Stroke identification by criteria based dispatch – a register based study

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Background: Rapid and precise dispatch of resources is a key element in pre-hospital emergency medicine. Emergency medical communication centres (EMCCs) dispatch resources based on protocols and guidelines, balancing the acute need of the individual and the resource allocation of the pre-hospital emergency medical system. The aim of this study was to determine the validity of stroke identification by the Norwegian dispatch guidelines.
Method and material: This was a register-based study where patients suspected for stroke were compared to those with the final diagnosis of stroke as an indicator group for the guideline validation. One EMCC and its three associated hospitals participated with 13 months of data. Four subcodes of the stroke dispatch code were defined as suspicious of stroke and further analysed. Factors associated with stroke identification were explored.
Results: The sensitivity for identifying a stroke patient at initial EMCC contact was 57.9% (51.5, 64.1), specificity was 99.1% (98.9, 99.2), positive predictive value was 45.7% (40.1, 51.4) and negative predictive value was 99.4% (99.3, 99.5). The emergency medical access telephone (113) was initial EMCC contact line in only 48% of the cases. Paralyses and admittance to a smaller hospital were associated with increased probability for stroke (OR 2.6, $P = 0.001$ and OR 2.7, $P = 0.01$), respectively.
Conclusion: The sensitivity for identification of stroke patients by the dispatch guidelines is modest, while the specificity is high. The 113 telephone line was initial EMCC access point for less than half of the stroke patients.

Editorial comment
Correct and optimal emergency medical dispatching is a challenging process. This study assessed how well the suspected diagnosis at dispatch for stroke matched the actual diagnosis confirmed later at hospitalization in a regional cohort.

Emergency medical dispatch holds a key role in the pre-hospital chain of survival. Identifying the patients in potential life threatening situations is the first step towards providing them rapid and appropriate help.

Emergency medical dispatch is usually guided by either a criteria based dispatch (CBD) approach based on supportive guidelines, or on stricter algorithm-based protocols like the Medical Priority Dispatch System (MPDS)[1]. Research on criteria based dispatch (CBD) guidelines has been sparse, much due to the complex interaction between the supporting guidelines and the skill, knowledge and experience of the call taking emergency medical dispatcher (EMD)[1–3]. Criteria based guidelines use a symptom based approach, which makes it difficult to compare initial dispatch criteria codes with final diagnoses at hospital discharge, and hence measure validity. However, some symptoms are more specific than others. We found that the card known as the 'Stroke card' stroke in the Norwegian index for medical emergency assistance (Index)[4], criterion card 27, could serve as a rather specific symptom and thus an indicator of dispatch precision. This in the dispatch guidelines used by all Norwegian emergency medical communications centres (EMCCs).

With the establishment of an effective but time critical treatment[4,5], stroke is now considered one of the critical conditions requiring immediate pre-hospital management, alongside cardiac arrest, severe respiratory failure, severe trauma and chest pain (the first hour quintet)[6]. Time from symptom onset to intravenous thrombolysis is dependent on many factors; patient/bystander awareness of critical symptoms and call for help (emergency medical phone), dispatch identification of stroke symptoms, and pre-hospital and in-hospital time[7,8]. Identification of stroke symptoms and identification of a time critical situation by the EMD is a key point in reducing both pre-hospital time, through 'lights and sirens', and in-hospital time, through pre-arrival notification[9–11].

Recent studies have shown that the EMDs in Norway use the dispatch guidelines in combination with their own skills[1,12], and that it is important to consider the EMD and the guidelines as a unity when exploring the validity of the guidelines. Stroke was chosen as a marker to explore this dispatch unity's ability to identify patients correctly. The main aim of the study was to determine the sensitivity, specificity, and positive and negative predictive values of stroke identification at first EMCC contact. The second aim was to evaluate factors possibly associated with stroke prediction or identification.

Method and materials

Study design

This was a retrospective register-based study from the western part of Norway. The study period was 1 January 2011 to 31 January 2012 (13 months). The study was stepwise; In the first step all patients with dispatch codes from criteria card 27 were collected from the EMCC, both 113 and health lines. At the same time, all patients with a final hospital discharge diagnosis of stroke were collected from the university hospital. In the second step stroke diagnoses were collected from the two smaller hospitals, and dispatch codes were collected from EMCC for the HUS stroke patients without a dispatch code 27. For the purpose of the study, acute ischaemic stroke (AIS), intracerebral haemorrhage (ICH), unspecified stroke and transient ischaemic attack (TIA) will all be referred to as stroke in this paper.

Study setting

The EMCC handles emergency medical telephone calls (national emergency 113 line) from the public and medical health lines from out-of-hours services, general practitioners (GPs) and other health personnel. Bergen EMCC covers three hospitals; Haukeland University Hospital (HUS), and two smaller local hospitals, Haraldsplass Diaconal Hospital (HDS) and Voss Hospital, with a 2011 population of 232 152 (57%), 149 622 (36%) and 28 647 (7%), respectively[13]. HUS and HDS are both located in the city of Bergen, and geographical territories determine which hospital the patients are admitted to. All stroke suspects < 60 years and all candidates for thrombectomy are routed to HUS regardless of territory. Voss Hospital is located 90 km to the north-east. All three hospitals have a dedicated

stroke unit, as recommended by the national guidelines for stroke treatment and rehabilitation[14].

Norwegian index for medical emergency assistance (Index)

The guidelines are criteria based, and are meant to be used by a skilled health educated dispatcher[15]. Usually this is a registered nurse with specific dispatch training[1]. The symptom cards display a list of criteria prompts in decreasing acuity, and the operator starts at the top and move downwards until one criterion is met. Each criterion has a unique dispatch code, and unleashes a pre-defined response and recommendations regarding appropriate first aid counselling. The pre-defined response categories are acute (life-threatening situations), urgent (possible life-threatening) and non-urgent.

Criteria card '27 – Impaired consciousness and paralyses' contains eleven acute, seven urgent and three non-urgent criteria. Of these, four of the acute criteria are variations on the Face-Arm-Speech-Time (FAST)-test and suspicion of stroke by the caller, and are marked with extra precaution: A.27.03 – Sudden facial drooping, A.27.04 – Sudden impaired strength in an arm or a foot, A.27.05 – Sudden speech difficulties, and A.27.06 – Increasing confusion/bluntness – suspicious on stroke. The precaution says that if signs and symptoms are suggestive of stroke, it may be an indication for rapid thrombolysis even several hours after symptom onset. It also requires the operator to contact a specialist on call at the nearest stroke unit for advice on urgency, if < 4.5 h since symptom onset.

Material and participants

The 'stroke patients' from the study period were retrieved from a stroke patient database at the stroke unit at HUS, a part of Norwegian stroke research registry (NORSTROKE). The patients were then identified in the EMCC material, with regards to dispatch codes and initial EMCC contact line.

Figure 1 shows the flow of the dispatch code 27 patients, retrieved from the EMCC. Patients with a stroke suspect dispatch code (A27.03-06) were included as 'Stroke suspects' in the study. The stroke suspects belonging to HUS were identified in the local NORSTROKE database, while those belonging to HDS and Voss were identified on discharge diagnose level in the hospital records, with regards to stroke or not. A stroke patient was defined as a patient with an ICD-10 code at hospital discharge, corresponding to ICH (I61), AIS (I63), unspecified stroke (I64) or TIA (G45).

Data merging of individuals was done using the unique Norwegian civil registration number and date of EMCC contact/hospital admission.

Statistical analysis

Sensitivity, specificity and predictive values were calculated with 95% confidence intervals (CI), using the normal approximation to the binomial distribution to obtain the standard error of the observed proportion. Pearson Chi-Square tests and binary logistic regression were used to analyse factors associated with prediction of stroke, and factors associated with identification of stroke. Dispatch code 'A.27.06 Increasing confusion/bluntness – suspicious on stroke', the university hospital, female sex and age group 60–74 years (the youngest common age group among the hospitals) were chosen as baseline indicator value when exploring factors associated with prediction of stroke. Results are presented in absolute numbers (*N*), percentages (%) and odds ratios (OR). The statistical analyses were performed using Statistical Package for the Social Sciences (IBM SPSS Statistics 23). *P*-values of 0.05 and below were considered statistically significant.

It was calculated that we needed a sample size of 30,000 calls, corresponding to 13 months at Bergen EMCC, to determine sensitivity, specificity and predictive values on a significance level of 0.05 and with a power of 80%. To include all stroke patients, the study was expanded to include medical health lines as well, giving a total sample size of 94,606 EMCC contacts.

Results

The study included 1013 dispatch code 27 patients, of which 709 were regarded as stroke suspects and 568 were transported to hospital (Fig. 1). Median age in this group was 77 years

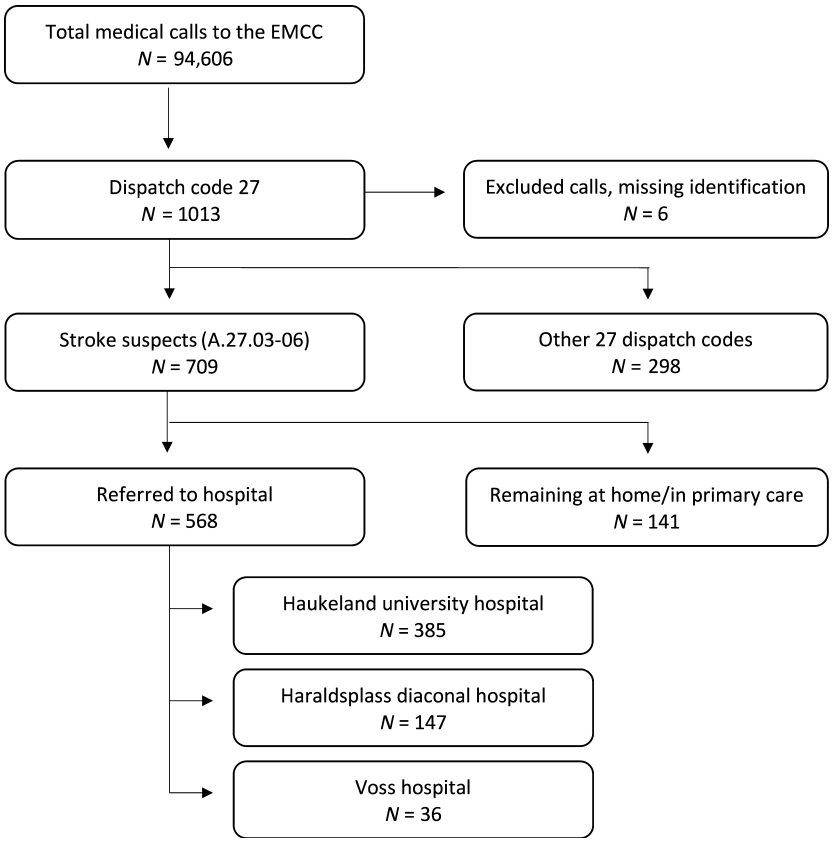

Fig. 1. Flow chart of stroke suspects after initial contact with EMCC in the study period.

(interquartile range (IQR) 63–85) and there were 50,5% male patients. The 519 stroke patients from HUS, consisted of 54,1% males, and the median age was 74 year (IQR 62–83). When studying the HUS population and the 113 line specifically (Table 1), we find a sensitivity for identifying a stroke patient at initial EMCC contact of 57.9% (95% CI: 51.5, 64.1), a specificity of 99.1% (95% CI: 98.9, 99.2), a PPV of 45.7% (95% CI: 40.1, 51.4) and a negative predictive value (NPV) of 99.4% (95% CI: 99.3, 99.5).

Table 1 Cross-tabulation of the 113 line: Patients with Index dispatch criteria code A.27.03-06 (stroke suspects) vs. confirmed stroke diagnoses (stroke patients).

		Stroke patients*		
		Yes	No	Total
Stroke suspects†	Yes	143	170	313
	No	104	17,987	18,091
Total		247	18,157	18,404

*True stroke condition: Confirmed stroke diagnoses at hospital discharge. †Predicted stroke condition: Index dispatch criteria code A.27.03-06 at first EMCC contact.

Stroke prediction

There were all together 314 stroke patients among the 1013 dispatch code 27 patients, and 87.9% of these had a stroke suspect dispatch code (A27.03-06) (Table 2). The proportion of true stroke patients among these four dispatch codes ranged from 27.6% to 42.7%. Although not represented by many patients, dispatch code U.27.05 'Sudden paralysis with rapid improvement' had a proportion of true stroke patients of 34.6%.

Chi-Square tests showed a statistically significant association between stroke prediction and dispatch code, hospital and age-group ($P = 0.02$, $P < 0.0005$ and $P < 0.005$ respectively), whereas sex was not a predictor for stroke ($P = 0.65$).

Exploring these associations further, univariate and multivariate logistic regression analyses confirmed these results (Table 3), with dispatch code A.27.04 – 'Sudden impaired strength in an arm or a foot' and admission to Voss hospital giving the highest OR for stroke in the multivariate analyses, 2.6 ($P = 0.001$) and 2.7 ($P = 0.01$) respectively. Age < 60 had reduced probability for stroke, with OR 0.3 ($P < 0.0005$).

Initial line of EMCC contact

Table 4 gives an overview of the stroke patients at HUS and their line of initial EMCC contact. The 48% whose initial EMCC contact were through the emergency medical telephone line 113 were characterized by acute responses (84%) and a high proportion of stroke suspect dispatch codes (58%). There were statistically significant differences between the two populations with regards to urgency, dispatch codes and age groups ($P < 0.0005$ and $P < 0.005$ and $P = 0.005$ respectively). The higher proportion of haemorrhagic strokes in the 113 population was not statistically significant.

Stroke identification

The telephone 113 population was further analysed with logistic regression to explore possible factors associated with stroke identification during the initial EMCC contact (Table 5). Patients

Table 2 Criteria card '27 – Impaired consciousness and paralyses': Distribution of 113 call patients and proportion of stroke patients among the different dispatch codes.

			All patients ($N = 1013$)		Stroke patients ($N = 314$)		
Urgency*	Dispatch code	Criteria/Prompts	*N*	% of total patients	*N*	% of dispatch code	% of total stroke patients
A	27.01	Non-responsive	51	5.0	6	11.8	1.9
A	27.02	Breathing difficulties	15	1.5	2	13.3	0.6
A	27.03	Sudden facial drooping†	131	12.9	56	42.7	17.8
A	27.04	Sudden impaired strength in an arm or a foot†	259	25.6	108	41.7	34.4
A	27.05	Sudden speech difficulties†	220	21.7	83	37.7	26.4
A	27.06	Increasing confusion/bluntness – suspicious on stroke†	105	10.4	29	27.6	9.2
A	27.07	Sudden intense and unusual headache	14	1.4	1	7.1	0.3
A	27.08	Still awake, but about to faint	31	3.1	3	9.7	1.0
A	27.09	Pale and clammy	24	2.4	1	4.2	0.3
A	27.10	Sudden strong stomach ache	1	0.1	–	–	–
A	27.11	Sudden rapid pulse and seems battered	2	0.2	–	–	–
U	27.01	Have had seizures, known epileptic and is still unconscious	1	0.1	–	–	–
U	27.02	Have had seizures, and is still confused/blunt after 20 min	2	0.2	–	–	–
U	27.03	Sudden confusion/bluntness without obvious explanation	53	5.2	7	13.2	2.2
U	27.04	Sustained bluntness or confusion	34	3.4	6	17.6	1.9
U	27.05	Sudden paralysis with rapid improvement	26	2.6	9	34.6	2.9
U	27.06	Lost consciousness multiple times last 24 h	18	1.8	1	5.6	0.3
U	27.07	Sudden loss of sight in one eye	9	0.9	2	22.2	0.6
N	27.01	Fainted, but awake and fine now	17	1.7	–	–	–
N	27.02	Fainted after nitroglycerine, but awake now	–	–	–	–	–
N	27.03	Known epileptic. Wakening after seizure now.	–	–	–	–	–

*A = acute, U = urgent, N = non-urgent. †Marked by index as stroke suspect: If signs and symptoms are suggestive of stroke, it may be an indication for rapid thrombolysis even several hours after symptom onset.

Table 3 Exploration of possible factors associated with stroke prediction by simple and full model binary logistic regression.

	Unadjusted effect				Adjusted effect			
		95% CI				95% CI		
	OR	Lower	Higher	*P*-value	OR	Lower	Higher	*P*-value
Dispatch code								
A.27.06	Ref.				Ref.			
A.27.03	1.9	1.1	3.4	**0.034**	2.2	1.2	4.0	**0.014**
A.27.04	2.2	1.3	3.8	**0.003**	2.6	1.5	4.5	**0.001**
A.27.05	1.5	0.9	2.6	0.130	1.7	1.0	3.0	0.063
Hospital								
HUS	Ref.				Ref.			
HDS	2.4	1.6	3.6	**< 0.0005**	2.00	1.3	2.9	**0.001**
Voss	2.9	1.4	6.2	**0.005**	2.7	1.3	5.8	**0.011**
Gender								
Female	Ref.				Ref.			
Male	1.1	0.8	1.5	0.590	1.2	0.8	1.7	0.444
Age								
60–74	Ref.				Ref.			
< 60	0.3	0.2	0.5	**< 0.0005**	0.3	0.2	0.5	**< 0.0005**
75–84	1.1	0.7	1.7	0.762	0.9	0.6	1.5	0.785
> 85	0.9	0.6	1.4	0.671	0.8	0.5	1.3	0.446

Patients admitted to hospital with a stroke suspect dispatch code, *N* = 568. OR = Odds ratio. Statistical significant values are in bold. Ref.: Baseline indicator value for in-group exploration. A.27.06 – Increasing confusion/bluntness – suspicious on stroke, A.27.03 – Sudden facial drooping, A.27.04 – Sudden impaired strength in an arm or a foot, A.27.05 – Sudden speech difficulties.

with haemorrhagic stroke had lower probability of getting a stroke suspect code, OR 0.4 ($P = 0.03$), while TIA patients had increased probability for stroke suspect codes, OR 3.7 ($P = 0.04$). These associations slightly increased in the multivariate analyses, with OR 0.5, $P = 0.04$ and OR 4.5, $P = 0.02$, respectively.

In 230 of the 272 (85%) health line calls, there was a free text note about stroke suspicion. There was a statistically significant association between dispatch code given and free text stroke notes; stroke suspect dispatch codes 97%, no dispatch code 87%, dispatch code 5 – 'Ordered mission' 86% and other dispatch codes 44%, $P < 0.0005$. There was no significant association between urgency and the existence of free text stroke notes, $P = 0.55$ (acute responses 87%, urgent 81% and non-urgent 85%).

Discussion

We found a modest sensitivity but a high specificity for stroke prediction by the EMCC, with a modest PPV and a high NPV. The emergency medical telephone line 113 was initial EMCC contact line for only 48% of the stroke patients, the others were conveyed through health personnel out-of-hospital. Dispatch codes including paralyses and admittance to one of the two smaller hospitals were associated with increased probability for stroke, while age below 60 years was associated with lower stroke prediction. Patients with haemorrhagic stroke were less likely to receive a stroke suspect dispatch code, while TIA were more likely to receive a stroke suspect dispatch code.

Stroke identification

Studies on algorithm based dispatch protocols have found an EMD sensitivity and positive predictive value (PPV) for identifying stroke ranging from 41% to 83%, and 42% to 49% respectively[16–18]. Looking at criteria based dispatch guidelines, a number of Nordic studies have been published during the last couple of years; in Denmark they found a sensitivity of 66% and a PPV of 30%[19], in Sweden a sensitivity of 64%[20] and in Finland a sensitivity of stroke identification of 67%[10]. These results are

Table 4 Stroke patients and line of initial EMCC contact.

	Total	113 line		Health lines		Chi-Square*
	N	*N*	%	*N*	%	*P*-value
Total	519	247	48	272	52	
Urgency						
Acute		207	84	77	28	**< 0.0005**
Urgent		31	13	73	27	
Non-urgent		9	4	122	45	
Dispatch code						
Stroke suspect		143	58	30	11	**< 0.0005**
None		8	3	111	41	
Dispatch code 5		25	10	113	42	
Others		71	29	18	7	
Gender						
Female		112	45	126	46	0.892†
Male		135	55	146	54	
Stroke type						
Infarction		192	78	224	82	0.057
Haemorrhage		36	15	22	8	
TIA		19	8	26	10	
Age group						
< 60		40	16	67	25	**0.005**
60–74		66	27	90	33	
75–84		76	31	68	25	
85<		65	26	47	17	

*Pearson Chi-Square test. †Chi-square test with Yate continuity correction. Statistical significant values are in bold.

comparable to the findings in this study, although sensitivity was somewhat lower. The dispatch guidelines used in Sweden and Denmark are rather similar to the Norwegian, and this difference might reflect a difference in use of the guidelines, pinpointing exactly the concerns raised earlier about the criteria based dispatch process being vulnerable to differences in use by the individual EMD and EMCC[1–3]. It has been shown however, that training EMDs in recognizing stroke raises the proportion of stroke patients dispatched as stroke suspects[21]. Although that study was from an algorithm dispatch protocol system, the nature of the CBD system suggests that the impact of training the EMDs in stroke recognition would be even more effective in the Norwegian system, as the EMDs' individual skill and competence are used in combination with the guidelines[1].

It has been postulated that although many patients are not recognized as stroke suspects, a majority of them will receive high priority due to their symptoms[22]. Patients suspected of stroke suspects received an acute response in 91.9% in our study, whereas the stroke patients with other dispatch codes received acute responses in 55.1% and urgent response in 39.2% of the cases. This shows that initial recognition of the stroke patient is important. Multiple studies have shown that stroke recognition lead to a faster response and improve time to hospital arrival[9–11,21]. In addition, an increasing focus on specialized stroke ambulances equipped with computed tomography (CT) scanners for earlier pre-hospital diagnostics[23–25], and in the future the possibility for pre-hospital thrombolysis, presupposes a valid stroke dispatch.

Stroke symptoms

We chose to focus on the four dispatch codes marked as stroke suspect in Index, which are closely associated with the FAST stroke symptoms. The Swedish 2015 study on stroke patients found that FAST symptoms were presented in 80% of the calls dispatched as stroke, compared with 35% in those receiving other dispatch codes[20]. This compares to our findings of nearly 90% identification of the stroke patients by the four selected dispatch codes. In contrast, a British study published in 2013 found that FAST symptoms were mentioned as the first problem in less than 5% of the calls[26], and an Australian study published in 2007 found that FAST symptoms were reported spontaneously in 11% (facial droop) to 41% (speech problems) of the calls[8].

Although not applied on many patients, 'Sustained bluntness or confusion' and 'Sudden paralyses with rapid improvement' presented with 30.9% and 34.6% stroke positive, respectively. 'Non-responsive', 'Breathing difficulties' and 'Sudden confusion/confusion without obvious explanation' were also used on stroke patients. Gibson et al. found in a 2012 study that patient consciousness is a difficult topic in emergency calls for suspected acute stroke; difficult for the caller to determine, miscommunicated or conflated with breathing difficulties[27]. Other known predictors of stroke not mentioned in index is fall (17–38%) and the word stroke mentioned by the caller (20–49%)[8,20,26,28–30].

Table 5 Exploration of possible factors associated with receiving a stroke suspect dispatch code by simple and full model binary logistic regression.

	Unadjusted effect				Adjusted effect			
		95% CI				95% CI		
	OR	Lower	Higher	*P*-value	OR	Lower	Higher	*P*-value
Caller								
Patient	Ref.				Ref.			
Next of kin	1.2	0.5	3.2	0.716	1.3	0.5	3.6	0.588
Public	1.0	0.3	2.9	0.971	1.0	0.3	3.2	0.965
GP	0.2	0.0	1.4	0.108	0.2	0.0	1.3	0.092
Out of hour clinic	0.3	0.1	1.7	0.192	0.3	0.1	1.8	0.190
Other health personnel	0.6	0.2	1.9	0.409	0.6	0.2	1.8	0.363
Gender								
Female	Ref.				Ref.			
Male	1.2	0.8	2.1	0.345	1.5	0.8	2.6	0.196
Age								
<60	0.9	0.4	2.0	0.795	0.9	0.4	2.0	0.756
60–74	Ref.				Ref.			
75–84	0.8	0.4	1.6	0.555	0.8	0.4	1.7	0.605
> 85	1.4	0.7	2.9	0.313	1.7	0.8	3.8	0.198
Stroke diagnose								
Infarction	Ref.				Ref.			
Haemorrhage	0.4	0.2	0.9	**0.029**	0.5	0.2	1.0	**0.041**
TIA	3.7	1.1	13.2	**0.042**	4.5	1.2	16.9	**0.024**

Stroke patients with 113 as initial EMCC contact, $N = 247$. OR = Odds ratio. Statistical significant values are in bold. Ref.: Baseline indicator value for in-group exploration.

Access point to medical care

More than half of the stroke patients accessed the EMCC through other health personnel. A study on different pre-hospital paths from the Netherlands found that almost half of the stroke patients primarily contacted their GP[7]. They also found that the median time between seeking medical advice to arrival at hospital was shortest when only ambulance was involved and the GP was bypassed, GPs representing a potential delay to treatment. Studies have shown that GPs tend to have a lower prediction level of stroke than paramedics and EMS physicians[31,32]. Nishikawa et al. found an increased association between stroke symptom knowledge and intention to call an ambulance after a 2 year long stroke education campaign in Japan[33]. A 2015 systematic review on stroke warning campaign studies found that although a majority reported positive intervention effects, the generalizability were limited because of methodological weaknesses[34].

A majority of the stroke patients with initial EMCC contact through the health lines, conveyed by out-of-hospital health personnel, received either dispatch code 5 'Ordered mission' or no dispatch code at all. The EMD rarely overturn the assessment made by a GP or an out-of-hour doctor on scene with the patient, and Index is not used as it would have been in a 113 call. A tentative diagnosis of stroke was listed as free text in 85% of these cases, indicating a far better prediction level among the GPs than previously reported[31,32]. Most of these patients received urgent or non-urgent instead of acute responses. This might be due to time delays beyond the thrombolysis window. Another reason for downgraded responses might be the GPs knowledge about the patients' previous medical history. Our data does not separate the patients managed by their own GPs from the patients managed by out-of-hour doctors. The degree of patient delay vs. delay due to not calling 113 directly is not known.

Limitations and generalizability

The study did not include data on false negative patients at the two smaller hospitals (positive stroke diagnoses with negative stroke suspect dispatch codes), restricting the validity calculations to be made at the HUS population alone. In 2013 it became mandatory for the hospitals to register all stroke patients in the National stroke registry. Use of registry based diagnoses and electronic dispatch codes will enable larger studies, and give more accurate estimates of the validity of Index. Further research should also strive to unravel the different pre-hospital paths for stroke suspects in Norway, and possible effects of these.

We believe our results to be generalizable to other European countries with similar criteria based dispatch guidelines, as are also reflected in comparable findings from previous studies[10,19,20].

Conclusion

The sensitivity and PPV for stroke identification of a criteria based dispatch guidelines was modest, while specificity and NPV were high. The public medical emergency phone 113 was the first EMCC access point in less than half of the cases.

Ethical approval and consent to participate

The study was approved by the Regional Committee for Medical and Health Research Ethics (2013/982/REC West). The committee also exempted patients' consent pertaining to analysis of sensitive data.

Authors' contributions

All authors participated in planning the study.

E. E.: Collected data, performed statistical analyses and drafted the manuscript.

H. N, T. W., S. H. and E. Z.: Participated in critical revision of the draft.

All authors read and approved the final manuscript.

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