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Improving capability, opportunity and motivation to support hereditary angioedema patients experiencing life threatening attacks: Pilot evaluation of a video-based training tool for healthcare professionals

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ABSTRACT

Background: Hereditary angioedema (HAE) is a rare inherited illness which causes swelling and can be life-threatening without urgent treatment. Patients who experience life-threatening throat swellings report poor emergency care experiences and long-term psychological distress from these encounters.
Methods: A > 5-min video intervention to improve emergency care for hereditary angioedema was developed using behaviour change theory. The video was piloted with nursing students using a mixed-methods evaluation approach including a pre-test post-test pilot experimental design and open-ended survey questions.
Results: Capability, opportunity and motivation to support HAE patients in need of emergency care improved following intervention exposure. The video was perceived to be engaging, educational, and motivating and appeared to shift attitudes and intentions towards listening, validating, and acting promptly when caring for patients.
Discussion: The short video intervention shows promise for use with emergency care professionals. Improvements could include supplementing the video with further resources and cues to action such as infographics. Evaluation with emergency care professionals and assessment of longer-term information retention and behaviour change is needed.

List of abbreviations

BCT	Behaviour Change Technique
COM-B	Capability, Opportunity, Motivation model of Behaviour
HAE	Hereditary Angioedema

1. Introduction

Hereditary angioedema (HAE) is a rare inherited illness, [1] where patients experience recurrent bodily swellings including limbs, genitals, face, mouth, and abdomen. [2] Prevalence is 1 in 50–150,000 occurring across all ethnic groups. [1] HAE can impact quality-of-life and mental health, with patients reporting effects on education, career progression, and work productivity. [3]

Swellings of the throat are life threatening due to risk of asphyxia, meaning quick and effective care is needed. [4] International guidance on HAE management recommends early administration of medication to improve patient outcomes [5]. Administration delay contributes to the estimated 25–40% of throat swell attacks which result in death. [6] Patients in the United Kingdom (UK) report negative emergency care experiences and have described ongoing psychological distress after perceived suboptimal emergency care support. [7] The International World Allergy Organization and European Academy of Allergy and Clinical Immunology guidelines for HAE management recommend that emergency departments train their staff to effectively recognise and treat HAE attacks. [5] It is therefore essential to develop interventions to improve the quality of care in emergency settings, reduce risk of loss of life and preserve psychological wellbeing for patients.

A recent meta-analysis highlighted that video-based approaches to health education have significant effects on knowledge acquisition, skill development and attitude change. [8] In clinical immunology specifically, educational videos have been a successful tool for educating patients and families [9] and have been shown to effectively change healthcare professional behaviour [10]. For example, evaluation of a

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brief video intervention reported improvements in administration of intramuscular epinephrine for anaphylaxis. [10]

One well evidenced theoretical foundation for supporting intervention development is the Capability, Opportunity, Motivation, Behaviour (COM—B) model and Behaviour Change Wheel. [11] This framework provides a taxonomy of behaviour changes techniques (BCTs) [12] shown to have benefit when used within video interventions, including ones designed for enhancing physical activity in cancer patients [13] and improving human papillomavirus awareness, vaccine knowledge and intentions. [14]

The aims of the study were to: 1) Develop and test a video intervention for improving the capability, opportunity and motivation of healthcare professionals to support patients with HAE experiencing life-threatening throat swellings. 2) Explore perceptions of the intervention to identify factors contributing to changes in capability, opportunity and motivation and potential ways to enhance effectiveness. It was hypothesised that viewing a theory informed behaviour change video would significantly improve the capability, opportunity and motivation of healthcare professionals to support patients with HAE experiencing life threatening throat swellings.

2. Methods

2.1. Design

A mixed-methods evaluation was conducted using pre-test post-test pilot experimental design without control group. The independent variable was intervention exposure with two levels: pre and post intervention. The dependent variables were scores on the COM-B components: physical capability, psychological capability, social opportunity, physical opportunity, automatic motivation, and reflective motivation. Quantitative data were collected using measures of the six COM-B components. Qualitative data were collected through open-response survey questions.

2.2. Intervention development

A formulation based on the COM-B model was produced [11] (Table 1; see supplementary materials for definitions of the COM-B subcomponents). Physical Capability and Physical Opportunity, which rely on physical and/or structural changes to working environments, could not be directly targeted by the video intervention. All other COM-B components were targeted and mapped to BCTs in the taxonomy [12] by identifying which could be delivered within a short video intervention. As video engagement falls with increasing length, and around 5–6 min is proposed to be optimal for attention and learning [15,16] a > 5-min video was planned.

The video featured immunologists, a charity representative, HAE patients and family members (The video can be viewed here: https://youtu.be/xaiMymMt4RE). A briefing document based on the formulation and BCT mapping exercise was circulated to the immunologists and charity representative explaining behaviour change theory and summarising the strategies identified as effective for behaviour change in this context (see supplementary material). The document outlined reasons for inclusion of BCTs and theoretical links to change and gave illustrative quotes which would align with the strategies. Those appearing in the video could formulate examples to support the BCTs in their own words to facilitate an unscripted and natural feel while embedding as many potentially effective BCTs as possible. For example, immunologists were advised to include reminders that patients would have a letter from their specialist containing guidance. In the final video an immunologist stated: "*Treat them as per the request that the specialist has given, the form that the specialist has filled, saying these are the medications that work best […] by all means suspect other conditions, although these are rare they do happen to patients with HAE, but treat them first for [hereditary] angioedema and if that hasn't sorted the problem out then go through your checklist*".

Table 1
COM-B Formulation.

Component	Subcomponent	Video aim	Example potential BCTs*
Capability	Physical Capability	-Not possible within this intervention approach.	N/A
	Psychological Capability	-Outline what HAE is and the symptoms to be recognised -Explain what to do when encountering someone with HAE.	- Instruction on how to perform a behaviour (4.1) -*Re*-attribution (4.3) -Information about health consequences (5.1) -Verbal persuasion about capability (15.1)
Motivation	Reflective Motivation	-Encourage reflection on how to work with a HAE patient -Provide instruction on effective care procedures.	-Goal setting (1.1) -Problem solving (1.2) -Behaviour substitution (8.2) -Identification of self as role model (13.1) Instruction on how to perform the behaviour (4.1)
	Automatic Motivation	-Appeal to empathic concerns through inclusion of patient stories.	-Information about social and environmental consequences (5.3) -Information about others' approval (6.3)
Opportunity	Physical Opportunity	-Not possible within this intervention approach.	N/A
	Social Opportunity	-Provide information from respected immunologists, patients and charity representatives.	-Social support (unspecified) (3.1) -Credible Source (9.1)

*As defined in the BCT Taxonomy [12]. Numbers in brackets relate to the numbered label applied to the technique in the Taxonomy.

Patient stories can prompt healthcare professional automatic motivation, for example, though hearing the negative consequences of current care and patient desire for change. Patients and family members were briefed that the video aimed to improve healthcare professional awareness of HAE to improve emergency care experiences. They were invited to tell their stories in their own words. All volunteers received a £100 shopping voucher for taking part.

The research team created question schedules for each contributor group, based on eliciting BCT aligned statements. AB, a health psychologist, observed the filming of the immunologists and charity representative and offered support, if requested, regarding rewording a response to better align with a BCT. All briefing documents were shared with the videographers who used the guidance to edit and produce the final video. Video drafts were reviewed by the research team, immunologists and charity representative.

2.3. Sampling procedures

Ethical approval was granted by the University of Staffordshire Health, Science and Wellbeing Ethics Committee. Due to the pilot nature of this study a convenience-led student sample were chosen. Participants were nursing students registered to attend a research conference for their course at a Midlands-based university. While nurses are less likely to encounter an emergency HAE situation than emergency care staff, they may at some point in their career treat patients with HAE. Therefore, participation was beneficial both for student skill development and to establish proof of concept for disseminating the intervention to

emergency care professionals. Students who consented to the research and completed both pre- and post-video surveys were eligible for a prize draw to win £100 shopping vouchers.

To achieve a power of 0.8, a sample size of 35 was calculated to detect a medium effect for *t*-tests (d = 0.5). In March, 93 students attended the conference and 41 participated (44%). In May, 68 students attended the conference and 23 (34%) participated. In total 161 students attended the conferences and 64 (40%) participated. The minimum sample size was exceeded.

2.4. Measures

The pre-test questionnaire collected demographic information and ascertained whether participants had any prior knowledge of HAE.

A brief measure shown to have acceptability, validity and reliability for self-evaluating COM-B components in healthcare professionals working in patient-facing roles, [17] was used to measure the COM-B components. For completeness, the full measure of all COM-B components was employed. Each component is measured using a single item Likert rating sca1e ranging from a score of 0 (strongly disagree) to 10 (strongly agree). The post-intervention survey reassessed the COM-B components and included open-response questions to qualitatively explore perceptions of the intervention. Survey questions are detailed in the supplementary materials.

2.5. Data collection

AB outlined that the conference talk would include an opportunity to take part in a research study. A QR code was displayed which linked to a Qualtrics information sheet and consent form followed by a short demographic questionnaire and the pre-test measures. Following pre-test completion AB displayed the intervention video. At the end of the video participants returned to the Qualtrics to complete post-test measures. AB then continued with the research talk which explained the research origins of the video.

2.6. Analytic strategy

2.6.1. Quantitative data

It was hypothesised that scores on the COM-B components (psychological capability, physical capability, social opportunity, physical opportunity, automatic motivation, reflective motivation) would significantly increase post-intervention. Paired sample *t*-tests were conducted to explore changes in scores from pre- to post-intervention.

2.6.2. Qualitative data

Descriptive content analysis [18] was used to explore the post-intervention open-text questions. All responses were extracted into Microsoft Excel and reviewed by MK before being systematically labelled with a researcher generated category which captured the content of the comment. A bottom-up, data driven approach to coding was employed. Responses with similar category labels were grouped into themes and numerical counts performed. Coding was reviewed and agreed by AB, no disagreements were noted. Quantitative analysis outcomes were cross referenced against the qualitative themes developed to provide additional context to illustrate the statistical findings.

3. Results

3.1. Participant characteristics

Forty-one BSc students participated in March 2025 including adult, child and mental health nursing students and twenty-three participated in May 2025 who were all adult nursing students. Further demographics can be seen in Table 2.

Table 2
Participant demographics.

	Count	%
Event Attended		
March 2025	41	64
May 2025	23	36
Age		
18–30	22	34
31–40	27	42
41–50	10	16
51–60	5	8
Ethnicity		
White: British	46	72
White: Other	3	5
Mixed: White and Black African	1	2
Asian: Indian	1	2
Asian: Bangladeshi	1	2
Asian: Chinese	1	2
Black: African	7	11
Black: Caribbean	2	3
Any other ethnic group	1	2
Prefer not to say	1	2
Education		
School leaver at 16	2	3
Further education	13	20
Higher education	43	67
Postgraduate education	4	6
Prefer not to say	2	3
County		
Staffordshire	37	58
Cheshire	9	14
Shropshire	7	11
West Midlands	4	6
Derbyshire	2	3
Not Reported	5	8
Employment		
Paid full time	3	5
Paid part time	32	50
Voluntary part time	1	2
Student	15	23
Seeking opportunities	9	14
Prefer not to say	1	2
Other	3	5
Employment Sector		
NHS	40	63
Private	10	16
Other	14	22
Heard of HAE		
Yes	5	8
No	59	92
Encountered a HAE Patient		
Yes	2	3
No	62	97

3.2. Quantitative results

3.2.1. Quantitative data diagnostics

All participants provided complete data on the six COM-B items at both time points. Visual inspection of histograms for each outcome and review of skewness and kurtosis values indicated that the distributions of the difference scores were approximately normal. Therefore, parametric tests were judged appropriate.

3.2.2. Change in COM-B scores

Paired-samples *t*-tests showed significant improvements on every COM-B component (Table 3). Hedges *g*, a measure of effect size less biased in smaller samples, and Cohens *d* indicate that all effects are medium to large. This suggests an immediate shift in perceived capability, opportunity and motivation following video exposure.

3.2.3. Sensitivity analysis

Two May students reported prior clinical experience of HAE. Three March students, and two May students reported they had engaged with a

Table 3
The means, t statistics, significance, and effect sizes for six COM-B items.

COM-B component	*Mean*			*t*(63)	*P*	*G (d)*	*95% CI*
	Pre Test (SD)	*Post Test (SD)*	*Change*				
Physical opportunity	4.17 (1.46)	5.08 (1.33)	0.91	−4.40	< 0.001	0.54 (0.54)	0.49, 1.32
Social opportunity	4.27 (1.54)	5.16 (1.16)	0.89	−4.50	< 0.001	0.56 (0.56)	0.50, 1.29
Reflective motivation	5.28 (1.35)	5.94 (0.87)	0.66	−4.00	< 0.001	0.49 (0.50)	0.33, 0.98
Automatic motivation	4.14 (1.53)	4.98 (1.25)	0.84	−4.73	< 0.001	0.58 (0.59)	0.49, 1.20
Physical capability	4.63 (1.33)	5.56 (0.94)	0.94	−5.58	< 0.001	0.69 (0.70)	0.60, 1.27
Psychological capability	4.47 (1.43)	5.31 (1.22)	0.84	−5.15	< 0.001	0.64 (0.64)	0.52, 1.17

previous webinar in which the intervention video had been played, this may indicate that they already had been exposed to the intervention. Removing their data did not alter any outcome; the pattern of significant findings remained unchanged.

To explore how robust the effects were, sensitivity analysis was carried out to test whether gains differed between the two teaching sessions, change scores (after – before) were compared between cohorts with independent-samples *t*-tests. None of the six comparisons was significant ($|t| \leq 1.12$, $p \geq .27$; $|g| \leq 0.28$), showing that the magnitude of improvement did not depend on whether students viewed the video in March or in May.

3.3. Qualitative results

Qualitative content analysis was used to develop five themes: 1) Growing awareness and knowledge of HAE, 2) Listening to and believing the patient, 3) Acting with confidence: ask, assess, escalate, 4) Positive feedback on format and storytelling, 5) Desire for more clinical detail or visual aids.

3.3.1. Growing awareness and knowledge of HAE

This theme was mentioned in 40 responses. Most students began with little or no prior knowledge about HAE. Following the intervention, they described being able to recognise the name, symptoms, and basic management suggesting improvements in psychological capability.

"I'd never previously heard of HAE so when I meet a patient with this I will at least know what it is."

"[the video is] good for raising awareness of the condition and its treatment."

"[the video] made me realise it can present in many ways."

3.3.2. Listening to and believing the patient

This theme was mentioned in 18 comments. Participants indicated that the patient narratives prompted reflection on nurse–patient power dynamics. Comments illustrated intentions to act with empathy and engage in shared decision making, suggesting a positive shift in social opportunity and automatic motivation.

"[I intend to] listen to patients and work collaboratively."

"[I intend to] have more open conversations with patients about their knowledge of their own conditions."

"Patients know their bodies-take them seriously."

3.3.3. Acting with confidence: ask, assess, escalate

This theme was mentioned in 18 comments. The students described ways in which they would translate new knowledge into intentions: questioning, assessment, escalation, and self-directed study. This is suggestive of increased reflective motivation and potentially physical opportunity for appropriate action.

"[I intend to] ask questions, listen to the patient."

"If I encounter the disease in the future I'll try to ask for help quickly and read around it."

"[I intend to] do my own research to be prepared."

3.3.4. Positive feedback on format and storytelling

This theme was mentioned in 30 comments. The participants valued the blended video format (patient, clinician, and researcher voices) which resonated strongly. These contributions suggest that storytelling aids retention and emotional connection, reinforcing gains across all COM-B domains.

"I think it [the video] was very good in teaching us and telling us what to expect."

"[the video included] a good range of comments from different people – doctors, family and patients."

3.3.5. Desire for more clinical detail or visual aids

This theme was mentioned in 15 comments. While overall reception to the video was positive, a minority wanted slower pacing, extra visuals or a brief 'what to do' summary. These suggestions indicate a wish to deepen physical capability but that additional intervention strategies may be needed to support this goal.

"Include more information about what it is and how it presents."

"I would like to learn from the video more about physiology of angioedema".

"Maybe could have included some visual pictures."

4. Discussion

This mixed methods pilot evaluation of a theoretically informed behaviour change video set out with two aims. Firstly, to test the potential for improving the capability, opportunity and motivation of healthcare professionals. Secondly, to explore perceptions of the video to identify factors contributing to improvements in capability, opportunity and motivation and potential ways to enhance intervention effectiveness.

The hypothesis that viewing a theory informed behaviour change video intervention would significantly improve the capability, opportunity and motivation of healthcare professionals appeared to be supported. Across sixty-four nursing students, medium-to-large improvements in all six COM-B determinants of behaviour were observed following video exposure. These findings indicate the potential value of embedding the video within routine teaching for offering a promising route to enhance nurses' readiness to support patients with hereditary angioedema.

In this sample, 92% had not previously heard of HAE, and therefore engagement in this intervention raised awareness about the condition. Despite nurses in general care settings being less likely to encounter an emergency HAE swelling than some other disciplines, raising awareness of HAE in any healthcare professional group is likely to have benefit. Diagnosis for HAE can take at least 4–9 years and the average diagnostic delay is longer than many other rare diseases. [19] During this delay a patient is likely to encounter a range of healthcare professionals, all of whom have the potential to identify signs of the condition and refer on accordingly. Furthermore, these findings provide an initial proof of concept for additional formal evaluation with emergency care staff who are most likely to encounter HAE patients in crisis and would therefore benefit most from intervention.

Qualitative themes aligned with, and added context to, the

quantitative findings. Themes illustrated that nursing students reported the video to be engaging, educational, and motivating. Interestingly, physical capability and opportunity significantly improved despite not being directly targeted. The COM-B model posits that the capability, motivation and opportunity components interact, and therefore changes in one component has potential to reduce or amplify behaviour change by leading to other changes elsewhere. [11] This may be reflected in how the video appeared to enhance knowledge of a rare condition, but more importantly, appeared to shift attitudes and intentions towards listening, validating, and acting promptly when caring for patients with complex symptoms. These are all improvements that do not require physical change in the work environment but appear to have influenced perceptions of these physical components in this sample. These shifts also have transferable benefits across patient groups. For example, empathic care and support are common needs shared by rare disease [20] and are skills at risk of erosion over time. [21] Behavioural interventions that foster empathy are therefore an essential component of continuing professional development for healthcare professionals.

The qualitative data also presented strategies whereby the intervention might be improved. For example, some would appreciate additional resources, particularly more visual or clinical guidance, suggesting that a brief supplemental resource may further support behaviour change. There is evidence to suggest that tools such as infographics can enhance the effectiveness of other health communication approaches [22], improve medical student engagement and interest in healthcare topics [23], and have the potential to improve quality of care [24]. Further evaluations of video effectiveness could explore the combination of video and infographic to support development and retention of new knowledge about rare diseases within a short, resource-light and accessible delivery format.

5. Limitations

As this was a pilot study, it was not feasible to include a control group for comparison. Therefore, it is not known whether the improvements found related to intervention exposure or instead to other factors. It may be that demand characteristics and a desire to be a 'good' participant influenced the results [25]. However, the facilitator was not previously known to the student cohorts, nor involved with their usual teaching or assessment, minimising the likelihood of wishing to please the facilitator. In addition, the spontaneous and unguided qualitative responses supported the significant changes in COM-B components found in the statistical results, indicating likely shifts towards intention and potentially behaviour change.

The use of the COM-B scale, while validated and valuable as a brief measure of outcomes, may be limited in terms of sensitivity due to the inclusion of single item components. Therefore, more complex multi-item measures may add value and exploratory power in future evaluations. In addition, immediate self-report measures were employed and there was no long-term or behavioural follow up. Assessing the behavioural impact of the video long-term is challenging due to the rare nature of the disease, meaning that those who engage with the intervention may never encounter a patient with the condition. However, longer-term follow-up to explore retention of the video content would be beneficial in future research.

Finally, participants were all nursing students engaging in a teaching-focused research conference, this limits transferability of findings to emergency department and critical care clinicians for whom the video was devised. Future research evaluating the video through a multicentre randomised controlled trial with emergency professionals, including long term behavioural follow up, is needed to assess whether the promise shown in this evaluation can be applied to emergency care settings.

6. Conclusions

A short and theory informed educational video appears to improve nursing student capability, opportunity, and motivation to support patients with a rare disease. Such interventions both raise awareness and foster intention to improve healthcare professional-patient communication and empathic practice, which has potential to be of benefit to a wide range of healthcare professional and patient groups.

Availability data

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

CRediT authorship contribution statement

Amy Elizabeth Burton: Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Mila Krajewska:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Sarah Olaluyi:** Writing – review & editing, Methodology, Investigation. **Alison Owen:** Writing – review & editing, Methodology, Investigation. **Sarah Dean:** Writing – review & editing, Formal analysis.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Ethical approval from University of Staffordshire Health Science and Wellbeing Ethics committee (SU_23_159).

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Declaration of competing interest

AB and SO have been contracted to deliver educational talks on HAE for pharmaceutical companies. No other conflicts of interest are declared.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ienj.2026.101865.

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