Multi-perspective simulations for implementing a change in service: Stroke Tele-thrombolysis.

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Abstract

Background: Simulation-based training has been utilised in a variety of ways to demonstrate and improve process elements of patient care. One example of this is in improving door-to-needle times in hyper-acute stroke care. Changes in service by one team which affects another brings difference of opinions between service providers involved and can lead to inter-departmental conflict. Method: In this report we use Kurt Lewin's model for change to describe how a series of multi-perspective simulation-based exercises were used in implementing a change in practice with the introduction of tele-thrombolysis within a large tertiary stroke referral hospital. Results: The use of multi-perspective or bi-directional simulation allowed a 'meeting of minds' with each service able to illustrate key themes to the other service. This was demonstrated through a series of simulation-based exercises. Conclusion: Following successful simulation-based exercises and subsequent interdepartmental agreement, a telethrombolysis pilot has been conducted within our centre. Ongoing audit of practice continues as this method of treatment delivery is continued. Further simulation work is planned as a national thrombectomy service is instigated.

Introduction

Ischaemic stroke is a true medical emergency with thrombolysis and thrombectomy being key time-dependent treatments. A number of process elements in the stroke chain of survival have been described which lead to reduced door-to-needle times. Public awareness campaigns, advanced notification to the receiving hospital and the use of telemedicine technologies are some of the strategies recommended to streamline the rescue chain.[1]

Ruff et al described how implementing a bundle of best practice interventions advocated by the American Heart Association (AHA) Target Stroke Initiative, improved door to CT and Door to Needle Times (DTN), leads to more rapid treatment for patients presenting with hyper-acute stroke.[2] One key component in the process is the timely assessment of the patient by a stroke physician with the knowledge and skills required to make a decision on thrombolysis. One intervention which is often utilised to enhance access to a decision maker, particularly in the out-of-hours period, is telemedicine. Telemedicine allows rapid assessment of the patient by a stroke specialist from a remote location to the patient utilising video telecommunication technology. This allows a reduction in transit times as the specialist does not have to travel to the hospital to see the patient and a thrombolysis decision can be made.

Simulation-based training has been reported to improve process elements of stroke care including a reduction in door-to-CT times and door-to-needle times.[3,4] Other tertiary stroke services have utilised telemedicine in a "hub and spoke" model and used simulation training to train emergency teams in the management of stroke using telemedicine.[5] In this report we describe, using Lewin's (Unfreeze, Change, Refreeze) model for change, our experience of using simulation to resolve interdepartmental-conflict between the Emergency Department and Acute Stroke teams when a new process, the establishing an out-of-hours telethrombolysis service, was proposed within our institution.[6]

Intervention

Background to change: Unfreeze

Aberdeen Royal Infirmary is a large urban hospital and a tertiary stroke centre receiving 750 stroke patients per year with a stroke thrombolysis rate of around 20%. Patients who may be eligible for stroke thrombolysis are usually pre-alerted to and received by the Emergency Department whereby a cascade of events rapidly occur including pre-booking of patient on clinical administration systems, pre-alerting the stroke team of the patients arrival, organising neuroimaging, triage observations and a rapid assessment of the patient. Simultaneously, either prior to or after CT imaging, the stroke team perform a comprehensive stroke examination and calculate the National Institute of Health Stroke Severity (NIHSS) score. They then make a decision regarding thrombolysis and when required, deliver the thrombolysis bolus and infusion. Early assessment by stroke physicians and excellent interdepartmental working alongside emergency physicians in our institution has traditionally allowed for a 'swarming' approach in the patient's journey with multiple individuals from different professional backgrounds and different specialities each performing tasks simultaneously. Whilst this approach works well in day-time hours, in the out-of-hours period it was recognised that stroke physician decision response times may be improved with the use of telemedicine. The stroke unit within the hospital has considerable experience of using telemedicine for peripheral units in our region. In mid-2020, on the background of the COVID-19 pandemic, it was proposed that telemedicine, for a host of reasons including on-call stroke physician transit times and shielding staff, be considered for use within our tertiary hospital, .g.. if using the hub (acute stroke unit receiving hospital) and spoke (peripheral department seeing patient) metaphor making the hub the thrombolysis decision maker rather than the place. At this stage whilst the benefits of telethrombolysis implementation were evident, there were doubts and concerns regarding the implementation of telethrombolysis.

<u>Change</u>

The doubts and concerns of those involved from both teams (ED and stroke) were appreciated and a series of joint *in situ* simulation-based exercises were undertaken to demonstrate and practice tele-thrombolysis. Firstly, a series of simulations were arranged from the perspective of the stroke team. This scenario was written and facilitated to the multidisciplinary Emergency Department team by the stroke team in that those participating in the exercise were the Emergency Department staff (medical, nursing and physician associate), with a human actor as patient and the stroke team staff acting as confederates. The purpose of this initial series of exercises (Hyper-acute stroke patient eligible for thrombolysis, designed by the acute stroke physicians) was to demonstrate feasibility of and the stages required for tele-thrombolysis including activating the stroke team, organising and establishing the tele-link and assisting with neurological examination under the direction of the stroke team and delivering thrombolysis,a process normally undertaken by the stroke team in our institution. Simulation exercises facilitated in this way allowed the ED team to see the benefits of tele-thrombolysis for patients and also identified training needs such as reconstituting thrombolysis drugs. The debriefing phase of the exercises involved staff from both teams and allowed for frank discussions between the two services.

Feedback from the initial series of stroke-service facilitated simulations led to a second simulation this time delivered from a counter-perspective, a simulation exercise designed and facilitated by the Emergency Department team to illustrate to the stroke team the concerns and doubts about the proposed process (again a hyper-acute stroke thrombolysis scenario, this time based on experiences of ED clinicians when managing a busy ED). In this exercise the participants were the stroke team (on

video link) with an actor representing the patient and the ED team as confederates within the scenario. This second simulation was conducted 'real-time' and identified a number of steps within the process that were challenging or previously unthought about. These including management of technical difficulties, ED staff availability, management of paperwork completed by off-site stroke team, definitions on when to active telethrombolysis protocol, safety features regarding drug calculations, delivery of thrombolysis and requirement for safety mechanisms to be built into protocol. Again, the debriefing element involved staff from both services.

Following on from the multi-perspective simulation exercises agreement was reached between the two teams to pilot tele-thrombolysis within a strictly defined protocol with added safety clauses that both teams could invoke as required.

Refreeze:

Telethrombolysis has been established in our institution since July 2020. Between July and November 2020 a total of 12 hyper-acute stroke patients received telethrombolysis, as identified from our local stroke thrombolysis database. There would have been a number of other teleconsultations not resulting in thrombolysis however these are not recorded on the thrombolysis database.

We designed and administered an evaluation questionnaire collecting information about staff experience of the simulation teaching and/or delivery of tele-thrombolysis. We targeted staff who had been involved either in telethrombolysis or one of the 3 simulation exercises. Of the 15 questionnaires administered, 12 (80%) were returned. The respondents included 4 stroke physicians (out of a potential 6) and 8 ED staff.

Of the 4 respondents who participated in tele-thrombolysis simulation, 2 were also involved in the pilot. 8 respondents participated in tele-thrombolysis pilot but not in the simulation exercise.

All respondents (n=4) who attended tele-thrombolysis simulation found it useful in that it highlighted the challenges of logistics and remote consultation. Furthermore, it allowed them appreciate the practical aspects of dosing, constituting and administering the thrombolytic.

All 4 respondents agree (6 /7 on the Likert scale) that the simulation exercise allowed them to identify gaps in the tele-thrombolysis process. 3 of 4 respondents felt the exercise and debrief helped streamline the process elements of proposed test of change. All strongly agree they would recommend multi-perspective simulation in the implementation of test of change. The 2 respondents who also participated in the pilot felt that the simulation exercise was useful (6/7) in preparing them to deliver tele-thrombolysis effectively.

The experience of respondents (5-ED staff and 3-Stroke physicians) who participated in the pilot only was largely positive with a number of responses indicating ease of access and facilitating decisions. 3 of the 5 (60%) Emergency Department staff, who had participated in a telethrombolysis but not a simulation exercise, felt a simulation exercise would have been useful prior to participating in the pilot.

There were 2 instances highlighting deficiencies in the telemedicine equipment and one stating that the process was time consuming for Emergency Department staff. Telethrombolysis has now been

established within our institution on an agreed basis between the two departments with pre-defined safety parameters and activation criteria.

Discussion

This report describes how simulation enabled two specialities to come together and explore concerns and challenges when a significant change in practice was being proposed, developed, and delivered. Being able to simulate telethrombolysis from two different perspectives allowed both faces of the coin to be demonstrated to the relevant interprofessional stakeholders. Utilising Lewin's framework for change allowed the need for change to be determined and explored between the two professional groups and for doubts and concerns expressed and managed in the unfreeze phase.[6] The change phase of simulation allowed for regular communication and involvement between the stakeholders and those that would ultimately be expected to facilitate tele-thrombolysis in clinical practice and empowered both sides to make adjustments to the proposed protocol and add in important safety clauses. The multi-perspective simulations identified key ongoing training requirements and highlighted process aspects to be considered as implementation commenced (e.g. system of handling notes and training requirements for rotating staff).

The subsequent introduction of telethrombolysis highlighted positive aspects around eliminating travel time, rapid decision making, and ease of access to stroke consult and a feeling of job satisfaction by the teams. It also underscored the need for ongoing education and simulation exercises to maintain skill. Quality assurance processes such as joint M&Ms and audits must underpin practice to sustain gains made in the quality improvement process.

We encourage consideration of the use of simulation exercises to establish collaborative agreement between services as part of a process of change when introducing a new service.

Contributorship statement

CB ran the simulation-based exercise from the Emergency Department perspective and drafted the initial manuscript. PE ran the simulation-based exercise from the Stroke perspective and contributed substantially to the final submitted version of the manuscript. Both are accountable for all aspects of the work.

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References

[1] Fassbender K, Balucani C, Walter S, Levine SR, Haass A, Grotta J. Streamlining of prehospital stroke management: the golden hour. *Lancet Neurol*. 2013;12(6):585-596. doi:10.1016/S1474-4422(13)70100-5

[2] Ruff. I, Ali. S, Goldstein. J et.al. Improving Door-to-Needle Times A Single Centre Validation of the Target Stroke Hypothesis Stroke. 2014;45:504-508

[3] Braithwait I, Waterson F, Alcock R, et al. O9 Quality improvement through simulated practice: reduced door to CT time in potentially thrombolysable stroke patients. BMJ STEL 2016;2:A4

[4] Ajmi S, Advani R, Fjetland L, et al. Reducing door-to-needle times in stroke thrombolysis to 13 min through protocol revision and simulation training: a quality improvement project in a Norwegian stroke centre. BMJ Qual Saf 2019; 28:939-48

[5] Richard S, Mione G, Varogui C, et al. Simulation training for emergency teams to manage acute ischemic stroke by telemedicine. Medicine (Baltimore) 2016;95(4):e3924

[6] Lewin K. Frontiers in group dynamics: Concept, Method and Reality in Social Science; Social Equilibria and Social Change. Human Relations 1947;1(1);5-41