Emergency Stroke Calls: Obtaining Rapid Telephone Triage (ESCORTT) – a programme of research to facilitate recognition of stroke by emergency medical dispatchers

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Scientific summary

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Scientific summary

Background

Stroke is a leading cause of mortality and disability worldwide. Stroke is increasingly recognised as a time-dependent medical emergency in which rapid access to specialist care reduces death and dependency. Rapid access to emergency stroke care can reduce death and disability by enabling immediate provision of interventions such as thrombolysis, physiological monitoring and stabilisation. Emergency medical dispatch sensitivity and positive predictive value (PPV) for identifying stroke is < 50%, and this is compounded by long delays in patients accessing emergency medical services (EMSs). Studies have shown that activation of the EMSs is the single most important factor in the rapid triage and treatment of acute stroke patients.

The programme consists of eight phases. The overall aim of the programme was to facilitate recognition of stroke by emergency medical dispatchers (EMDs) who play a key role in facilitating the public's access to the emergency services. Objectives for each phase involved:

Phase 1: identifying a cohort of patients in hospital with a final diagnosis of stroke and exploring the identification and diagnosis of stroke in this cohort by EMDs and ambulance personnel.

Phase 2: exploring communication between the public and EMDs to explore the features that expedited or delayed people's initial decision to contact EMSs.

Phase 3: exploring communication of the patients in phase 1 with EMDs to identify the 'key indicator' words for suspected stroke, and to compare these with the final diagnosis in hospital.

Phase 3a: identifying how patients' consciousness level was questioned, described and interpreted by callers and EMDs.

Phase 4: comparing the words used by the public making 999 calls to the EMSs, the subsequent ambulance dispatch codes and final diagnosis in hospital, for stroke and non-stroke calls.

Phase 5: developing algorithms and protocols for ambulance and NHS Direct staff to assist in the identification of those with suspected stroke.

Phase 6: developing an online stroke-specific training package for EMDs informed by the previous phases.

Phase 7: implementing the training package and evaluating the content within one EMD control centre.

Phase 8: evaluating the impact of the training package on the recognition of stroke by EMDs.

Phase 1

Aim

To explore how patient and stroke characteristics are associated with dispatch code; accuracy of dispatch code; ambulance diagnosis; and how dispatch code was associated with time to arrival at hospital.

Methods

Between 1 October 2006 and 30 September 2007, we obtained EMS and hospital data for consecutive patients with a diagnosis of stroke (EMSs or hospital) for patients arriving at hospital via EMSs.

The associations between diagnosis, characteristics (patient and stroke), and time were explored using logistic regression.

Results

Seven hundred and thirty-five patients had dispatch and/or final diagnosis of stroke. Dispatchers correctly identified 48.3% of the stroke patients. For patients with a final diagnosis of stroke, facial weakness and speech problems were consistently associated with dispatch (face $p < 0.001$; speech $p < 0.002$) and ambulance (face $p < 0.001$; speech $p < 0.01$) diagnosis of stroke. The time from call to arrival at hospital was shorter when the dispatch code was stroke compared with not stroke ($p < 0.05$).

Conclusion

Dispatch code was correct in just under half of the cases. Facial weakness and speech problems were consistently associated with a diagnosis of stroke. A correct diagnosis of stroke by EMDs resulted in a rapid journey to hospital.

Phase 2

Aim

To identify the features that expedited or delayed people's initial decision to contact EMSs at the onset of acute stroke, and to explore callers' experiences of the call.

Methods

Participants were identified through a criterion-based purposive sample of admissions to two hospitals via ambulance with suspected stroke between 10 October 2008 and 22 January 2009. Semi-structured interviews were analysed using content analysis.

Results

Of 50 callers, one (2%) was the patient. Two themes were identified that influenced the initial decision to contact EMSs at the onset of stroke: perceived seriousness and receipt of lay or professional advice. Two themes were identified in relation to the communication between the caller and the call handler: symptom description by the caller and emotional response to onset of stroke symptoms.

Conclusion

An incident that was perceived to be serious was likely to expedite the call to the EMSs. Seeking advice may or may not expedite a call to the EMSs, but seeking advice ipso facto creates a delay. Callers often felt reassured by the advice given by the EMSs but many were uncertain about whether or not an ambulance had been dispatched.

Phase 3

Aim

To identify 'key indicator' words used by people making emergency calls for suspected stroke.

Methods

Patients with a diagnosis of stroke (hospital or EMSs) were identified between 1 October 2006 and 30 September 2007, through a retrospective review of hospital and EMS records, and EMS calls. Content analysis was used to explore the problems described by the caller.

Results

Five hundred and ninety-two calls provided complete EMSs and hospital data. The problems which were most frequently reported by callers were collapse/fall ($n = 236$, 39.9%) and stroke ($n = 220$, 37.2%).

Of the 220 callers saying that the patient was having a stroke, 188 (85.5%) were correct. At least one of the Face Arm Speech Test (FAST) items was reported in 145 (30.7%) of the calls in which the final diagnosis was stroke: speech was most common ($n = 72$, 15.2%). No callers mentioned all three FAST items.

Conclusion

Callers who contacted EMSs for suspected stroke and said that they suspected stroke were usually correct. The problems reported most frequently were collapse/fall or stroke. Speech problems were the most commonly reported item of the FAST.

Phase 3a

Aim

To identify and compare how patients' consciousness level was questioned, described and interpreted by callers and EMDs during acute stroke calls.

Methods

The calls used in phase 3 were included in this additional phase. The caller's response to two standard questions, 'Is the patient conscious?' and 'Is he/she completely awake?', and other relevant dialogue was coded. Responses which suggested misinterpretation of terms relating to consciousness level, or where the call handler used additional clarifying questions, were analysed in detail.

Results

In 109 (18.4%) of 592 calls, an altered level of consciousness was recorded on the ambulance report form. Calls often contained unscripted, protracted dialogue about consciousness level. Consciousness level was difficult for the caller to determine, miscommunicated or conflated with breathing difficulties.

Conclusion

Ambiguities and contradictions in dialogue about consciousness level arise during ambulance calls for suspected and confirmed stroke. Further research is needed to identify whether or not these issues also arise in non-stroke calls, and which terms are best understood by the public in describing consciousness level.

Phase 4

Aim

To compare the words used by the public making calls to the EMSs, the subsequent ambulance dispatch codes and final diagnosis in hospital, for stroke and non-stroke calls.

Methods

All calls to one EMS dispatch centre between 8 March 2010 and 14 March 2010 were analysed. Content analysis was used to explore the problems described by the caller. Findings were compared with phase 3.

Results

Two hundred and seventy-seven non-stroke calls were identified. Only eight (2.9%) callers mentioned stroke, and 12 (4.3%) and 11 (4%) mentioned limb weakness and speech problems, respectively, whereas no caller mentioned more than one FAST item. This contrasted with phase 3, in which 188 (31.8%), 86 (14.5%), and 80 (13.5%) callers mentioned stroke, limb weakness or speech problems, respectively, and 14 (3%) mentioned more than one FAST item. The proportion of callers mentioning falls was slightly lower in phase 4 ($n = 72$, 26%) than in phase 3 ($n = 182$, 38.5%).

Conclusion

People who contact the EMSs about non-stroke conditions rarely say 'stroke', 'limb weakness', 'speech problems' or 'facial weakness'. These terms are more frequently used when people contact the EMSs about stroke. The word 'fall' is commonly used in both stroke and non-stroke calls.

Phase 5

Aim

To develop algorithms and protocols for ambulance and NHS Direct staff to facilitate the identification of suspected stroke.

Methods

The steps taken to identify and explore a process of revising current algorithms and scripted questions with the EMSs and NHS Direct were mapped to Kotter's eight-step change model (Kotter JP, Cohen DS. *The Heart of Change*. Boston, MA: Harvard Business School Press; 2002. p. 7).

Results

Further evidence would be required to change the Advanced Medical Priority Dispatch System (AMPDS) algorithm for stroke within the ambulance service or NHS Direct because AMPDS is based on published standards from a wide range of international institutions such as the National Institutes of Health (NIH) and the American Medical Association (AMA). Similarly, NHS Direct algorithms are aligned to Department of Health (DoH), NHS and National Institute for Health and Care Research (NICE) policies.

Conclusion

It was not possible to change the AMPDS algorithm for stroke based purely on the findings from Emergency Stroke Calls: Obtaining Rapid Telephone Triage (ESCORTT). Additionally, AMPDS is to be replaced by NHS Pathways, which further reduces the value of changing the existing stroke algorithm. Future research could evaluate the impact of NHS Pathways in terms of dispatch/prioritisation for suspected stroke as little is known about the impact of NHS Pathways.

Phase 6

Aim

To develop an online training package to improve the recognition of stroke by EMDs.

Methods

An online training package was developed between 1 December 2008 and 30 June 2009 using the results from phases 1–4, and the views of an expert committee.

Results

The findings from phases 1–4 were used to inform the sections of the training package that specifically relate to:

- How often is suspected stroke confirmed as a stroke by ambulance crews and in hospital? (Phase 1.)
- What influences the public's initial decision to contact EMSs at the onset of stroke symptoms? (Phase 2.)
- Communication between the EMD and caller. (Phase 2.)
- Suspected stroke – describing the symptoms. (Phase 3.)
- The proportion of callers obtaining first medical contact from the EMSs for suspected stroke. (Phase 3.)
- Who is most likely to dial 999 for suspected stroke? (Phase 3.)
- How stroke symptoms may be described by the public? (Phase 3.)

- Callers' understanding of the term 'conscious'. (Phase 3a.)
- If non-stroke callers mention 'stroke' and/or the FAST symptoms? (Phase 4.)

Conclusion

This is the first stroke-specific training package to be developed for EMDs, underpinned by research evidence.

Phase 7

Aim

To implement and evaluate the online training package.

Methods

Between 21 September 2009 and 25 January 2010 the training package was delivered to EMDs within one control centre. A questionnaire evaluated perceived changes in knowledge and satisfaction with the training.

Results

The course was undertaken by two educational and training managers, who rolled it out to 67 EMDs, 76% of whom were female. Sixty-four (95.5%) EMDs reported an increase in stroke symptom knowledge, while 65 (97%) of the EMDs were either very satisfied or satisfied with the training.

Conclusion

This is the first study to develop and evaluate stroke training for EMDs. The online learning for EMDs increased perceived stroke knowledge and provided the opportunity for continuing professional development.

Phase 8

Aim

To evaluate the impact of the training package on the recognition of stroke by EMDs.

Methods

This phase took place in an ambulance service and a hospital in England using an interrupted time series design. Suspected stroke patients were identified in 1-week blocks, every 3 weeks over an 18-month period, during which time the training was implemented. Patients were included if they had a diagnosis of stroke (EMSs or hospital). The effect of the intervention on the accuracy of dispatch diagnosis was investigated using binomial (grouped) logistic regression.

Results

In the pre-implementation period, EMDs correctly identified 63% of stroke patients; this increased to 80% post-implementation. This change was significant ($p = 0.003$), reflecting an improvement in identifying stroke patients relative to the pre-implementation period for both the during-implementation [odds ratio (OR) 4.10, 95% confidence interval (CI) 1.58 to 10.66] and post-implementation (OR 2.30, 95% CI 1.07 to 4.92) periods. For patients with a final diagnosis of stroke who had been dispatched as stroke there was a marginally non-significant ($p = 0.068$) reduction of 2 minutes between pre- and post-implementation phases from call to arrival of the ambulance at scene.

Conclusion

There was a significant increase in the number of stroke patients dispatched as such by EMDs and a small, but non-significant, reduction in time from call to arrival at scene by the ambulance.

Although an interrupted time series is not the strongest methodology for evaluating the effect of an intervention, it was an efficient use of the resources available and provided more robust results than if a simple before and after study had been performed. The training package is owned by the University of Central Lancashire, it has been endorsed by the UK Stroke Forum Education and Training, and is free to access online.

Overall conclusions

If stroke is suspected, use of the word stroke by the public during the call to the EMSs should increase the likelihood that an immediate and appropriate response is initiated, as outlined in the stroke chain of survival. The majority of calls made to the EMSs on behalf of someone with suspected stroke are made by a female family member. The public's awareness of the symptoms of stroke and how to report this when contacting the EMSs are important. Callers tend to describe symptoms indirectly in terms of loss of function (e.g. unable to grip, cannot stand) rather than describing 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. People who contact the EMSs about non-stroke conditions rarely say stroke, or 'FAST' items: these words are more frequently used when people contact the EMSs about stroke. Ambiguities and contradictions in dialogue about consciousness level arise during ambulance calls for suspected and confirmed stroke. This is the first programme of work to develop, implement and evaluate the impact of a training package for EMDs with the aim of improving the recognition of stroke. The findings suggest that in addition to improving the recognition of stroke, the training has the potential to contribute to a reduction in pre-hospital delays.

Recommendations for future research

1. Test the effectiveness of the training package on the recognition of stroke across other EMSs in England.
2. Explore the impact of the early identification of stroke by call handlers on specialist assessment and treatment, and thrombolysis rates.
3. Test the effectiveness of the training in services that have recently adopted the NHS Pathways triage system.
4. Explore how to raise the public's awareness of stroke symptoms, the importance of contacting the EMSs, and what to convey to the EMD during the call in order to reduce delays in accessing emergency treatment.
5. Ambiguities and contradictions in dialogue about consciousness level arise during ambulance calls for suspected and confirmed stroke. Further research is needed to identify whether or not these issues also arise in non-stroke calls, and which term or terms are best understood in conveying altered levels of consciousness in emergency situations.
6. Explore the potential financial benefits within the EMSs if accuracy and speed of EMS diagnosis are improved.
7. Explore the effectiveness of the training on longer-term benefits (e.g. reduced length of stay and disability) resulting from earlier and more accurate diagnoses.
8. Longer-term follow-up of the impact of the training could usefully explore such issues as timing, frequency and mode of delivery or refresher sessions.

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