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Use of the learning conversation improves instructor confidence in life support training

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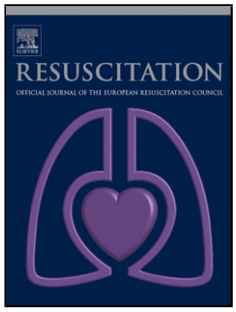

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Use of the Learning Conversation Improves Instructor Confidence in Life Support Training: An Open Randomised Controlled Cross-Over Trial Comparing Teaching Feedback Mechanisms

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ABSTRACT

Aims: Feedback is vital for the effective delivery of skills-based education. We sought to compare the sandwich technique and learning conversation structured methods of feedback delivery in competency-based basic life support (BLS) training.

Methods: Open randomised crossover study undertaken between October 2014 and March 2015 at the University of Birmingham, United Kingdom. 640 healthcare students undertaking a European Resuscitation Council (ERC) BLS course were enrolled, each of whom was randomised to receive teaching using either the sandwich technique or the learning conversation. 58 instructors were randomised to initially teach using either the learning conversation or sandwich technique, prior to crossing-over and teaching with the alternative technique after a pre-defined time period. Outcome measures included skill acquisition as measured by an end-of-course competency assessment, instructors' perception of teaching with each feedback technique and candidates' perception of the feedback they were provided with.

Results: Scores assigned to use of the learning conversation by instructors were significantly more favourable than for the sandwich technique across all but two assessed domains relating to instructor perception of the feedback technique, including all skills-based domains. No difference was seen in either assessment pass rates (80.9% sandwich technique vs. 77.2% learning conversation; OR 1.2, 95% CI 0.85-1.84; p=0.29) or any domain relating to candidates' perception of their teaching technique.

Conclusions & relevance: This is the first direct comparison of two feedback techniques in clinical medical education using both quantitative and qualitative methodology. The learning conversation is preferred by instructors providing competency-based life support training and is perceived to favour skills acquisition.

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1. BACKGROUND & STUDY RATIONALE

Out-of-hospital cardiac arrest (OHCA) is associated with poor survival and, in those for whom return of spontaneous circulation is achieved, significant morbidity.(1–3) As has recently been highlighted by a number of large consortia studies, outcomes may nevertheless be improved through use of the chain of survival, which includes the delivery of prompt and effective cardiopulmonary resuscitation (CPR).(4) Despite this, there exists evidence to indicate that delivery of CPR is sub-optimal in both pre-hospital and in-hospital settings.(5,6)

The quality of CPR delivered by rescuers may be improved by enhancing the training process. The provision of feedback to candidates undertaking simulation based Basic Life Support (BLS) training is one area which may influence rescuers' quality of CPR by improving both skill acquisition and skill retention.(7) This feedback is traditionally provided concurrently during BLS training, though pre-training feedback has recently been identified to be of benefit within a cohort of medical students.(8,9)

A number of structured processes have been reported on within education literature to support the effective delivery of feedback to learners.(10–12) There is however little consensus amongst resuscitation bodies as to which feedback mechanism is most effective for life support education. The European Resuscitation Council (ERC) previously recommended that candidates completing BLS training were provided with interpersonal feedback using the 'sandwich technique' but now advocates an adapted 'learning conversation' approach.(13) This provides a structured three-step approach to delivering a critique of a candidate's performance. Instructors adopting this approach must interpose criticism, or a point for improvement, between two positive statements of praise, as identified in figure 1a.

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An alternative approach for the delivery of feedback is the 'Learning Conversation'. This is advocated by both the ERC and Resuscitation Council UK (RCUK) for training in BLS and Advanced Life Support (ALS) respectively.(13,14) In contrast to the sandwich technique, the learning conversation focusses on the perspective of the learner rather than their teacher. As is demonstrated in figure 1b, the learner is prompted to voice their own view of their performance with instructors then validating their ideas to permit the learner to focus on areas they were most concerned about.

There has been individual subjective criticism of both the sandwich technique and the learning conversation from a sociological perspective.(15–17) However, there has been no direct comparison of the relative impact of variant feedback techniques on skills performance or the confidence of either trainees or those instructing them. Resuscitation councils must therefore attempt to design skills-based education programmes in the absence of a relevant evidence base for the mechanism through which feedback is to be delivered, despite its known importance to short and long term knowledge retention.

2. OBJECTIVES

We sought to directly compare whether use of the learning conversation feedback mechanism permitted greater attainment of competencies than the sandwich technique feedback mechanism amongst healthcare students undertaking skill-based basic life support (BLS) training. We additionally analysed the comparative impact of feedback delivered using the sandwich technique or learning conversation on the confidence of trainees undertaking BLS training and those instructing them.

3. METHODS

3.1. Study design, setting and subject protection

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This open randomised controlled crossover trial was undertaken within the University of Birmingham, UK, between October 2014 and March 2015. All participants provided written informed consent and were free to withdraw from the study at any time. Ethical approval was obtained from the University of Birmingham Science, Technology, Engineering, and Mathematics ethical review committee prior to the start of recruitment following protocol review (ERN-14-0979). There was no deviation from the proposed study methodology and protocol following trial commencement.

The University of Birmingham has for almost twenty years operated a unique peer-led BLS course that has been described previously and which each year provides ERC-accredited BLS training to over 600 first-year undergraduate and graduate students studying medicine, physiotherapy, dentistry, nursing and pharmacy.(18) Each candidate receives in excess of 12 hours face to face tuition at maximal instructor:student ratio of 1:3 and four courses are delivered over each academic year. Tuition is provided by senior healthcare students who are trained as ERC BLS instructors and who undergo additional in-house training, as has recently been described.(19) All prospective BLS providers must pass a formative competency based practical skills assessment undertaken by a trained ERC BLS assessor in order to complete the course. Internal audit of teaching and assessment quality is routinely undertaken and inter-assessor variability is low, as previously described (20).

3.2. Study participants

Instructors on this programme were invited to participate in the study prior to the start of the 2014-2015 academic year. All 58 instructors provided informed written consent and were randomised to use either the sandwich technique or learning conversation as their method of feedback delivery for the first two courses of the academic year. They subsequently crossed over and taught with the alternative technique for the final two courses of the academic year. Each instructor received specific competency-based training using the feedback technique relevant to them prior to their first teaching session with each technique. Senior members of the course organising committee peer-

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reviewed all teaching sessions at random intervals in order to maintain teaching quality and to ensure that the appropriate teaching technique was being used, thereby reducing potential for contamination bias.

Six-hundred and forty first and second year healthcare science students undertaking the BLS course during the same academic year were provided with information relating to the study in advance of their first training session. All were randomised to receive teaching incorporating feedback delivered using either the sandwich technique or the learning conversation method, but were offered the opportunity to switch to the sandwich technique group prior to the course commencement if they wished. No students requested a change of group. Four hundred and seventy three (73.9%) candidates provided prior consent to complete questionnaires relating to their perception of the feedback they received following course completion. Consent was obtained from candidates following randomisation to teaching feedback method in order to avoid adding bias to the analysis of assessment data.

3.3. Exclusion criteria

Instructors and candidates were excluded from participating if they were unable to provide informed consent.

3.4. Interventions

Candidates received training using either the sandwich technique or learning conversation, so that approximately one half of the candidates received training using either technique. Candidates received training using only one of the feedback techniques so that, for instance, those receiving training using the sandwich technique did not also receive feedback using the learning conversation. A crossover approach was adopted in order to both limit the differing skill of instructors acting as a

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confounder for assessment results and to permit direct comparison of instructors' confidence teaching with each feedback mechanism.

3.5. Randomisation

A computer-generated randomisation list was prepared for randomisation of both instructors and candidates. Both groups were allocated at a ratio of 1:1 (sandwich technique : learning conversation). Instructors were randomised to teach using either the sandwich technique or learning conversation after providing consent to participate. Candidates were randomised to be taught with one of the two mechanisms prior to commencing training. Randomisation was undertaken by senior healthcare students responsible for course management using Microsoft Excel® 2013 with no restriction applied. Instructors were aware of their group allocation. Candidates were not directly informed of the group they had been allocated to although it was impossible to blind the candidates due to the nature of the intervention.

Our pilot study did not identify any significant differences between demographic variables with respect to skill acquisition with, or perception of, the sandwich technique or learning conversation. (21) Given this and that there are to our knowledge no known confounders for the impact of varying teaching feedback mechanisms we did not employ stratification in this trial.

3.6. Sample size

We resolved to adequately power the study to determine a difference in assessment pass rate. Based on a previous pilot study we assumed an effect size of 10% with a type I error rate of 5% and power of 80%.(21) A sample size of 596 was estimated to be required by *a priori* power calculation.

3.7. Outcome measures

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Outcome measures were defined in advance of study recruitment and have not deviated nor changed following data collection. The primary outcome measure was assessment pass rates. Secondary endpoints included evaluation of the change in instructors' perception of feedback delivery between feedback techniques, in addition to candidates' perception of receiving feedback with one of the techniques.

3.7.1. Skill acquisition

All candidates underwent a structured assessment at the end of their BLS course, as per local policy. This comprised an evaluation of skills including CPR delivery, use of an AED, placing a person in the recovery position and management of a bleeding or choking casualty. These routinely collected assessment data were extracted for all candidates and evaluated anonymously in order to determine the impact of each feedback technique on skill acquisition. Candidates were deemed unsuccessful at assessment if they inadequately performed any assessed skill. Assessors were not aware of the teaching feedback method used to train candidates.

3.7.2. Subjective perception of feedback technique impact

Instructors and candidates were asked to complete a questionnaire to assess their perception of respectively providing and receiving feedback using their designated technique at the end of each course (questionnaires provided as supplementary efigures 1 and 2). Validated questionnaires using visual analogue scales and free text answer spaces were utilised (see supplementary material). Instructors completed the same questionnaire regardless of the feedback technique used but did not have access to their previous questionnaire entries. Instructors' questionnaires included questions relating to instructors' understanding of and confidence in providing feedback and its perceived effect on candidates learning in general, and for specific BLS and first aid skills. Candidates responded to validated questionnaires probing their satisfaction with the feedback they received. We have reported on the use of these questionnaires in a previous pilot study.(21)

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3.8. Statistical analysis

Statistical analyses were undertaken as per protocol using the statistical software SPSS (IBM inc.). All analyses were planned and no post-hoc assessments were undertaken. Data was considered non-parametric. Paired median scores provided by instructors for specific domains relating to their perception of providing feedback were compared between techniques using the Wilcoxon Signed Rank test. Non-paired feedback perception scores from candidate questionnaires were assessed via Mann-Whitney significance testing. Categorical data was assessed by Fisher's test. Results were considered significant if $p<0.05$ (2-tailed). All free text answers were initially coded prior to the use of content analysis in order to determine emergent themes. No adjustment was necessary and no subgroup analyses were undertaken.

4. RESULTS

4.1. Participant recruitment

Twenty eight instructors were initially randomised to the sandwich technique arm and 30 to the learning conversation arm. All instructors responded to requests to complete study questionnaires and consented to participate in the study. Initial pre-course questionnaires were completed by all instructors in both arms, representing an initial response rate of 100%. One instructor who had been randomised to the learning conversation technique withdrew from the teaching programme due to personal circumstances unrelated to either the course or the study. Of the remaining 29 instructors initially randomised to the learning conversation arm, 24 completed post-course questionnaires both when teaching using the learning conversation and when subsequently instructing using the sandwich technique (80% response rate). Three instructors initially randomised to sandwich technique failed to complete post-course questionnaires, representing an overall response rate within this arm of 89.3%.

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All instructors taught throughout the academic year with no additional changes made to the teaching faculty. Forty-seven participants were included in the final comparative analysis (23 sandwich technique and 24 learning conversation). Initial questionnaire data for those who completed only pre-course questionnaires was not analysed.

Routinely collected assessment data were analysed for all 640 candidates. Of the 472 who provided consent to provide additional qualitative data, 219 responded from the learning conversation group and 253 from the sandwich technique group; respectively 69.5% and 78.0% of the total number in each study arm.

A summary of recruitment for both instructors and candidates is included in figures 3a (instructors) and 3b (candidates).

4.2. Participant demographics

There were no differences in baseline characteristics identified between instructors or between candidates taught using the learning conversation or sandwich technique (table 1). Of the 640 candidates 315 were taught using the learning conversation and 324 using the sandwich technique. The median age of those taught using the sandwich technique and those taught using the learning conversation was 19 (IQR 18-20). One hundred and four (33.0%) of those taught with the learning conversation and 114 (35.2%) of those taught using the sandwich technique were male.

Demographic data were broadly similar for candidates who undertook the course but did not return a questionnaire. Median age (19; IQR 18-20) was identical for those who did and did not respond in both arms of the study. A greater proportion of males did not complete questionnaires in both arms of the study but the proportion of males not responding was similar for both learning conversation (47.9%) and sandwich technique (50.7%). The proportion of undergraduate students studying

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medicine and physiotherapy who failed to complete the questionnaire survey was greater for sandwich technique than learning conversation (60.6% vs. 55.2% and 28.2% vs. 16.6% respectively). The proportion of these candidates was higher in both non-responder groups than in those who completed the questionnaire survey.

The median age of instructors was 19 (IQR 18-20) in those initially teaching using the learning conversation and in those initially teaching with the sandwich technique. Nine of the 24 participants to first teach using the learning conversation were male (37.5%), compared with 5 of 19 (21.7%) who first taught using the sandwich technique.

4.3. Assessment of skill acquisition and short-term retention

The proportion of candidates deemed to have attained BLS skills successfully and who passed their first BLS assessment was marginally higher for learning conversation (80.9%) than sandwich technique (77.2%) though results did not reach significance (OR 1.25, 95% CI 0.85-1.84, p=0.285; table 2).

4.4. Instructors' perceptions of delivering feedback using the sandwich technique and learning conversation

Data relating to the perception of instructors are summarised in table 3a and figure 4. As is demonstrated by figure 4, we identified no significant difference between instructors' perceptions of delivering feedback using the feedback techniques.

Instructors who first taught using the sandwich technique found this feedback mechanism significantly easier to understand than the learning conversation (8.5 vs 6.5; p=0.001). They reported greater satisfaction with the improvement of their candidates when teaching using the sandwich technique (7.5 v 7.0; p<0.05). Instructors who first taught using the sandwich technique additionally

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reported that they considered the sandwich technique to be significantly more effective at teaching CPR than the learning conversation (7.5 vs. 6.5; $p<0.05$).

No significant difference was identified between the sandwich technique and learning conversation for the perceptions of instructors who first taught using the sandwich technique towards other parameters of the BLS algorithm, teaching basic first aid or the ease with which they used the mechanism. There were also no differences seen between the groups for the degree to which instructors felt comfortable delivering feedback or believed that students responded to their feedback.

Instructors who first taught using the learning conversation were significantly more comfortable delivering feedback using this mechanism than using the sandwich technique (7.8 vs. 6.8; $p<0.05$). They felt their students responded better to feedback delivered using the learning conversation (6.8 vs. 5.0; $p<0.05$), were more satisfied with their candidates' improvement in performance following feedback delivered using the learning conversation (7.8 vs. 6.0; $p<0.001$) and rated the learning conversation higher in its ability to improve candidates performance (7.3 vs. 5.0; $P<0.01$).

Instructors who first taught using the sandwich technique additionally reported it to be a more effective method than the learning conversation for delivering skills teaching of BLS (7.5 vs. 5.8; $p<0.05$), recovery position (7.0 vs. 5.5; $p<0.05$), management of a bleeding casualty (7.5 vs. 5.5; $p<0.05$), management of a choking casualty (7.5 vs. 6.0; $p<0.001$) and management of a casualty in shock (7.3 vs. 5.5; $p<0.05$). No significant difference was identified in the ease with which they understood the concept underlying the two feedback techniques (7.5 vs. 8.0; NS). A summary of instructors' perceptions is incorporated within table 3.

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4.5. Candidates' perceptions of receiving feedback delivered using either the sandwich technique or learning conversation method

There was no statistical difference identified in perception of feedback quality between candidates taught using the learning conversation or the sandwich technique. Candidates ranked the improvement in their training following feedback at 8.5 and 8.0 for the sandwich technique and learning conversation respectively (NS). There was no difference identified in their perception of the clarity of either positive (8.5 vs. 8.5; NS) or negative (9.0 vs. 8.5) feedback points delivered to both groups. Overall, 100% of candidates who received sandwich technique feedback felt it had improved their ability to perform BLS, compared with 99.1% of those taught with learning conversation (NS). No significant difference was identified with respect to candidates' perception of the time spent providing feedback, with 98% of those undertaking sandwich technique training believing they received sufficient feedback time compared with 99.6% of those undertaking learning conversation training (NS).

4.6. Free text analysis of instructors' opinions on both feedback techniques.

Nine of the 47 instructors (19.1%) felt that the learning conversation '*took longer to deliver'* and three (6.4%) thought the learning conversation was more difficult to use; an indicative comment reflecting this was *'(I) sometimes wasn't quite sure how to stick clearly to the feedback technique'*. Thirteen (27.7%) instructors commented that the learning conversation felt more like a natural conversation, an example of which included: *"I felt the students responded better when I used the learning conversation as it was more natural and flowed better."* Nineteen (40.4%) instructors remarked that the sandwich technique was too structured and repetitive; *"Very repetitive – students quickly picked up on pattern of technique and therefore began to ignore it and so it lost its value".* Sixteen (34%) instructors commented that the sandwich technique was awkward to use as candidates naturally wanted to talk about points for improvement first; *"Students were quick to think of the negatives rather than the positives of their performance*".

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5. DISCUSSION

The effective provision of timely feedback bestows a number of advantages in skills-based clinical education.(22) Numerous approaches have been proposed to support the systematic delivery of feedback to learners, such as the learning conversation and the sandwich technique, which is largely based on a model for feedback first described by Pendleton in 1984.(10,23) These and others were initially proposed in the non-medical education literature and are now widely used in the skills-based training of healthcare professionals.(10,13,14,16,24) Whilst they have each met with criticism within wider education settings, there is a paucity of data concerning their specific efficacy when used in skills-based clinical training and resuscitation training in particular.

This study is therefore the first to directly compare two teaching feedback methodologies. Whilst the primary outcome measure in this study of objective assessment of candidate performance did not demonstrate a significant difference between the two feedback techniques, we have demonstrated that instructors preferred using the learning conversation as a feedback mechanism in most of the domains studied.

It can be seen from the data presented that the degree to which instructors favoured each feedback technique varied by the order in which they taught with them (Table 3a). This finding likely reflects an artificial inflation of sandwich technique scores in those who originally taught with it as a consequence of familiarity, as all had previously received BLS provider training using the sandwich technique. A key example of this is the ability of instructors to understand the technique used. When starting with the sandwich technique instructors found the learning conversation significantly more difficult to understand whereas there was no difference in perceived difficulty when starting with the learning conversation. This suggests that familiarity s important when learning a potentially more complex feedback technique. Initial VAS scores were higher for the first technique instructors

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taught with for all but one domain, again suggesting an effect due to familiarity. Another example of this effect is demonstrated by how comfortable instructors felt when using the different feedback techniques, with a significant reduction demonstrated when switching from the learning conversation to the sandwich technique, but not the when changing from the sandwich technique to the learning conversation. There is nevertheless a clear and significant difference in scores awarded to the second technique instructors were asked to use. For those who initially taught with the sandwich technique there was no significant difference in VAS rating after use of the learning conversation in all but two domains. Conversely, instructors who first taught using the learning conversation ranked it significantly more favourably for all but two domains.

This finding is reversed for the ease with which assessors understood their respective feedback. Those who first taught with the sandwich technique identified it to be significantly easier to understand than the learning conversation. Conversely, no significant difference was seen between teaching techniques for those starting with the learning conversation. It may be postulated on the basis of this that the sandwich technique is either easier for instructors to understand or at least comparable with the learning conversation, if the preference effect for initial sandwich technique teaching is to be taken in to account.

Interestingly, instructors who first taught using the learning conversation scored it more favourably for teaching each of the six assessed skills. In contrast, those who first taught with the sandwich technique significantly favoured its use for the BLS skill domain. This, unlike the other five domains, is a complex multistage process. It is therefore possible that instructors' familiarity with the sandwich technique contributed to this result. Preference of a simpler feedback technique in the context of teaching a more complex skillset may reflect a perceived or actual difficulty in teaching these skills. Further study comparing feedback techniques when teaching more complex skill sets such as ALS is required in order to confirm or refute this.

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All candidates undertook a pass/fail competency based assessment at the end of their life support training programme. Candidates may pass this assessment on successful demonstration of all taught skills and it may therefore be considered a surrogate measure of skills acquisition. There was no significant difference identified between pass rates for learning conversation (80.9%) and sandwich technique (77.2%) amongst all candidates undertaking assessment. Despite the high pass rates in both groups these results are in keeping with our pass rates documented on previous courses, and although a large number of participants are needed in order to demonstrate an effect this study was adequately powered to do so if one were to exist.

Whilst there was no objective demonstration of improved skill acquisition the subjective perception of the instructors on candidate performance showed that when changing to the sandwich technique having used the learning conversation, instructors felt candidate's response to feedback, improvement following feedback and preparedness for examination were all significantly reduced. Although this is not reflected in the objective assessment this could be explained by the relative ease of acquiring a simple skill set. Whilst using the sandwich technique may mean that the candidates acquire skills more slowly, the length of the BLS course and multitude of practice opportunities may have negated this difference by providing enough time for the students to compensate for any deficiencies in feedback and subsequent skill acquisition.

It is possible that candidates sought to practise outside of the course time with candidates from the opposite arm of the study. Whilst this is unlikely to have occurred we have no way of controlling for this and as such could represent a confounding factor. In this respect, instructor's subjective opinions of how well candidates were becoming proficient with skills following their teaching may be less open to confounding. The degree to which skills are retained is also of significant clinical

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relevance and it is not clear from the results whether the respective feedback mechanism would impact on skill retention.

There was no difference identified in the preference of candidates who undertook the BLS training programme towards either teaching technique. This is perhaps not surprising given that candidates were exposed to only one teaching feedback mechanism. It does however provide evidence for a consistent learner response to feedback provision in a life support training setting.

We believe that the duration of this course was sufficient and offered enough feedback encounters in order to answer the proposed study question. In order to confirm that the effect seen in this study is maintained over a longer course further study using another life support course such as ALS is required.

This study benefits from a comparatively large sample size for a trial of an educational intervention but has a number of limitations. It is a single-centre analysis which, whilst perhaps favouring standardisation across study arms, limits the generalisability of the results. The population studied included healthcare professionals in training, the majority of whom had undergone very limited or no clinical training but who are clearly likely to be a motivated cohort. The degree to which these results are generalizable to selected specialty training is therefore unclear. Skill retention was not studied, though decay is known to impact on performance of skills both within and outside of the BLS setting.

6. CONCLUSIONS

There has been no previous analysis of either the subjective or objective effectiveness of different teaching feedback mechanisms in BLS training. This randomised controlled trial has identified that the learning conversation is preferred by BLS instructors and enables at least comparable skill

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acquisition to the sandwich technique. The style in which feedback is delivered does not appear to directly impact on learners' perception of its effectiveness. Instructors nevertheless perceive the learning conversation to significantly enhance the performance of learners when compared with the sandwich technique. Further study is required to see if these effects are maintained over a longer course duration with more complex skill acquisition and whether any effect on skill retention can be demonstrated.

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9. AUTHOR CONTRIBUTIONS

CJ and AO jointly devised the study, with additional input from JH. CJ, AO, JH and LB developed the study methodology and both CJ and AO obtained ethical approvals. LB designed and validated study questionnaires. CJ and LB recruited participants and oversaw data collection and sampling. LB undertook statistical analyses and both LB and CJ wrote the first draft of the manuscript. All authors were involved in subsequent revisions of the manuscript and all have read and approve of the final submitted version of the manuscript.

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10. CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest relating to this article.

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12. FIGURE LEGENDS

Figure 1: An overview of the structured processes underpinning feedback delivery using the sandwich technique (figure 1a) and the learning conversation (figure 1b)

Figure 2: An overview of the crossover approach utilised for this study

Figure 3a: A flow chart overview of participant (instructor) recruitment, allocation and analysis.

Figure 3b: A flow chart overview of participant (candidate) recruitment, allocation and analysis.

Figure 4: Visual analogue scores for instructors' end-of-course perceptions of teaching with either the sandwich technique first (sandwich technique 1st), followed by the learning conversation (learning conversation 2nd) or with the learning conversation first (learning conversation 1st) followed by the sandwich technique (sandwich technique 2nd). Each graph relates to a specific question posted to instructors, which they were asked to rank on a visual analogue scale ranging from 0-10, where 0 reflected least effective and 10 identified most effective or favourable scoring.

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Candidates	Learning Conversation			Sandwich Technique		
	Assessment data (All candidates)	**Questionnaire responders**	**Questionnaire non-responders**	**Assessment data (All candidates)**	**Questionnaire responders**	**Questionnaire non-responders***
Total	315	219 (69.5%)	96 (30.5%)	324	253 (78.0%)	71(22.0%)
Median age	19 (18-20)	19 (18-20)	19 (18-20)	19 (18-20)	19 (18-20)	19 (18-20)
Gender M (%)	104 (33.0%)	58 (26.6%)	46 (47.9%)	114 (35.2%)	78 (30.8%)	36 (50.7%)
Degree Course:						
Undergraduate Medicine	158 (50.1%)	105 (48.0%)	53 (55.2%)	170 (52.5%)	127 (50.2%)	43 (60.6%)
Graduate Entry Medicine	24 (7.6%)	22 (10.0%)	2 (2.1%)	24 (7.4%)	24 (9.5%)	0
Pharmacy	33 (10.5%)	26 (11.9%)	7 (7.3%)	27 (8.3%)	26 (10.3%)	1 (1.4%)
Dentistry	30 (9.5%)	24 (11.0%)	6 (6.3%)	36 (11.1%)	34 (13.4%)	2 (2.8%)
Undergraduate Physiotherapy	26 (8.3%)	10 (4.6%)	16 (16.6%)	30 (9.3%)	10 (4.0%)	20 (28.2%)
Graduate Entry Physiotherapy	11 (3.5%)	3 (1.3%)	8 (8.3%)	11 (3.4%)	7 (2.8%)	4 (5.6%)
Sport and Exercise Science	3 (1.0%)	1 (0.4%)	2 (2.1%)	1 (0.3%)	1 (0.4%)	0
Nursing	30 (9.5%)	28 (12.8%)	2 (2.1%)	25 (7.7%)	24 (9.5%)	1 (1.4%)
Instructors	**All instructors**	**Questionnaire responders**	**Questionnaire non-responders**	**All instructors**	**Questionnaire responders**	**Questionnaire non-responders**
Total	30	24	6	28	23	5
Median age	19 (18-20)	19 (18-20)	Unknown	19 (18-20)	19 (18-20)	Unknown
Gender M (%)	12 (40%)	9 (39.1%)	3 (50%)	8 (28.6%)	5 (21.7%)	3 (60%)
Programme of study:						
Undergraduate Medicine	26 (86.7%)	20 (83.3%)	6 (100%)	23 (82.1%)	18 (78.4%)	5 (100%)
Graduate Entry Medicine	0	0	0	1 (3.6%)	1 (4.3%)	0
Pharmacy	1 (3.3%)	1 (4.2%)	0	2 (7.1%)	2 (8.7%)	0
Dentistry	0	0	0	1 (3.6%)	1 (4.3%)	0
Undergraduate Physiotherapy	2 (6.7%)	2 (8.3%)	0	1 (3.6%)	1 (4.3%)	0
Sport and Exercise Science	1 (3.3%)	1 (4.2%)	0	0	0	0
Nursing	0	0	0	0	0	0

Table 1: Demographic data for all instructors and candidates. Comparisons were undertaken between responders and non-responders across both the learning conversation and the sandwich technique using the non-parametric Mann-Whitney test. All comparisons were non-significant.

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Teaching technique	**Assessment result**		Totals:
	Pass	**Fail**	
Learning conversation	80.9% (255)	19.1% (60)	315
Sandwich technique	77.2% (251)	22.7% (74)	325
Totals:	506	134	640

Table 2: Candidate assessment results detailing the proportion of participants who were successful at their competency-based basic life support assessment after being taught using feedback provided using either the learning conversation or sandwich technique. There was no significant difference in pass/fail results between techniques when assessed using Fisher's test.

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Question	ST then LC (VAS score)			LC then ST (VAS score)		p-value
How easy was it to understand the concept of your feedback technique?	8.5 (8.0-9.0)	6.5 (5.5-8.0)	**0.001**	7.5 (6.5-8.0)	8.0 (7.1-9.0)	**0.364**
How Comfortable were you in delivering feedback?	7.0 (6.0-8.0)	6.5 (5.0-8.0)	0.203	7.8 (7.0 -8.5)	6.8 (4.1-7.9)	**0.005**
How easy did you find this feedback mechanism to use?	7.0 (6.5-6.5)	6.75(5-8.1)	0.106	8.0 (6.5-8.5)	7.0 (4.5-7.9)	0.062
How well did students respond to your feedback?	6.5 (5-7.5)	5.5 (5.0-7.5)	0.201	6.8(5.6-8.0)	5.0 (3.6-6.9)	**0.002**
5How satisfied were you with your candidate's improvement in performance following your feedback?	7.5 (6.5-8.5)	7.0 (6.5-8.5)	0.036	7.8(7.0-8.5)	6.0 (4.1-7.0)	**<0.001**
6How would you rate the feedback technique in its ability to improve candidate's performance?	7.0 (6.5-8.0)	6.5 (5.8-7.75)	0.332	7.3 (6.5-8.4)	5.0 (3.1-6.5)	**<0.001**
7How good is the feedback technique at preparing candidates to sit the basic life support exam?	7.5 (6.0-8.0)	7.0 (6.5-8.0)	0.232	7.3 (6.5-8.4)	5.3 (4.1-6.4)	**<0.001**
How effective was the feedback mechanism at teaching:						
Basic Life Support	7.5(6.5-8.0)	6.5 (6.0-7.5)	**0.033**	7.5 (6.6-8.5)	5.8 (3.5-7.0)	**0.001**
Automated External Defibrillator	7.5 (6.5-8.0)	6.5 (6.0-8.0)	0.092	7.0 (6.1-8.9)	5.5 (3.6-7.0)	**0.001**
Recovery Position	7.5 (6.5-8.0)	6.5 (6.0-8.0)	0.116	7.0 (6.5-8.0)	5.5 (3.1-6.9)	**0.004**
Bleeding	7.0 (6.0-8.0)	6.5 (5.5-8.0)	0.330	7.5 (6.1-8.0)	5.5 (3.6-7.0)	**0.004**
Choking	7.0 (6.5-8.0)	6.5 (5.5-8.0)	0.122	7.5(6.5-8.4)	6.0 (3.6-7.0)	**<0.001**
Shock	7.0 (6.0-7.5)	6.5 (5.5-8.0)	0.523	7.3(6.1-8.5)	5.5 (3.5-7.0)	**0.002**

Table 3a: Summary overview of instructors' perceptions of the sandwich technique and learning conversation feedback mechanisms.

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Question	Sandwich Technique	Learning Conversation	P value
How did you feel about the type of feedback you received?	7.5 (6.5-9.0)	7.5 (6.5-9.0)	0.704
How helpful did you find the feedback in improving your training?	8.5 (7.5-9.5)	8.0 (7.5-9.0)	0.721
How clear was the feedback on your positive points?	8.5 (7.5-9.5)	8.5 (7.5-9.5)	0.083
How clear was the feedback on your improvement points?	9.0 (8.0-9.5)	8.5 (7.5-9.5)	0.056
How would you describe the feedback?	8.5 (7.5-9.5)	8.5 (7.5-9.5)	0.855

Table 3b: Summary overview of candidates' perceptions of the sandwich technique and learning conversation feedback mechanisms.

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Figure 1

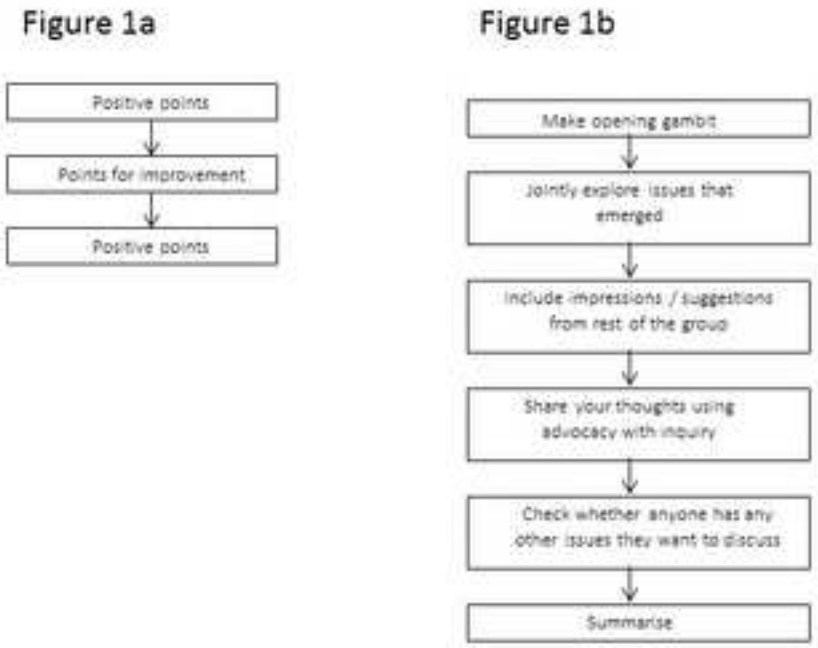


Figure 1a
Positive points
Points for improvement
Positive points
Figure 1b
Make opening gambit
Jointly explore issues that emerged
Include impressions / suggestions from rest of the group
Share your thoughts using advocacy with inquiry
Check whether anyone has any other issues they want to discuss
Summarise

Figure 2

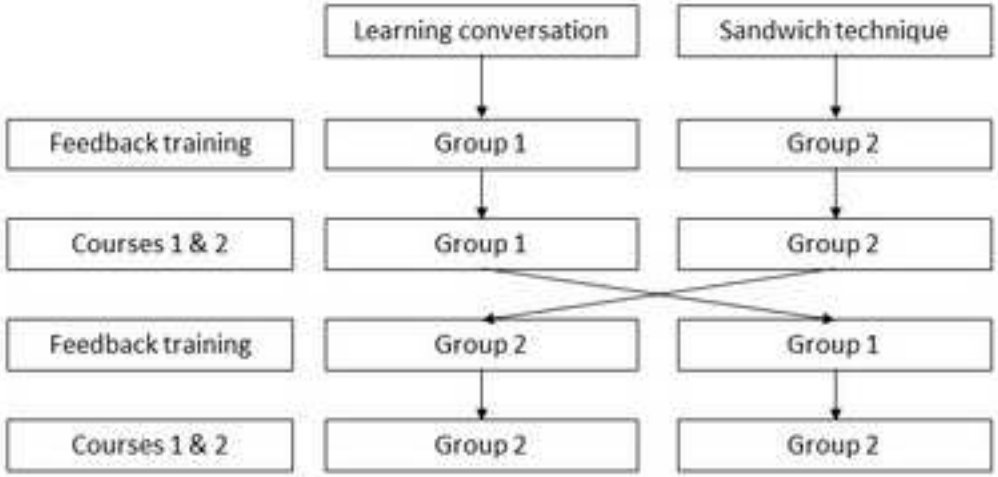

Learning conversation
Sandwich technique
Feedback training
Group 1
Group 2
Courses 1 & 2
Group 1
Group 2
Feedback training
Group 2
Group 1
Courses 1 & 2
Group 2
Group 2

Figure 3

Figure 3a

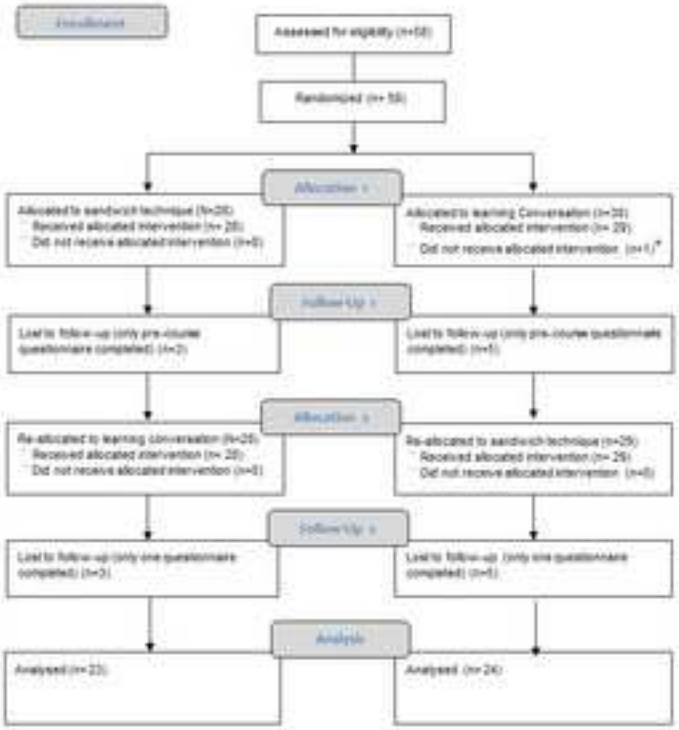
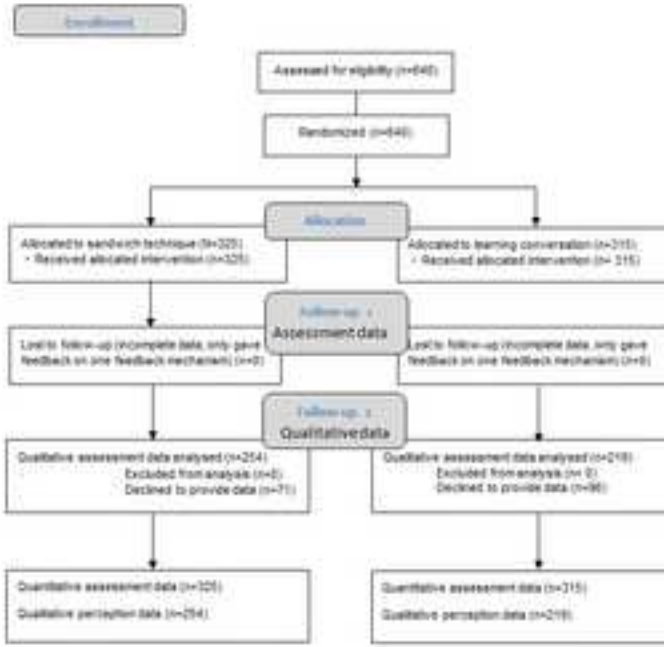
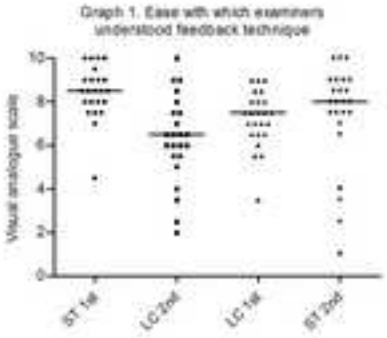
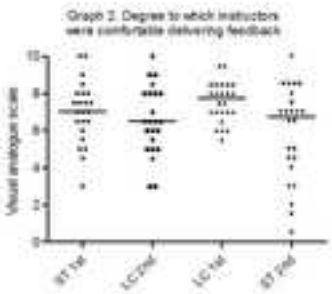
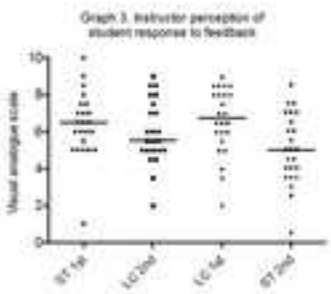
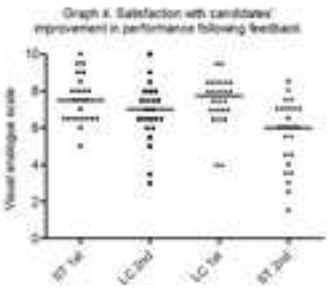
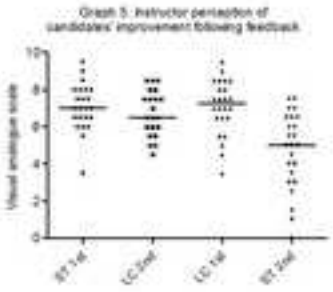
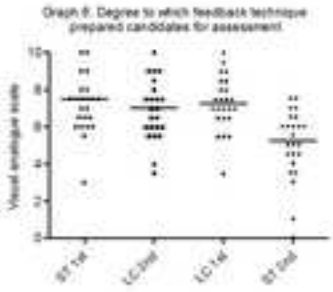
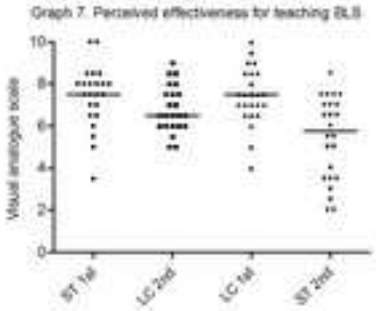
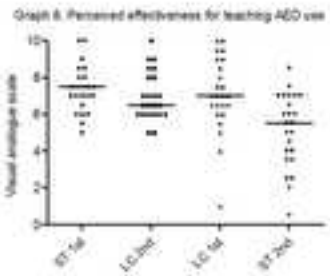
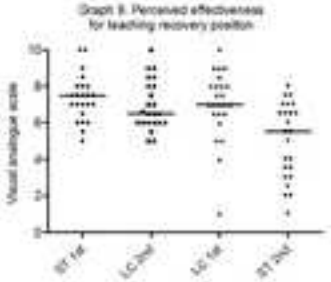
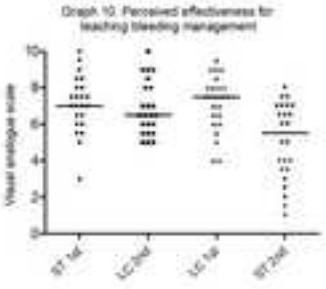
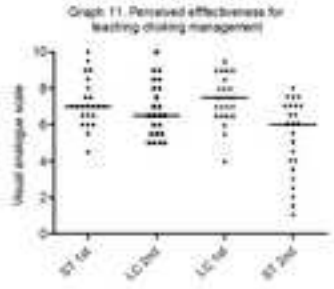
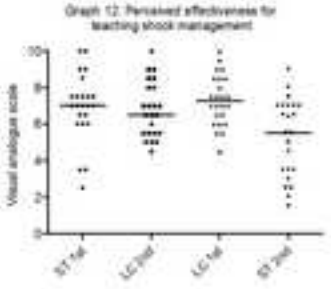


Figure 3b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