



Conducting the emergency team

A novel way to train the team-leader for emergencies

Larsen, Ture; Beier-Holgersen, Randi; Dieckmann, Peter; Østergaard, Doris

Published in:
Heliyon

DOI:
[10.1016/j.heliyon.2018.e00791](https://doi.org/10.1016/j.heliyon.2018.e00791)

Publication date:
2018

Document version
Publisher's PDF, also known as Version of record

Document license:
[CC BY-NC-ND](https://creativecommons.org/licenses/by-nc-nd/4.0/)

Citation for published version (APA):
Larsen, T., Beier-Holgersen, R., Dieckmann, P., & Østergaard, D. (2018). Conducting the emergency team: A novel way to train the team-leader for emergencies. *Heliyon*, 4(9), [e00791].
<https://doi.org/10.1016/j.heliyon.2018.e00791>

Received:
15 January 2018
Revised:
27 June 2018
Accepted:
11 September 2018

Cite as: Ture Larsen,
Randi Beier-Holgersen,
Peter Dieckmann,
Doris Østergaard. Conducting
the emergency team: A novel
way to train the team-leader
for emergencies.
Heliyon 4 (2018) e00791.
doi: [10.1016/j.heliyon.2018.e00791](https://doi.org/10.1016/j.heliyon.2018.e00791)



Conducting the emergency team: A novel way to train the team-leader for emergencies

Ture Larsen^{a,*}, Randi Beier-Holgersen^b, Peter Dieckmann^c, Doris Østergaard^c

^a Simulation Unit (SimNord), Department of Administration, Kvalitetsafdelingen, Nordsjællands Hospital, Dyrehavevej 29, 3400 Hillerød, Denmark

^b Department of Gastrointestinal Surgery, Nordsjællands Hospital, Dyrehavevej 29, 3400 Hillerød, Denmark

^c Copenhagen Academy for Medical Education and Simulation (CAMES), Capital Region of Denmark and University of Copenhagen, Herlev Hospital, Herlev Ringvej 75, 25 etage, 2730 Herlev, Copenhagen, Denmark

* Corresponding author.

E-mail address: ture@besked.com (T. Larsen).

Abstract

Introduction: Worldwide, medical supervisors find it difficult to get students to rise to the occasion when called upon to act as leaders of emergency teams: many residents/rescuers feel unprepared to adopt the leadership role. The challenge is to address the residents very strong emotions caused by the extremely stressful context. No systematic leadership training takes this aspect into account.

Aim: The overall aim of the course is to investigate whether, in an emergency, a clinical team leader could apply a conductor's leadership skills.

Background: An orchestral conductor is a specialist in practicing leadership focusing on non-verbal communication. The conductor works with highly trained specialists and must lead them to cooperate and put his interpretation into effect. The conductor works purposefully in order to appear calm, genuine and gain authority.

Method: A conductor and a consultant prepared a course for residents, medical students and nurses, $n = 61$. Ten \times two course days were completed. The exercises were musical and thus safe for the students as there were no clinical

skills at stake. The programme aimed to create stress and anxiety in a safe learning environment.

Conclusion: The transfer of a conductor's skills improved and profoundly changed the participating students', nurses' and residents' behaviour and introduced a method to handle anxiety and show calmness and authority.

Perspectives: If this course in leadership is to be introduced as a compulsory part of the educating of doctors, the ideal time would be after clinical skills have been acquired, experience gained and routines understood in the clinic.

Keywords: Health profession, Psychology, Evidence-based medicine, Emergency medicine

1. Introduction

Worldwide, medical supervisors find it difficult to get students to rise to the occasion when called upon to act as leaders of emergency teams [1]: many residents feel unprepared for the leadership role in emergencies [2, 3, 4, 5, 6, 7, 8, 9]. However, leadership in emergencies is considered very important for patient safety [3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20] and can affect mortality [4, 7, 9, 16].

It is necessary for residents to address and handle anxiety [4, 5, 7, 9, 21] and panic [7] in stressful [4, 7, 10, 13, 17, 22, 23, 24, 25] and complex [8, 10, 12, 16, 17, 25, 26] situations [1]. Therefore, in order to provide good and convincing leadership, residents must learn to be confident [2, 4, 5, 7, 8, 9, 20, 21, 25, 27, 28, 29, 30] and calm [5, 7, 14, 21] when assuming the role of team leader [1].

There is no systematic leadership training that takes this aspect into account. Handling negative feelings is not part of existing programmes [31]. Leadership during an emergency situation involves knowledge and skills, but also implies dealing with the pressure [5, 22, 24, 32, 33, 34] of being the decision-maker and the pressure of bearing the ultimate responsibility for what happens (or does not) [31]. This article describes a course that supplements existing programmes by addressing the emotional challenges for those leaders.

2. Background

2.1. Leadership and its relation to healthcare

It is important to fully understand that leadership and assuming leadership is an individual and personal matter and a deliberate choice [31]. It is *necessary* that the person who steps forward as teamleader fully understands the risks and responsibilities of the leadership role [7, 17, 20, 21, 30] — also referred to as the leaders' introspection [29], psychological self-care [35], mental readiness [17, 22] or having the ability

to understand and manage oneself [30]. “In accepting the leadership role, the individual assumes the mantle of the group’s possible failure. Any individual’s faltering can be laid at the leader’s feet. This is the law of total responsibility” [21], stated by Iserson in 1986.

2.2. The conductor’s role and its relation to leadership in healthcare

An orchestral conductor is a specialist in practicing leadership focusing on non-verbal communication. The conductor’s goal is to interpret and realize the composer’s intentions and to convey this interpretation to the orchestra to ensure the music comes alive in an artistically satisfactory way. The conductor works with highly trained specialists and must lead them to cooperate and put his interpretation into effect.

In order to achieve the respect and authority to lead an orchestra, it is important to appear calm, balanced, competent, authentic, and credible. The leader works purposefully with his posture and appearance in order to eliminate anything that could possibly prevent the message from being interpreted as intended.

It is necessary for the conductor to listen, sense, and observe what *actually* takes place in the room and demonstrate a ‘*presence at the specific moment*’, which will give him the ability to constantly adapt and adjust to changes and embrace the unexpected. This presence should also reflect his ‘*responsiveness*’, defined by the ability to sense, notice, recognize, feel, and experience the emotions of another person or group of persons subjectively.

This ability to gain an overview of the situation in all its complexity and find solutions based on technical as well as human resources will be perceived by the team as signs of competence. When the leader adds the courage to ‘*improvise*’ on the basis of a given situation, he will not only demonstrate competence, but make his presence felt. In so doing, he will be perceived as even more genuine by the teams.

“Improvisation requires a lot of experience and discipline and cannot be executed by beginners, neither is it something to be pulled out when everything else fails” [36]. The importance of skilled professionals being able to improvise in their leadership roles is also discussed and emphasized by jazz-pianist and Professor of Management, Frank J. Barrett [37].

By working with these objectives, the conductor or the teamleader’s credibility will be enhanced. Conductors know that only when this credibility is established is the conductor able to lead the orchestra, and to provide the appropriate level of encouragement or criticism considered appropriate without upsetting anyone.

The emergency teamleader and the team are not focusing deliberately on non verbal communication while the conductor is traditionally trained to use gestures and eye-contact like all musicians look attentively at the conductor, focus on their own task, respond to the other's efforts, and trust in the conductors' responsibility and overview. The conductor and the emergency teamleader both work intense situations demanding authoritative leadership leaving little room for 'time out' or discussions. Based on these similarities, we consider that training in the non-clinical context of conducting music might help residents to take into account, face, and deal with the emotional challenges of being a leader. The conductor's focus and objectives during the course are presented in [Table 1](#).

The overall aim of the course is to investigate whether, in an emergency, a clinical team leader could apply a conductor's leadership skills.

Table 1. The conductors focus.

Appearance immediate, intuitive decoding

Appears confident

Appears easily readable

Appears comfortable

Professionally focused (authority, engaged)

Leadership — Shows Power

Leadership — Is demanding (opposite caring)

Presence at the specific moment (intense)

Presence at the specific moment (listening)

Presence at the specific moment (paying attention)

Absorbed in his project

Physique, exact observations: control of body

Appears calm

Appears relaxed

Seeking eye contact

Relaxed use of facial expressions

Relaxed use of eyes

Relaxed use of eyebrows

Relaxed use of smiles

Shoulders back

Raised chin

In control of hands

In control of legs

Disturbing elements, exact observations

Very individual characteristics. Examples: Fixed grin. Unintended smile. Licking their lips. Very raised eyebrows. Awkward location of hand. Nodding his head. Leaning violently forward. Touching his face. Scratches on the neck, showing stress and discomfort, etc.

3. Method

This section covers several aspects. Firstly, pedagogic considerations and assumptions, then the development of the course and how it was conducted, and finally the evaluation.

3.1. Pedagogic considerations

3.1.1. *Anxiety and safety*

In order to simulate an emergency situation and to optimize leadership training the course creates a framework with stress, anxiety, and discomfort in a harmless, non-clinical, and safe setting. It is important to provide psychological safety [38] where the participants feel able to accept being uncomfortable and feel that they will be viewed positively even if they make mistakes [39].

3.1.2. *Transformative learning perspective*

The course assumes that participants have to experience and obtain a ‘bodily feel’ of the pressure of being a conductor in order to really understand it, as described in *Embodied Cognition* [40]. This theory is used in the design of effective learning environments, especially those targeting conceptual change [41]. According to *Transformative Learning Theory* [42] one prerequisite for ensuring a real transformation is to be faced with a ‘disorienting dilemma’ [43]. A ‘Disorienting Dilemma’ is defined as an acute personal or social crisis or, at another level like on this course: the participants were given assignments which were almost impossible to solve.

3.1.3. *Change of setting*

The course builds on a change of teaching strategy to implement an element of surprise, which is also needed to create the dilemma that is used as trigger for transformative learning process. There is a radical change of setting with the shift from a traditional class-room set-up to a musical set-up in another room; this change of setting emphasizes the great importance that the instructors attach to this surprising exercise.

3.1.4. *Apprenticeship*

Traditionally, a conductor himself is trained via an apprenticeship and this method would be applied to the course. Individual ‘straight on’ feedback, offered with the utmost care and sensitivity, is a cornerstone when doing the exercises: the participants must not feel concerned at this point. The conductor has experienced that learning is promoted by getting close to this limit when giving this very personal feedback.

3.2. Development of the course

As described in the literature, the consultant had experienced the lack of leadership and anxiety in simulation training of residents and the missing focus on leadership. As an amateur trombone player she realized the parallel between the teamleader and the conductor when her concert band received a new skilled conductor. The development of the course was based on a conductor's skills in order to give medical students, nurses, and residents the tools required to appear calm and credible in to the emergency team.

3.3. The conduct of the course

A consultant and an orchestral conductor were the faculty for the course.

The consultant was familiar with the students and residents as she is responsible for their education at the hospital. In addition, her presence guaranteed the clinical relevance of the course.

The presence of the conductor was a new element in the clinical context and therefore the participants were more attentive.

Classrooms: Teaching took place in three different rooms. Room one was an ordinary classroom setup. The faculty stood in front of the board. This situation was a known and safe framework for a course for medical students and doctors. In room two, a music stand was placed in front of a semi-circle with chairs for the participants. Behind the semi-circle was a piano. This musical setup was a 'change a setting' for the participants. Room three contained a fully equipped simulation room with a SimMan 2G patient simulator, again familiar to everybody.

Primarily, the consultant explained the background of the course, and based on her own experience described a case where the team leader failed with unfortunate consequences. The similarity between a teamleader in an emergency and a conductor at a concert was described: two highly tense situations demanding firm leadership in which decisions must be obeyed and there isn't much room for discussion. Then, the Conductor briefly described his thoughts on leadership as described in the background section and in [Table 1](#). The conductor promoted a *change of setting* by explaining that teaching would continue in the adjoining room, and the course participants themselves would have the opportunity to act as conductors and singers in a choir.

A chronological review of the content of the course days is presented in [Table 2](#).

Table 2. Course description.

Exercise	Content	Objectives	Comment
Musical exercises, course-day one			
Initiate a sound (class and simulation room)	Trainees must in turn get the others to sing 'ah' initiated by a simple Conducting gesture	Calmness, authority and require an action.	This exercise was replaced by conducting 'Frere Jacques' after two courses
Beating a basic 4/4 pattern (music room)	A simple conducting exercise that focuses on the correct movements of hands	Necessary preparation for the following exercise. An apparently simple but in fact difficult obstacle	A big obstacle, requires a great attention
'Frere Jaques' (music room)	Conducting a choir	Authority, presence at the specific moment, 'first meeting' and non-verbal communication	Obstacles, disorienting dilemma, discomfort, stress and anxiety
Ghetto Blaster orchestra, (class room)	Conduct a Ghetto Blaster orchestra, improvising w. three sounds	Leading a multidisciplinary team. Authority, presence at the specific moment, appearance and communicating without words.	Experience the intensity in the communication when conducting an orchestra 'achieving a state of trance'
Musical exercises, course-day two			
Ghetto Blaster orchestra, (class room)	Conduct a Ghetto Blaster orchestra, improvising with ten sounds	Leading a multidisciplinary team. Authority, presence at the specific moment, appearance and communicating without words.	Experience the intensity in the communication when conducting an orchestra 'achieving a state of trance'
Mastery, (class room)	The conductor tells and shows	Experience the strong authority, presence at the specific moment, appearance and nonverbal communication from a professional conductor.	The power of eye-contact and use of empathy
Ghetto Blaster orchestra (class room)	Conduct a Ghetto Blaster orchestra: follow a score	Leading a complex situation following a composed score. A parallel to a clinical algorithm. A difficult obstacle	Obstacle, disorienting dilemma, discomfort. Leadership in an extremely complicated exercise.
CPR algorithm with sounds on Ghetto Blasters (class room)	Sounds were composed to illustrate the different tasks to be performed at a CPR emergency. They were to be performed according to the CPR algorithm	Transfer to the clinic	This exercise was removed from the course after two course-days.
CPR simulation (Simulation room)	Perform a full CPR simulation as team leader with a medical team	Transfer of the learned leadership competencies to the clinic	It was a problem training leadership and medical algorithms simultaneously
Emergency, course-day three			
Personal videos	Watching videos from the first course-day	Reflecting on the course and the topics and own performance	Major impact on the participants
Emergency simulation (Simulation room)	Perform a full emergency simulation as team leader	Incl. to diagnose. A possibility for calling 'time-out' if problems occur	Most participants experienced this simulation as regular acute training

3.3.1. Participants

All participants were recruited from Nordsjællands Hospital, Denmark: Residents starting work in spring 2015 were contacted by mail and offered a course on team leadership and non-verbal communication. The residents were appointed and participated in the course one month prior to the beginning of their first clinical period as a doctor. In autumn 2014, 3rd semester graduate students were offered courses starting in January 2015. The students enrolled. As an experiment, an additional training day was added for two different teams. To investigate whether the course was applicable to other ages, groups and health-care professionals or was relevant in teamwork with nurses, a course day was held for emergency room nurses.

The Committees on Health Research Ethics for the Capital Region of Denmark was asked to give ethical approval but a formal review was waived for this study (H-4-2015-FSP). All participants gave written consent for their videos to be displayed/published here.

3.4. Evaluation methods

3.4.1. Data acquisition and analysis

Integrated video and audio recordings representing 22:12 hours of observation of all the courses for the residents and students were made. One camera focused on the 'leader' and another on the 'team'. The first four course days were recorded on the GoPro Silver edition, and these cameras were replaced by the GoPro HERO 4 Black edition, which has high definition resolution (4K), allowing zooming in on the details of the footage in the editing process. The HD footage was edited on a MacBook Pro with two external two TB hard drives (one for backup). Recordings from a single course day took up between 40 and 60 GB of disk space: all 22:12 hours of recordings filled approximately one TB of hard drive space. The videos were edited in Adobe Premiere Pro CC, release 2017.1.2.

Dialogues from selected courses were transcribed verbatim (including short descriptions of important events, e.g. 'laughter'). Written field notes were compiled for all the courses. Complete dialogues were transcribed from six courses (the final course design) – a total of 160 pages. Transcription made partly by TL and partly by two medical students who were not attending or informed about the course ('blinded' as to the background, method and assumptions for the course). Throughout the project, TL kept a research diary, where observations and thoughts deemed to be relevant for the project were recorded. All data is available and can be requested from TL.

3.4.2. *Comments and evaluations*

All the participants made evaluations immediately after the courses, $n = 61$. They gave written quantitative evaluations and responded to a short survey of four quantitative questions plus an option for a free assessment comment. The questions concerned 1) Expectations: Was my expectations fulfilled? 2) New knowledge and ideas: Did I learn what i needed, did I get new ideas? 3) Use of learning: Will I apply information and ideas? 4) Impact on results: Will the new information I have acquired improve my practice? The scale ranged form 1–4 where 1 is the best. The students and residents were encouraged to reflect on the course in written evaluations after the course. After receiving edited video clips showing their personal performance during the two course days, the students and residents were sent a survey with 14 questions.

3.5. Analysis

3.5.1. *Abduction as a method*

An abductive approach to research makes it possible for the researcher to present a qualified presumption (*educated guess or inference*) [44] when commencing his investigation. Based on his findings, he acquires new knowledge, he might alter/adapt this new knowledge to the presumption and the process starts over. This principle is the foundation of more contemporary methods e.g. Grounded Theory or Qualitative Content Analysis.

3.5.2. *Qualitative Content Analysis*

All text-based data were gathered into one single pdf-document and searched for keywords and sentences describing the content of the course, and the words were interpreted in a meaningful context. The method was Qualitative Content Analysis, conventional, and inductive: Themes emerged in and abductive – inductive process, abductive because the conductor had his presumptions for the course – inductive because the findings adjusted the presumptions. When themes were established the process became directed by the themes, thus the process became deductive. The words were grouped into three themes according to the assumptions and findings in the data set. 1) Learning Environment described as a safe surroundings with the purpose of being able to address anxiety, 2) Pedagogics described as tools to handle the stressful situation as well as anxiety, and 3) Learning Goals – The Conductors Focus as described in the background section and in Table 1. The words were interpreted in a meaningful context.

Three keywords were important for the course though rarely verbalized: video footage was searched for *Trance*, *Apprenticeship* and *Transformation* based on the conductor's assumptions for the course. '*Trance*' is an experience,

'*apprenticeship*' is an overall important teaching concept, '*transformation*' is an aim, but none of those keywords were explicitly verbalized during the course.

Video footage was reviewed several times, and edited with the aim of exemplifying the themes described above.

4. Results

20 three-hour course days were completed in the period January – May 2015, three course days were cancelled because of lack of participation. Seven participants were not able to attend course day two because of time pressure from other activities (Table 3).

Written qualitative evaluations were received one day to five months after the course from 20 of 38 participants (53%). The video material was edited to 332 small video clips and each participant was sent their personal videos together with a new survey. These surveys were received 2·5–10 months after the course, 14 e-mail reminders were sent and ten of the 38 participants responded (26%). Unsolicited comments received 24 months after the course from four of the 38 participants (10%). In addition, two 'blinded' students wrote non-guided reflection on the course based on the content of their transcriptions of four course days. These considerations are included in the data set.

3 themes emerged: Learning environment. Pedagogics. Learning goals – the conductor's focus.

All themes are highlighted with quotes according to whether they were made during *the courses* illustrating what took place during the courses or were provided in evaluations *after the courses*, reflecting thoughts from the course up to two years later (Supplementary Table and Table 4).

Ten short videos were edited according to the themes and produced from the 22:12 hours of footage from the courses. The videos all give an impression of the learning

Table 3. Population and participation in course.

Population	Participation in course. January – May 2015		
	Day 1 (3 hours) (11 course days)	Day 2 (3 hours) (7 course days)	Day (3 hours) (2 course days)
Residents	15	11	0
Medical students	23	20	4
Nurses	23	0	0
Total	61	31	4

Table 4. Sceptical comments.

Stress and obstacles	[BS1]: The first game with Frere Jaques focuses on something that is too technically complicated in relation to a medical benefit [R2], two months after: I sometimes felt You focused on some details that were indifferent to us as doctors. I.e. I think too much time was spent on the correct factor to conduct Frere Jaques
Physics	[R2], two months after: I still think that too much emphasis was placed on not having to smile/should look very serious.

R = Resident, BS = 'Blinded' Student.

environment and include laughter. The videos and the themes they are illustrating are presented in [Table 5](#).

[Table 5](#), Video 1 shows a 'change of setting' for the residents and the impact of being challenged to conduct a simple children's song. Given the difficult challenge of beating a 'basic four-beat pattern' ([Table 5](#), video 1) the participants became more stressed in an already stressful situation, and this revealed personal physical challenges and interference – they could then be assessed by the conductor.

The video (video 1) show clear signs of participants feeling insecure: twisting their hands, scratching their neck, shaking their shoulders or head, laughing – mouth wide open, hiding their hands in their laps and showing anxiety while laughing was interpreted as participants feeling stressed, finding the task very difficult and struggling to solve the challenge.

The participants' discomfort and uncertainty led them to pay more attention to the conductor – and strengthened the cohesion among the participants when laughing at each other.

4.1. Learning environment

Selected comments are shown below in the themes. Quotes given after the course are presented in Supplementary Table.

'Many points and a lot of learning are received best in a safe environment and when playing, which one must say that the course fulfils.'

[S13], two months after

Safe, enjoyable laughter had a significant impact on the course indicating that the participants felt safe and enjoyed participating.

Reflections about the learning process were found. This further confirms that the participants felt safe to speak up and share reflections about the content of the course.

Table 5. Eleven selected videos from the course.

11 videos (hyperlinks). All videos gives an impression of a safe learning environment and shows enjoying laughter

1. Training beating a four beat pattern youtu.be/WW898db57Zw	Duration: 0:38. A change of setting: four male and four female participants are training beating a basic four-beat scheme. Focused attention, handling a difficult obstacle. Cohesion on the team. Theme: Stress and obstacles
2. Apprenticeship youtu.be/EnHluj3F0	Duration: 1:50. The conductor explains and shows care for nine participants in order to make the individual participants obtain a feel of calmness when performing as a leader. The conductor stands as a role model. Themes: Apprenticeship, Eye-contact, Presence at the specific moment, Responsiveness, Communication, Non-verbal, Engagement.
3. 'Straight on' Feedback youtu.be/fwbfgfTNf_e8	Duration: 2:04. 13 participants receive very 'Straight on' personal feedback from the conductor who goes to the limit. Themes: Apprenticeship/'Straight on' feedback, Physics, Authority, Stress and obstacles, Communication, Non-verbal.
4. Discomfort & Obstacles youtu.be/UmIFk9VXuCQ	Duration: 2:12. 21 participants show discomfort: shake their heads, laugh nervously, scratch their neck, show rolling eyes, hide the face in their hands, smile apologetic etc. Themes: Stress and obstacles, non-verbal
5. A safe environment youtu.be/_ZmUYjI-T4E	Duration: 2:24. 19 participants show they feel safe, fool around and laugh. Female participant often does the 'shimmy', small dance movements, plays with a hat etc. Themes: Safe learning environment
6. The intensity in communication when conducting youtu.be/3sPmMQCne_E	Duration: 0:29. Four participants conduct team. They are showing excellent leadership and are in a 'state of Trance' with their team. Themes: Trance, Authority, Eye-contact, Presence at the specific moment, Responsiveness, Communication, Non-verbal, Engagement.
7. Achieving a state of flow youtu.be/KcyZf3_QfMk	Duration: 1:12. One participant conducts completely absorbed for more than ten minutes. The team (orchestra) isn't moving, fully focused on the conductor. Light goes out at 0:20 (2:37) but nobody pays attention to this. Themes: Trance, Authority, Eye-contact, Presence at the specific moment, Responsiveness, Communication, Non-verbal, Engagement
8. A Transformation youtu.be/GW7XPdnf-EU	Duration: 6:54. A real transformation (English subtitles). Shows how the trainers 'gets under the skin' of the participants. Shows the reflection on the learning and the support from the other participants. The participant in focus goes from saying "My palms are totally sweaty" and "I think it's horrible" to say: "I wish everyone could try this" and "It is very impressive". Themes: Trance, Transformation, Authority, Eye-contact, Presence at the specific moment, Responsiveness, Stress and obstacles, Communication, Non-verbal, Engagement
9. End Point youtu.be/IQtMa0VJgfw	Duration: 1:55. 16 participants showing excellent leadership when conducting. In control of their body, attentive to the project, confident, absorbed and in full control of the situation. Themes: Trance, Authority, Eye-contact, Presence at the specific moment, Responsiveness, Communication, Non-verbal, Engagement

(continued on next page)

Table 5. (Continued)

11 videos (hyperlinks). All videos gives an impression of a safe learning environment and shows enjoying laughter

10. A Breakdown youtu.be/f5BiNFL_zDU	Duration: 1:21. A participant breakdown. After attending the two course-days concerning leadership she tries to transfer the learned skills to the clinic in a medical acute simulation. When confronted with her lack of medical knowledge she forgets all trained leadership skills and loses control of the situation. Themes: Physics, Stress and obstacles, Non-verbal, Training algorithms and leadership.
11. Unique individuals youtu.be/Bdok4ArYXcM	Every participant brings in their own experiences, perceptions and emotions

4.2. Pedagogics

4.2.1. Trance

It was observed that a trance-like state frequently occurred between the leader and the team during the exercises, as shown in video 6, 7 and 9 in [Table 5](#).

‘... I also felt completely in my own world. It was a really amazing feeling.’
[S1], at the course

4.2.2. Apprenticeship/‘straight on’ feedback

Participants recognized that the conductor was a specialist who, through his profession, had acquired the ability to focus on non-verbal language. Part of the learning process through apprenticeship is the very direct personal feed-back ([Table 5](#), Video 1, 2, 3, and 8). The conductor worked with the participants’ body posture and addressed simple physical elements: hands, neck, chin, back, chest etc. This was done in order to emphasize different personal physical issues while explaining to the team their impact and importance. Furthermore, participants observed how personal instruction made a big impact on the person who received the instruction, and experienced how individual feedback immediately influences, transforms and strengthens the leader’s credibility in front of the team. 15 participants stated that they felt that the faculty fully understood the challenges they faced (‘got under their skin’) (Supplementary Table ‘stress and obstacles’ and [Table 5](#), Video 1, 4, and 8). 17 participants stated that they greatly appreciated this personal and ‘straight on’ feedback (Supplementary Table: Apprenticeship, ‘straight on’).

‘The idea of using conductor theory to control body language seems immediately a bit exotic, but on closer inspection, incredibly logical.’
[S12], six weeks after

4.2.3. Transformation

‘I just think, you know, it was just so great to see you guys, or – I suppose I have tried myself as well – but anyway, just to be able to see! How much you have all progressed with this course. I’m just sat here thinking shit, wow!’
[R3], at the course

15 participants during the course and 21 participants after the course stated that there had been significant development in the individual participant’s behaviour. (Supplementary Table, ‘transformation’ and Table 5, Video 8, plus progress and development from video 4 to 9).

4.3. Learning goals – the conductor’s focus

Described in Table 1.

4.3.1. Physics

‘It was also very clear that the participants gained a much greater body awareness. They became aware of how they communicate, what they signal with their body language and what all this does with the message they are going to convey’.
‘Blinded’ student 2

47 participants expressed that they had become aware of the importance of body language when communicating. (Supplementary Table, ‘physics’ and Table 5, Video 3).

4.3.2. Authority

‘The good thing about practicing non-verbal communication was to experience calmness, which could also be created in an emergency. There was not so much noise in the form of people speaking all at once, but I also experienced an inner calmness in communicating my message clearly and was well aware that the recipient had understood the order, and I was able to concentrate on the next part of the treatment algorithm.’

[R8], four months after

17 participants specifically stated that they have achieved interaction between body language, appearance and authority – and understood why this leads to calmness and self-confidence – confidence for the leader as well for the members of the team (Supplementary Table, ‘authority’ and Table 5, Video 9).

‘So when I feel that I’m calm – you can see it too.’

[S5] dialogue from a course

4.3.3. Eye-contact

‘Especially as a doctor and a team leader in an emergency situation where there is a great tendency for things to get messy and communication is not efficient, you can pass orders and communicate through mimics, body language and your eyes.’

[S3], one month after

Eight participants during the course and ten participants after the course stated that they had learned that eye-contact is a powerful tool for ensuring that decisions are communicated, received and understood (Supplementary Table, ‘eye-contact’ and Table 5 video 2, 6, 7, 8, and 9).

4.3.4. Presence at the specific moment

‘We are not good at being present ... I am not. But it is important to be present when leading a large group of people... Presence can be used in a lot of contexts!’

[S4], dialogue from the course

The importance of listening, being attentive and demonstrating awareness was a topic introduced repeatedly by the faculty during the courses. The participant understands the importance of presence in promoting the quality of cooperation with the team and eight participants stated this explicitly (Supplementary Table, ‘presence at the specific moment’ and Table 5 Video 6, 7, and 9).

‘That was also why I just wanted to listen to how it sounded. You know, just standing there listening to all the different parts coming together.’

[S1], at the course

4.3.5. Responsiveness

‘Yes, I felt that I got them more ... under control. Because when you look at people — you’ll know exactly where they are — and where I am myself’

[R7], dialogue from a course

The participants learned that in this course context it was valid to talk about and express subjective perceptions (*I feel, I can see, it seems like, I can sense, I can tell*). Sentient perceptions were stated by 11 participants (Table 5, Video 6, 7, and 9).

4.3.6. Stress and obstacles

‘I was pushed to the limit at the same time as I needed to use what was newly learned, which was a productive challenge’

[S21], three months after

15 participants stated that they were pushed out of their comfort zone, however 19 participants acknowledged that the environment was nevertheless safe. Three sceptical comments from one participant and one ‘blinded’ student were identified (presented in Table 4): independently of each other, they found it too complicated and, in terms of the clinic, irrelevant for doctors to learn conducting techniques (Supplementary Table, ‘stress and obstacles’ and Table 5, Video 1, 4, and 8).

4.3.7. Communication

‘...Impressive to see how much you can say without words, just body language and mimic.’

[S10], five months after.

Participants were surprised and impressed to see how much they could communicate and how explicit and nuanced they could make their demands without speaking.

‘Unbelievable how much you can say and ask for without using words’

[S3] day one

4.3.8. Non-verbal, smile/grin

Conductor: The very best: that’s your smile when it succeeded! When you succeed, you look so proud and happy! And we are so happy to be part of your pride and your project. [S7] agrees: When you give that smile, we get such a ‘Yes! I did it right!’

Dialogue from a course

Non-verbal, Smile/Grin: The words ‘smile’ and ‘grin’ was found in three contexts: *Safe learning environment:* It was frequently observed and registered that the participants actually laughed and smiled during the course when they were enjoying themselves. *Anxiety and stress:* It was also observed and recorded that during the course the participants laughed and smiled as an involuntary and nervous reaction to stress. *Non-verbal communication:* A smile especially can express very nuanced and different emotions: kindness, pride, appreciation, embarrassment, compassion, silliness and confusion etc. As such, how and when to use a smile when communicating as a leader was discussed in depth — i.e. when it promotes and when it interferes with the leadership (Supplementary Table, ‘Grin/smile’ and Table 5, Video 1, 3–6).

4.3.9. Engagement

... I felt like I was a part of your [project]. You were engaged! Because if you were not, you'd just have proceeded, and then I'd just go: 'Well, who cares anyway'

[S5] dialogue from a course

Participants experienced that, in order to demonstrate authority and leadership in a convincing manner, it was necessary for the leader to show he was fully absorbed in the project (Table 5, Video 1, 6, 7, and 9).

4.4. Additional findings

The additional findings were mainly guided by one surprising factor; for some of the participants transferring the newly acquired leadership competencies from a musical setting to a full scale CPR simulation turned out to be a problem (Table 5, video 10). A reasonable explanation was that, when challenged on their clinical knowledge, the participants forgot about non-verbal communication and leadership (therefore a new theme was introduced: *Training algorithms and leadership*). However, the participants were excited about the content of the course and considered the competencies to be important for their future work as doctors (new theme: *Relevance*). This problem led to discussions about when in education would be the ideal time to learn these skills (*When to learn*). These discussions and the written evaluations confirmed that the course addressed important topics which were not covered in formal education (*Missing angle at the university*). An interesting finding was that the course participants considered that the course could be used in many other contexts besides the musical and clinical (*Generally applicable*). These themes concerned the perspective of the lessons learned from the courses.

4.4.1. Training algorithms and leadership

14 of the participants stated that they had benefited from the CPR exercise, but the majority showed they forgot the newly learned lessons when challenged on clinical knowledge (one example in Table 5, Video 10). Four participants stated that it was advantageous to train leadership separately from medical competence (Supplementary Table, 'algorithms and leadership').

4.4.2. When to learn

"When to learn" was described by three participants who pointed out that the ideal time to attend this course in relation to the medical education programme would be after proper clinical routine/experience had been acquired (Supplementary Table, 'when to learn').

4.4.3. *Relevance*

‘... without the ability to communicate, six years of study are to some extent almost useless’

[S7], day one

35 of the participants agreed that the course was highly relevant for their clinical practice.

‘Anyone could need it in the daily work’

Nurse 1, day one

Two years after the course, four participants stated that it had changed their professional behaviour (Supplementary Table, ‘relevance’).

‘I personally think the course has been a good foundation, now that I’ve started as a resident.’

[S14], unsolicited comment, 24 months after (by e-mail)

4.4.4. *Missing angle at the university*

11 participants stated that the content of the course had an important objective which was lacking in teaching at the university (Supplementary Table, ‘Missing angle at the university’).

4.4.5. *Generally applicable*

‘I felt a big improvement when attending an oral examination last Monday... I got rid of the worst of my bad habits! So cool!’

[S5] day two

13 participants stated that the subject was relevant to educational contexts, clinics, when collaborating in general, day to day work, doctors’ work, instructing cross-fit, swimming lessons, public speaking and attending oral exams (Supplementary Table, ‘generally applicable’).

‘Think I will benefit from this both professionally and privately...’

[S11], day one

4.5. *Four quantitative questions*

As shown in Figs. 1, 2, 3, and 4, all course participants responded positively to four quantitative questions in the survey. In particular, it can be emphasized that 80·4% stated that they acquired new ideas. Nurses yielded the highest result, 95·7% reported that they acquired a great deal of new knowledge. The nurses responded

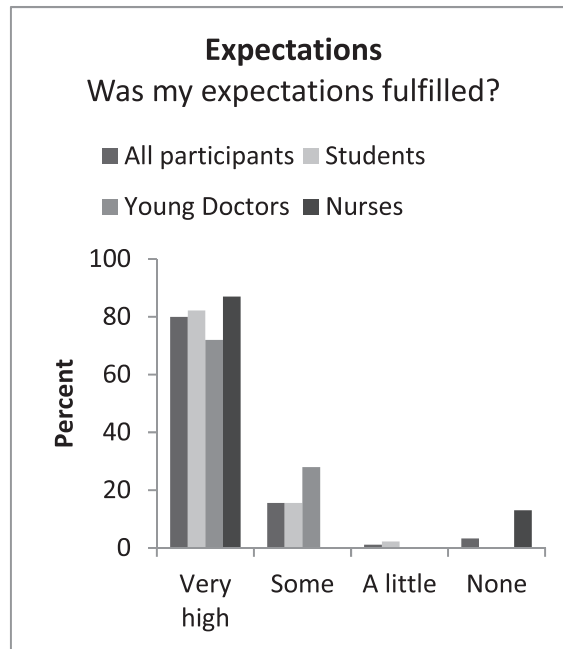


Fig. 1. n = 61 participants. Answers from course days 1 and 2, a total of n = 96 answers.

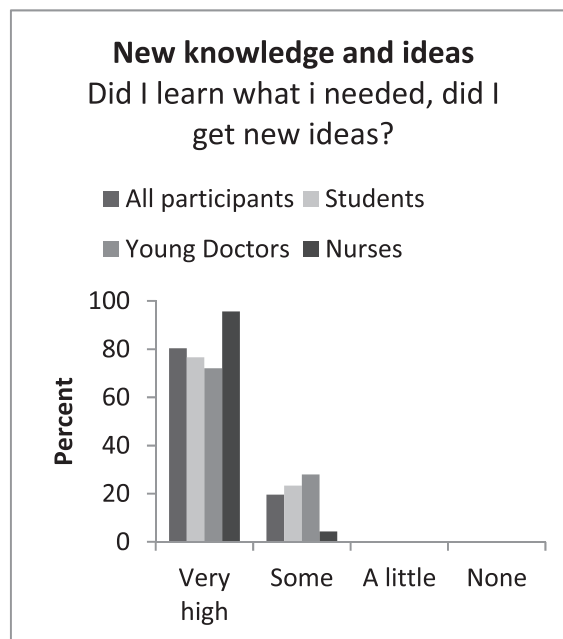


Fig. 2. n = 61 participants. Answers from course days 1 and 2, a total of n = 96 answers.

most positively to the course according to acquiring new knowledge and ideas (Fig. 2). The average age in this group was over 50, approximately 20 years older than the two other groups, which indicates that after years of experience this group was aware of how fatal it could be when the team leader failed.

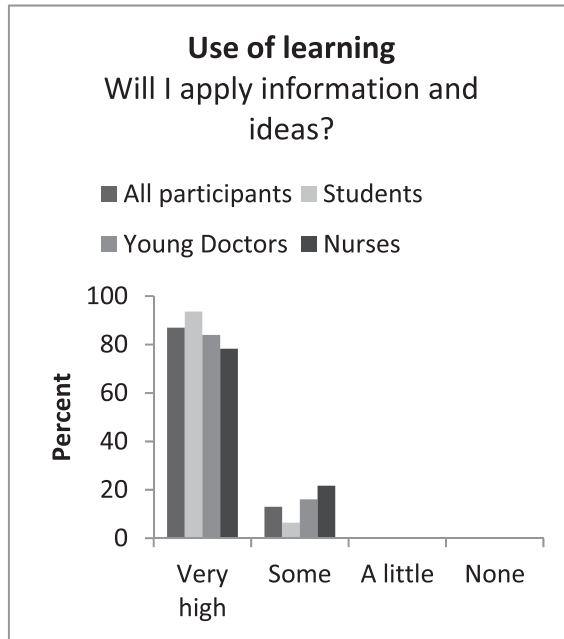


Fig. 3. n = 61 participants. Answers from course days 1 and 2, a total of n = 96 answers.

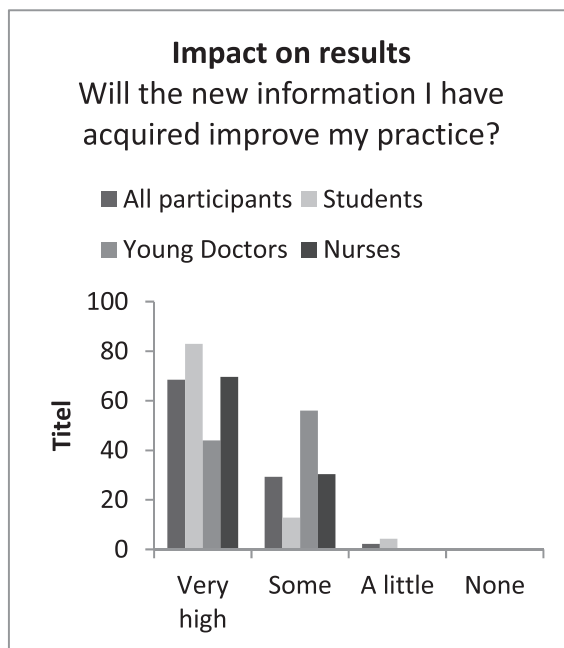


Fig. 4. n = 61 participants. Answers from course days 1 and 2, a total of n = 96 answers.

5. Discussion

5.1. Summary of main findings

The transfer of a conductor's skills improved and profoundly changed the participating students', nurses' and residents' behaviour and introduced a method to handle anxiety and demonstrate calmness and authority.

We believe that this course represents the missing link between what the researchers have done and what the researchers have known and sought for more than three decades. This is confirmed by the group of nurses who have the greatest experience in acute situations. They know after many years of experience what is lacking in dealing with acute situations and this is met in this new approach to training in practicing leadership in emergencies.

The course works in an area that goes beyond language, demonstrating a shared perception in collaboration when creating music together. The philosopher Susan K Langer made this a prerequisite and explained it when she stated: '*the limits of language are not the last limits of experience, and things inaccessible to language may have their own forms of conception*'. [45] This leads to the concept described as 'trance' in this article where time and place dissolve.

When collaboration is optimal when working with an orchestra, a state can occur where time and place are dissolved as described in flow-psychology. "Flow" is defined by the psychologist Csikszentmihályi as: "the creative moment when a person is completely involved in an activity for its own sake. The ego falls away. Time flies. Every action, movement, and thought follows inevitably from the previous one..." (Interview, Wired magazine, *September 2006 issue*, p. 21.) ... "The flow state must be a general pedagogical ideal because it is often extremely good learning, as you are optimally challenged, fully focused and emotionally involved so you tend to remember very much of what you are dealing with" (TL's translation) [46].

An important part of the reflection takes place during dialogues during the course. At the beginning of the first day, the conductor uses words he considers important in relation to teaching. He introduces concepts such as '*assuming leadership*', '*radiate authority*', '*presence at the specific moment*' and showing '*engagement*'. Gradually, reflection and feedback are left to the students who, equipped with these objectives and vocabulary, assess each other's performances. It should be mentioned that there is a delicate balance between course participants actually acquiring this new knowledge and simply repeating the words of the conductor.

Expressing safety or sheer avoidance manoeuvre? (Table 5, video 5) When the participants are dancing, making caricatures, and flirting with the members of team as demonstrated in this video, it is debatable whether they are doing so as an expression of well-being and security or in order to draw attention away from their personal

sense of insecurity in the specific situation. This is a recurring topic for the course: stress and obstacles go hand in hand with safety and happiness.

It is interesting to ascertain that the skills and competences addressed in the course are situated on a meta-level and are a prerequisite for the teaching: the faculty has to be able to assume the leadership role as educators who are able to improvise when teaching. Every participant brings in his own experiences, perceptions and emotions (Table 5, video 11). It is very important for the faculty to be able to demonstrate 'presence at the specific moment' and 'responsiveness' in order to appear credible as teachers and role models.

It is possible to use existing learning theories to define and explain why the course has a huge impact on the participants, but the project has created new learning goals and a methodology of its own.

'I think the course is a great opportunity to work with yourself in a safe but challenging way, and there is a great deal of praise for the instructors to ensuring a good framework'

[S10], video survey, five months after

5.2. Limitations

It is possible to argue that the course was a clinical challenge and setting while a consultant and fellow students were present, and that the participants' professional knowledge was therefore challenged and they were in competition with each other. But as the results in the videos and the text-analysis show, the majority stated that they perceived the learning environment as safe.

Beyond limits of language: words cannot express substantial parts of human perception and experience. However, in order to underline which objectives were addressed during the course, this is demonstrated primarily by words in the form of quotes. The challenge inherent in this article is to document the conductor's highly qualitative approach in introducing non-verbal communication in a clinical research tradition. It should be mentioned that all the videos presented in Table 5 are in fact more *explanatory* when documenting the nuances in the content of the course.

We allow ourselves to *interpret* that we change the participants' behaviour as team leaders, measured by their own experience on their own body as well as by observing the other participants in the situation. However, we think it is necessary to *interpret* because we are discussing things that have no definite definition. There is no fixed definition of the quality of leadership and it is not possible to assess 'charisma' or assess the quality of non-verbal communication and leadership, only qualitative and interpretative approaches exist.

5.3. Perspectives

If this course in leadership is to be introduced as a compulsory part of the educating of doctors, consideration should be given to when it is to be implemented. Our results indicate the ideal time would be after clinical skills have been acquired, experience gained and routines understood in the clinic.

5.4. Conclusion

The aim of this project was to transfer the competencies from an orchestral conductor to residents in healthcare in emergencies. The focus was on appearance, authority and non-verbal communication. The transfer of a conductor's skills improved and profoundly changed the participating students', nurses' and residents' behaviour and introduced a method to handle anxiety and show calmness and authority. This course seems to accommodate the need for an operational and targeted training of the team leader in emergencies, addressing a way to achieve confidence in a stressful, but safe learning environment. In addition the outcome turned out to be a profound transformation of participants' self-understanding.

Declarations

Author contribution statement

Ture Larsen, Randi Beier-Holgersen: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Peter Dieckmann, Doris Østergaard: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Funding statement

This work was supported by a grant from Tryg Foundation, The Research Council and the HR Department at Nordsjællands Hospital, and the Laerdal Foundation.

Competing interest statement

The authors declare no conflict of interest.

Additional information

Supplementary content related to this article has been published online at <https://doi.org/10.1016/j.heliyon.2018.e00791>.

References

- [1] T. Larsen, R. Beier-Holgersen, J. Meelby, P. Dieckmann, D. Østergaard, A Search for Training of Practicing Leadership in Emergency Medicine: a Systematic Review, 2018. Under review.
- [2] K.M. Itani, K. Liscum, F.C. Brunnicardi, Physician leadership is a new mandate in surgical training, *Am. J. Surg.* 187 (3) (2004) 328–331.
- [3] E. Gilfoyle, R. Gottesman, S. Razack, Development of a leadership skills workshop in paediatric advanced resuscitation, *Med. Teach.* 29 (9) (2007) e276–e283.
- [4] C.W. Hayes, A. Rhee, M.E. Detsky, V.R. Leblanc, R.S. Wax, Residents feel unprepared and unsupervised as leaders of cardiac arrest teams in teaching hospitals: a survey of internal medicine residents, *Crit. Care Med.* 35 (7) (2007) 1668–1672.
- [5] M. Hjortdahl, A.H. Ringen, A.C. Naess, T. Wisborg, Leadership is the essential non-technical skill in the trauma team—results of a qualitative study, *Scand. J. Trauma Resusc. Emerg. Med.* 17 (2009) 48.
- [6] S. Hunziker, C. Buhlmann, F. Tschan, et al., Brief leadership instructions improve cardiopulmonary resuscitation in a high-fidelity simulation: a randomized controlled trial, *Crit. Care Med.* 38 (4) (2010) 1086–1091.
- [7] C. Kolehmainen, M. Brennan, A. Filut, C. Isaac, M. Carnes, Afraid of being “witchy with a ‘b’”: a qualitative study of how gender influences residents’ experiences leading cardiopulmonary resuscitation, *Acad. Med.* 89 (9) (2014) 1276–1281.
- [8] G.A. Nicksa, C. Anderson, R. Fidler, L. Stewart, Innovative approach using interprofessional simulation to educate surgical residents in technical and nontechnical skills in high-risk clinical scenarios, *JAMA Surg.* 150 (3) (2015) 201–207.
- [9] P.S. Robinson, E. Shall, R. Rakhit, Cardiac arrest leadership: in need of resuscitation? *Postgrad. Med. J.* 92 (1094) (2016 Dec) 715–720. Epub 2016 Jun 8.
- [10] N.F. Leenstra, O.C. Jung, A. Johnson, K.W. Wendt, J.E. Tulleken, Taxonomy of trauma leadership skills: a framework for leadership training and assessment, *Acad. Med.* 91 (2) (2016) 272–281.
- [11] E. Fernandez Castelao, M. Boos, C. Ringer, C. Eich, S.G. Russo, Effect of CRM team leader training on team performance and leadership behavior in simulated cardiac arrest scenarios: a prospective, randomized, controlled study, *BMC Med. Educ.* 15 (2015) 116.

- [12] A. Briggs, A.S. Raja, M.F. Joyce, S.J. Yule, W. Jiang, S.R. Lipsitz, J.M. Havens, The role of nontechnical skills in simulated trauma resuscitation, *J. Surg. Educ.* 72 (4) (2015) 732–739.
- [13] S. Hunziker, F. Tschan, N.K. Semmer, S. Marsch, Importance of leadership in cardiac arrest situations: from simulation to real life and back, *Swiss Med. Wkly.* 143 (2013) w13774.
- [14] M. Jacobsson, M. Hargestam, M. Hultin, C. Brulin, Flexible knowledge repertoires: communication by leaders in trauma teams, *Scand. J. Trauma Resusc. Emerg. Med.* 20 (2012) 44.
- [15] A.H. Ringen, M. Hjortdahl, T. Wisborg, Norwegian trauma team leaders—training and experience: a national point prevalence study, *Scand. J. Trauma Resusc. Emerg. Med.* 19 (2011) 54.
- [16] S. Hunziker, F. Tschan, N.K. Semmer, M.D. Howell, S. Marsch, Human factors in resuscitation: lessons learned from simulator studies, *J. Emerg. Trauma Shock* 3 (4) (2010) 389–394.
- [17] S. Hunziker, A.C. Johansson, F. Tschan, N.K. Semmer, L. Rock, M.D. Howell, S. Marsch, Teamwork and leadership in cardiopulmonary resuscitation, *J. Am. Coll. Cardiol.* 57 (24) (2011) 2381–2388.
- [18] S.C. Marsch, C. Muller, K. Marquardt, G. Conrad, F. Tschan, P.R. Hunziker, Human factors affect the quality of cardiopulmonary resuscitation in simulated cardiac arrests, *Resuscitation* 60 (1) (2004) 51–56.
- [19] T. Wisborg, T.H. Ronning, V.B. Beck, G. Brattebo, Preparing teams for low-frequency emergencies in Norwegian hospitals, *Acta Anaesthesiol. Scand.* 47 (10) (2003) 1248–1250.
- [20] S. Cooper, A. Wakelam, Leadership of resuscitation teams: ‘lighthouse leadership’, *Resuscitation* 42 (1) (1999) 27–45.
- [21] K.V. Iserson, Critical leadership, *J. Emerg. Med.* 4 (4) (1986) 335–340.
- [22] S. Yule, R. Flin, S. Paterson-Brown, N. Maran, Non-technical skills for surgeons in the operating room: a review of the literature, *Surgery* 139 (2) (2006) 140–149.
- [23] K.J. Sommer, Pilot training: what can surgeons learn from it? *Arab. J. Urol.* 12 (1) (2014) 32–35.
- [24] S. Yule, S.H. Parker, J. Wilkinson, A. McKinley, J. MacDonald, A. Neill, T. McAdam, Coaching non-technical skills improves surgical residents’

- performance in a simulated operating room, *J. Surg. Educ.* 72 (6) (2015) 1124–1130.
- [25] A. Mantha, N.L. Coggins, A. Mahadevan, R.N. Strehlow, M.C. Strehlow, S.V. Mahadevan, Adaptive leadership curriculum for Indian paramedic trainees, *Int. J. Emerg. Med.* 9 (1) (2016) 9.. Epub 2016 Feb 20.
- [26] M. Hargestam, M. Hultin, C. Brulin, M. Jacobsson, Trauma team leaders' non-verbal communication: video registration during trauma team training, *Scand. J. Trauma Resusc. Emerg. Med.* 24 (2016) 37.
- [27] J.D. McCue, G. Magrinat, C.J. Hansen, R.S. Bailey, Residents' leadership styles and effectiveness as perceived by nurses, *J. Med. Educ.* 61 (1) (Jan 1986) 53–58.
- [28] S. Cooper, Developing leaders for advanced life support: evaluation of a training programme, *Resuscitation* 49 (1) (2001) 33–38.
- [29] G. Fond, D. Ducasse, J. Attal, A. Larue, A. Macgregor, M. Brittner, D. Capdevielle, Charisma and leadership: new challenges for psychiatry, *Encephale* 39 (6) (2013) 445–451.
- [30] J.K. Stoller, C.A. Taylor, C.F. Farver, Emotional intelligence competencies provide a developmental curriculum for medical training, *Med. Teach.* 35 (3) (2013) 243–247.
- [31] T. Larsen, R. Beier-Holgersen, D. Østergaard, P. Dieckmann, Training Residents to Lead Emergency Teams. Barriers, Challenges and Learning Goals: a Qualitative Review, 2018. Under review.
- [32] H. Sadideen, S.M. Weldon, M. Saadeddin, M. Loon, R. Kneebone, A video analysis of intra- and interprofessional leadership behaviors within “the burns suite”: identifying key leadership models, *J. Surg. Educ.* 73 (1) (2016) 31–39.
- [33] R. Flin, S. Yule, S. Paterson-Brown, N. Maran, D. Rowley, G. Youngson, Teaching surgeons about non-technical skills, *Surgeon* 5 (2) (2007) 86–89.
- [34] S. Yule, R. Flin, S. Paterson-Brown, N. Maran, D. Rowley, Development of a rating system for surgeons' non-technical skills, *Med. Educ.* 40 (11) (2006) 1098–1104.
- [35] A. Willems, B. Waxman, A.K. Bacon, J. Smith, S. Kitto, Interprofessional non-technical skills for surgeons in disaster response: a literature review, *J. Interprof. Care* 27 (5) (2013) 380–386.
- [36] N. Koivunen, G. Wennes, Show us the sound! Aesthetic leadership of symphony orchestra conductors, *Leadership* 7 (1) (2011) 51–71.

- [37] F. Barrett, *Yes to the Mess: Surprising Leadership Lessons from Jazz*, Harvard Business Press, Boston, MA, 2012.
- [38] Amy Edmondson, Psychological safety and learning behavior in work teams, *Adm. Sci. Q.* 44 (1999) 350–383.
- [39] J.W. Rudolph, D.B. Raemer, R. Simon, Establishing a safe container for learning in simulation: the role of the presimulation briefing, *Simul. Healthc.* 9 (6) (2014) 339–349.
- [40] R.A. Wilson, L. Foglia, Embodied cognition, in: Edward N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy*, Metaphysics Research Lab, Stanford University, 2017. Spring 2017.
- [41] Holton, D.L. Constructivism + embodied cognition = enactivism: theoretical and practical implications for conceptual change. In: AERA 2010 Conference.
- [42] L.C. Jones, You learn it in your heart: transformative learning theory and clinical pastoral education, *J. Pastor. Care Counsel.* 64 (4) (2010) 7.1–10.
- [43] J. Mezirow, Transformation theory of adult learning, in: M.R. Welton (Ed.), *Defense of the Lifeworld. Critical Perspectives on Adult Learning*, State University of New York Press, 1995, pp. 39–50.
- [44] R. Burch, Charles Sanders Peirce, Wed Nov 12, 2014. Available at: <https://plato.stanford.edu/entries/peirce/>.
- [45] S.K. Langer, *Philosophy in a New Key, a Study in the Symbolism of Reason, Rite, and Art*, Cambridge, Mass, 1942.
- [46] H.H. Knopp, Om kunsten at finde flow i en verden, der ofte forhindrer det, *Kognition Pædagogik - tidsskrift tænkning læring* 14 (52) (2004) 66–82.