that ¼ of all hospital-treated

cerebral strokes in Norway were admitted to hospitals in Helse Vest. According to data from 2017, 90 of these patients received thrombectomy treatment (5).

I would like to point out that due to the ongoing Covid-19 situation, the time period for data collection may be changed. Several hospitals reported significantly lower numbers of hospitalized stroke patients during the lockdown (7), and a new lockdown period in the data collection period will in high degree affect the data.

Figure 1 describes a simplified version of the stroke patient population. The large rectangular area includes all patients in Helse Vest diagnosed with an ischaemic stroke that either received treatment (Red and Green Area) or did not receive treatment (White area) due to late arrival time. This represents a large proportion of stroke patients, and a major factor for the time loss is prehospital delay due to patients with stroke symptoms await before they contact the Emergency Services (8). The red and green area represent patients treated with thrombolysis and mechanical thrombectomy, respectively.

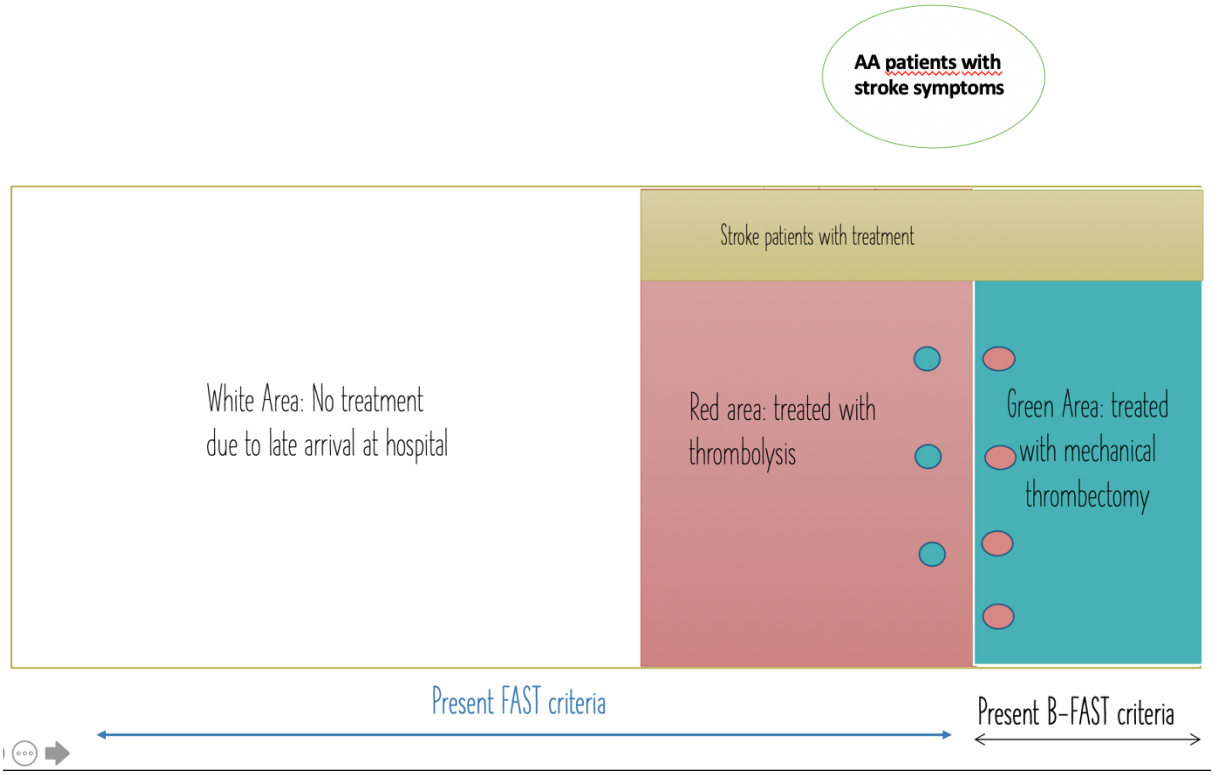

Figure 1

The parameters in the figure I want to analyse in detail are:

- To what extent do stroke patients with B-FAST symptoms receive thrombectomy treatment. The read circles in the "Present B-FAST criteria" interval represents overtriaged stroke patients that were false positive. More specifically, this means that they were prehospitally triaged for thrombectomy, but received thrombolysis. It is however important to recognise that B-FAST neurological symptom is not a definite inclusion criterion for treatment with mechanical thrombectomy, but can be described as a prehospital criterion for considering thrombectomy treatment. The red circles in the green area represent this population.
- The green circles in the "Present FAST criteria" interval represents undertriaged stroke patients that were false negative: they received thrombectomy, but were not prehospitally triaged with B-FAST symptoms.
- The circle outside the stroke population box represents Air Ambulance (AA) patients transported to hospital with stroke symptoms, who were not diagnosed with an ischaemic stroke.

Time schedule and Education

I will start my full-time research year autumn 2021, but will start collecting data January 2021. From autumn 2021, I will begin to analyse the data and working with a manuscript. The aim is to publish an article by the end of the spring semester 2022. I also hope to present an abstract at a congress in my full-time research year.

Jan 2021	Autumn 2021	Spring 2022
Data collection	Further Data Collection and Analysis	Article writing Presentation of one abstract at a congress

During "Forskerlinjen" I plan to take following subjects:

- MEDMET1 – "Grunnkurs i medisinsk og helsevitenskapeleg forskning»
- FORMIDL901 – «Vitenskapeleg formidling»
- Legeforeningen: courses in statistics
- Midtveisevaluering

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Objective and aims of the project

The objective of the project is to investigate the implementation of common criteria for transport to thrombectomy intervention centres in Helse Vest. This will be the main focus area in my two planned articles which will have different investigation aims:

- Article 1: To what extent are the B-FAST criteria used to transport acute ischaemic stroke patients directly to Intervention Centres for mechanical thrombectomy?
- Article 2: To what extent were stroke patients correctly triaged according to the B-FAST criteria, and to what degree did these patients receive thrombectomy treatment?

Ethical Consideration and REK approval

The research project involves access to personal medical journals where I will investigate to what extent adult patients diagnosed with ischaemic stroke had present B-FAST criteria. This is the only type of quantitative data we are interested in and no other type of data will be collected. The collected data will be non-identifiable and cannot be traced back to the patient. This study will apply for consent from the Regional Ethics Committee in Helse Vest (REK Vest) and from Institutional Review Board from the included hospitals.

Research Staff and Group

RAKOS is the Regional Competence Centre for Emergency Medicine in Helse Vest. The aim of the research group is to “develop, unite and distribute competences to improve the emergency medical services in Helse Vest” (9). Their research projects are related to emergency medical topics (9). Thomas W Lindner is head of the centre, and Conrad Bjørshol works as a Senior Researcher at the centre. Lindner received his PhD from the University of Bergen in 2015 and also works as a Consultant Anaesthesiologist. Bjørshol received his PhD from the University of Oslo in 2012 and also works as a Consultant Anaesthesiologist.

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