THE IDENTIFICATION OF ACUTE STROKE: AN ANALYSIS OF EMERGENCY CALLS

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Abstract

Background

Accurate dispatch of Emergency Medical Services (EMS) at the onset of acute stroke is vital in expediting assessment and treatment. We examined the relationship between callers' description of potential stroke symptoms to the Emergency Medical Dispatcher (EMD) and the subsequent classification and prioritisation of EMS response.

Aim

To identify key 'indicator' words used by people making emergency calls for suspected stroke, comparing these with subsequent category of response given by the EMD.

Method

A retrospective chart review (hospital and EMS) in North West England (1st October 2006 to 30th September 2007) identified digitally recorded EMS calls, which related to patients who had a diagnosis of suspected stroke at some point on the stroke pathway (from the EMS call taker through to final medical diagnosis). Using content analysis, words used to describe stroke by the caller were recorded. A second researcher independently followed the same procedure in order to produce a list of "indicator" words. Description of stroke-specific and non stroke-specific problems reported by the caller were compared with subsequent EMS dispatch coding and demographic features.

Results

Six hundred and forty three calls were made to EMS of which 592 (92%) had complete EMS and hospital data. The majority of callers were female (67%) and family members (55%). The most frequently reported problems first said by callers to the EMD were collapse or fall (26%), and stroke (25%). Callers who identified that the patient was having a stroke were correct in 89% of cases. Calls were dispatched as stroke in 45% of cases, of which 83%

had confirmed stroke. Of the first reported problems, Face Arm Speech Test (FAST) stroke symptoms were mentioned in less than 5% of calls with, speech problems being the most common symptom. No callers mentioned all three FAST symptoms.

Conclusion

Callers who contacted EMS for suspected stroke and said stroke as the first reported problem were often correct. Calls categorised as stroke by the EMD were commonly confirmed as stroke in hospital. Speech problems were the most commonly reported element of the FAST test to be reported by callers. Recognition of possible stroke diagnosis in fall and other presentations should be considered by EMDs. Further development and training is needed in the community to improve pre-hospital stroke recognition in order to expedite hyperacute stroke care.

Introduction

Stroke is increasingly recognized as a time-dependent medical emergency in which rapid access to specialist care reduces death and dependency [1]. The interaction of EMDs with callers is potentially important in early identification of symptoms suggestive of stroke and initiating a rapid EMS response. Published reports on accuracy of EMDs to recognise stroke from callers' descriptions are few ([2,3,4]).

In the UK, people seeking urgent medical assistance call a universal number (999) and are connected to the EMS dispatch centre in closest proximity. All calls to the EMS in the UK are digitally recorded for training and governance purposes. Once the call is logged and patient location established, an EMD will dispatch the closest ambulance. Calls to EMS are triaged using Advanced Medical Patient Priority Dispatch System (AMPDS)[5], a system also used widely in Europe and North America. EMD classification and prioritisation directly impact speed of ambulance response and the level of medical care (e.g. paramedic) sent. . If the EMD suspects a time critical condition such as stroke, an ambulance can be dispatched as a high priority (category A: 8 minute response). The categories for response prioritisation are pre-determined by the Department of Health.

Identifying 'true stroke' from an EMS call is challenging. A recent Australian study reported that stroke was spontaneously identified by the caller in only 44% of EMS patients in whom the final Emergency Department diagnosis was stroke [6]. Furthermore, studies have shown that EMD sensitivity and positive predictive value for identifying stroke using AMPDS software is below 50% [7,8,9]. Further exploration of the words used by callers and the response this prompts by EMD, may lead to ways of improving emergency services for suspected stroke patients.

Aim

To identify key 'indicator' words used by people making emergency calls for suspected stroke, comparing these with subsequent category of response given by the EMD.

Methods

Setting

Regional EMS and two acute hospital trusts in the North West of England serving a diverse urban/rural population of 650,000.

Subjects and Sampling

Patients with suspected acute stroke who arrived at a participating hospital through calling the EMS, during a 12 month period (1st October 2006 to 30th September 2007).

Patients were identified through retrospective review of the stroke register, hospital coding system, case notes and EMS documentation forms. Once patients were identified we checked with the EMS for presence of an emergency call. Demographic and dispatch data were also collected. These data included: the relationship of the caller to the patient, location of the patient, dispatch code and category of response (e.g. A is an eight minute response).

Inclusion criteria: Patients who arrived at hospital through EMS who presented and / or were admitted with a diagnosis of suspected stroke by any of: dispatcher; paramedic; physician in the emergency department or hospital ward.

Exclusion criteria: Patients who did not arrive at hospital through EMS, patients who developed stroke as an in-patient, patients who received a diagnosis of subarachnoid haemorrhage, patients referred by their primary care physician (GP) or GP staff on behalf of the patient. Patients for whom we did not have data for final medical diagnosis.

Approval for this study was granted by: the National Patient Information Advisory Group, the Local Research Ethics Committee North West 11 (08/H1015/8), the Faculty of Health Ethics Committee at the University of Central Lancashire and NHS Research and Development at the EMS and acute hospitals.

Data collection and analysis

All call recordings for our sample were listened to in full by a researcher trained in qualitative research methods. At the beginning of a call to EMS, the caller is asked the open question, "What's the problem, tell me exactly what happened?" by an EMD to establish the chief complaint. We focussed the analysis on the callers' response to this first question, which we termed 'the first story'. The first story typically involves the description of two or three presenting problems (See Appendix 1): we selected the first reported problem.

Calls were analysed by coding the first reported problem used by the caller to describe the presenting issue, diagnosis or condition. To ensure inter-rater reliability, 100 consecutive calls were coded by at least two researchers and any discrepancies were resolved by discussion. Analysis was undertaken using a constant comparative method in order to identify key indicator words and relationships within the data ([10,11]). Open coding of the data was undertaken using content analysis (facilitated by Atlas ti software). The research team met regularly to discuss the coding categories in order to ensure a consistent approach to analysis of the data. New categories were considered and added to the list of indicator words at weekly intervals. Key indicator words identified were grouped to form categories.

Further data were collected from EMS and patient medical records regarding dispatch code (e.g. stroke, unconscious, faint) and diagnosis information from each of the following: attending EMS personnel, emergency department, medical admissions unit, stroke unit or other clinical area and final medical diagnosis from ED or discharge letter.

Results

643 calls were received by EMS where stroke was suspected at some point on the stroke pathway, of which 592 (92%) had complete EMS and hospital data. Analysis focussed on the calls made to the EMS for the 592 patients for whom we had complete data, including a final medical diagnosis. Three hundred and ninety seven of the callers were female (67%). The majority (55%) of the callers were family members (Table 1). Of these, daughters (30%) and wives (28%) were the most likely to call EMS on behalf of the patient. Median duration of calls was 2 minutes 40 seconds.

Patient characteristics can be seen in Table 2. Most patients (72%) were in their own home at the time of the call to the EMS. Nursing and residential care settings and public places were the next prevalent locations (14% and 13% respectively).

Collapse or fall was the most frequent first reported problem (26%), with stroke being the second most frequent (25%), see Table 3. Of the 148 patients where callers mentioned stroke, 132 (89%) had a final medical discharge diagnosis of stroke or Transient Ischemic Attack (TIA) confirmed in hospital. Of the first reported problems, very few callers mentioned the common FAST warning symptoms and signs. Speech problems were the most commonly mentioned problem (2%). Despite 161 (27%) patients having face weakness, arm weakness and speech problems recorded in their medical records, no callers mentioned all three FAST symptoms during their call to the EMS.

The most frequent dispatch code used by the EMD was stroke (269, 45%), of which 223 (83%) had a final medical diagnosis of stroke or TIA. Patients who were dispatched as stroke arrived at hospital more quickly (median 39 minutes, inter quartile range [IQR] 32-47 minutes) than those with other dispatch codes (median 44 minutes, IQR 35-53 minutes). Of the 269, only 99 (37%) were allocated the highest priority (category A) response, the majority 164 (61%) of patients received a lower priority (category B) response. No patients with suspected stroke were given the lowest priority (category C) response and no category

was recorded for the remaining 6 (2%) calls. A range of other dispatch codes were used, the most frequent being sick person 54 (9%), unconscious 53 (9%), and fall 52 (9%).

From the 592 calls, 473 (80%) patients had a final medical diagnosis of stroke or TIA. 119 (20%) patients had non-stroke diagnoses.

Discussion

Detailed analysis of actual calls to the EMS has enabled us to study what was said by callers, rather than relying on abstracting data from patient records alone. However, this limited the amount of data that we were able to collect about the caller, as we were only able to record details discussed during the call, generally the relationship to the patient. We also had to rely on the final medical diagnosis as recorded in the case notes.

In this study, the problems reported most frequently by callers to the EMS were collapse or fall (26%) and stroke (25%). The term fall or collapse has previously been reported by 17% and 21% of callers respectively ([2,6]). Use of the term stroke in our study is, at 25%, lower than the 45-51% in smaller series ([3,4]). However, this study is much larger and focuses on the first reported problem between the caller and EMD when callers are most likely to report their initial interpretation of the problem. Following this first reported problem, the conversation becomes a series of closed questions as the EMD follows a specific AMPDS algorithm.

The callers to EMS in our study were predominantly family members, the patient's daughter being most likely, consistent with previously published Australian data [6]. The patient was rarely the caller (2% of all calls), as in other series ([4,6,12]).

Collapse or fall was the most frequently reported problem. Motor problems were often reported by their consequences, which resulted in a person collapsing, falling to the floor, or being found on the floor. Non traumatic falls were more likely to be given a low priority

response dispatched as a category C, a finding noted elsewhere [9]. Consequently, there may be implications for the assessment and treatment of stroke patients dispatched as such. These findings suggest that EMD should elicit specific symptoms of stroke when evaluating patients with a reported fall or collapse.

We have found that the use of the terms collapse or fall or stroke by the caller tend to be associated with a final diagnosis of stroke, suggesting these terms have high sensitivity. We did find that these terms were used by callers when the final diagnosis was not stroke, but this was a much smaller percentage, suggesting reasonable specificity. However, we must be cautious in our interpretation of these findings. The sample in this study had a diagnosis of stroke at some point on the pathway so it may not be too surprising to see high sensitivity and specificity. To properly gain an understanding of the specificity of these terms we need to identify a sample of patients that have not been suspected as having had a stroke at any point on their patient journey.

When the term stroke was used by the caller, the proportion of patients with a confirmed diagnosis of stroke or TIA was high (89%), calls dispatched as stroke also resulted in a quicker arrival time to hospital.

An important finding of our study was that the common warning signs of stroke (face weakness, arm weakness and speech disturbance) were rarely reported as the first problem: speech was the most common FAST (2%) symptom reported. This is reflected in a recent Australian study, which found that speech problems were the most commonly reported FAST symptom by bystanders [13]. Arm and face weakness were less commonly reported (1%). This has important implications for training EMDs to recognise patients with possible stroke. Callers often used an explanation of arm weakness such as 'unable to grip or hold objects' rather than the term arm weakness itself. These calls were made to the EMS prior to the FAST campaign [14].

Of calls where the EMS response was dispatched as stroke, the proportion of patients with a final medical diagnosis of stroke or TIA was (83%). EMDs used an AMPDS code of stroke in only 45% of all calls. Generic codes such as sick person and fall were often used, with the potential to delay appropriate assessment and treatment for stroke.

Patients with a non stroke-specific medical diagnosis included both neurological and non-neurological conditions such as seizure, respiratory conditions and infections. Common stroke mimics such as seizure, syncope, space occupying lesions, hypoglycaemia and sepsis have been reported elsewhere [15].

Pre-hospital notification of a patient with suspected stroke is known to be strongly associated with rapid admission to hospital [16], and is perhaps especially important in expediting assessment and delivery of thrombolytic therapy for eligible patients. It is possible that this opportunity is missed when non-stroke categories are used by EMDs.

This is the largest study to look at the content of calls to the EMS for suspected stroke. Within our sample when callers contacted the EMS and reported stroke as the first problem they were often correct. If stroke is suspected, members of the public should be encouraged to say the word stroke when contacting the EMS in order to initiate an immediate and appropriate response as outlined in the 'stroke chain of survival'[17].

Key Points

- The majority of calls made to the EMS on behalf of someone with suspected stroke were made by a female relative.

- It is important to raise the public's awareness of the symptoms of stroke and how to report this when contacting the EMS.

- Callers tended to talk in terms of loss of function (e.g unable to grip, cannot stand) rather than symptoms such as weakness.

- EMDs should be made more aware of the terminology used by callers describing suspected stroke and should probe for specific symptoms when stroke is suspected.

Acknowledgements

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Table 1. Relationship between caller and patient.

	N 592 (%)
Family member	323 (55)
Care/Nursing Home Staff	78 (13)
Other	50 (8)
NHS Staff	27 (5)
Friend	24 (4)
Neighbour	24 (4)
Leisure industry i.e. sports arena staff	21 (4)
Worker i.e. bus driver, shop assistant	18 (3)
Police	14 (2)
Patient	12 (2)
Missing	1 (0)

Table 2. Patient characteristics.

	N 592
Mean age (sd)	75 (13)
Female	311 (53%)
Final medical diagnosis:	
Stroke	377 (64%)
TIA	96 (16%)
Other	119 (20%)
Stroke/TIA type:	
Ischaemic	336 (71%)
Haemorrhage	55 (12%)
No scan data	82 (17%)
Stroke/TIA Severity assessed by AVPU level on admission:	
Alert	387 (82%)
Voice	39 (8%)
Pain	18 (4%)
Unresponsive	19 (4%)
Missing	10 (2)%

Table 3. The first reported problem said by the caller during the call to EMS.

	N 592 (%)	Final Medical Diagnosis	
		Stroke/TIA	Other
Collapse or fall	155 (26%)	118 (76%)	37 (24%)
Stroke	148 (25%)	132 (89%)	16 (11%)
Unknown problem	43 (8%)	34 (79%)	9 (21%)
Previous medical history (e.g. atrial fibrillation, dizzy spells, catheter)	34 (6%)	27 (79%)	7 (21%)
Previous medical history of stroke	31 (5%)	20 (65%)	11(35%)
Conscious level	28 (5%)	23 (82%)	5 (18%)
Speech problems	14 (2%)	14 (100%)	0 (0%)
Arm weakness	8 (1%)	6 (75%)	2 (25%)
Face weakness	6 (1%)	5 (83%)	1(17%)
Other, (e.g. heart attack, unwell, confused)	125 (21%)	94 (75%)	31 (25%)