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Medical emergency teams negotiating meaning in real-life decisions: a discourse analytical approach

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ABSTRACT

Objectives: Explore how interdisciplinary emergency teams use three specific modes of talk (discourse types) in decision-making processes.

Design: Exploratory study

Setting: Interdisciplinary emergency teams admitting patients with critical illness in a university hospital emergency department.

Participants: The results were based on 10 live ad-hoc emergency teams. All teams consisted of at least two internal medicine physicians, two ED nurses, one anaesthetist, and one nurse anaesthetist. The number of healthcare professionals involved in each emergency team varied between 11-20, and some individuals were involved with more than one team.

Results: The three discourse types played significant roles in team decision-making processes when negotiating meaning. Online commentaries (ONC) and metacommentaries (MC) created progression while offline commentaries (OFC) temporarily placed decisions on hold. Both ONC and MC triggered action and distributed tasks, resources, and responsibility in the team. OFC sought mutual understanding and created a broader base for decisions.

Conclusion: A discourse analytical perspective on team-talk in medical emergencies illuminates both the dynamics and complexity of teamwork. Here we draw attention to the way specific modes of talk function in negotiating mutual understanding and distributing tasks and responsibilities in non-algorithm driven activities. The analysis uncovers a need for an enhanced focus on how language can trigger safe team practice and integrate this knowledge in teamwork training to improve communication skills in ad-hoc emergency teams.

Article summary

Strengths and limitations of this study

- Videotaping of emergency teams during real-life admissions of patients with critical illness ensured authentic samples for analysis.
- The activity-type analysis provided new insight in how team-talk influences teamwork in non-algorithm driven medical emergencies.
- Culture and body language, significant issues in talk-work relationship, were not addressed in this study.

INTRODUCTION

Communication error is a common cause of adverse events in healthcare [1-6]. There has been a growing scientific focus on cognitive and social skills, "Non-Technical Skills" (NTS), for health professionals in an effort to improve patient safety.[7-9] NTS are crucial for avoiding errors, especially in emergency teamwork.[10-14] Crew Resource Management principles (CRM) have been adapted to medical NTS training from aviation in order to improve teamwork in emergency care,[15-17] and communication-skills are integrated in CRM-guided team frameworks in several medical specialties.[18-20] Studies show that team training improves team processes,[21-24] and evidence connecting team training to improved patient outcomes is accumulating.[25 26] Standardized communication strategies such as Closed Loop Communication (CLC) are recommended in critical care.[27-29] Recent studies indicate, however, that the use of CLC is limited despite recommendations and extensive training, especially in non-algorithm driven activities implying high cognitive load (identification of cues, interpretations, integration of existing knowledge and decisions).[13 30-33] Studies of naturally occurring team talk have increased our understanding of the talk-work relationship.

Lingard and colleagues found communication patterns benefitting safety in interdisciplinary team discussions during pre-surgical checklist-driven team briefings,[34] and Kolbe and colleagues found that high performing anaesthesia teams used monitoring and talking to the room during general anaesthesia induction.[35] Previous reports have also uncovered specific modes of talk constructing and supporting coordination in emergency team activity during standardized-scenario in-situ simulation training.[36 37]

Interdisciplinary ad-hoc teams composed to meet specific patient needs in critical and complex medical situations attend most in-hospital medical emergencies. Communication is crucial in such teams to converge joint expertise in support of team decisions, defined as "a team process that involves gathering, processing, integrating, and communicating information in support of arriving at a task-relevant decision."[38-41] Here we investigate how three discourse types defined as "online commentary" (ONC), "meta-commentary" (MC), and "offline commentary" (OFC) influence team decision-making processes in real-life interdisciplinary medical emergency teams while admitting non-trauma patients with critical illness to the hospital. ONC was defined by Heritage and Stivers (1999) as descriptions or evaluations of real-time observations,[42] Bateson (1972) described MC as implicit messages framing the activity type orienting to next action or a plan,[43] and OFC is defined by Sarangi (2010) as clarifications and explanations implying a pedagogic role. [44] Examples of these discourse types are summarized in Table 1.

Table 1

Discourse types

Discourse type	Definition	Example

Online commentary (ONC)	Description or evaluation of real-time observations [42]	"His oxygen-saturation isn't getting any better"
Metacommentary (MC)	Implicit message framing the activity type, orienting to next action or a plan [43]	"I think we should intubate"
Offline commentary (OFC)	Clarification and explanation, building evidence [44]	"A CT-scan can tell us if there are significant signs of brain anoxia"

METHODS

Data were collected in the emergency department (ED) of a Norwegian university hospital from May 2015 to March 2016. This study was approved by the Regional Committees for Medical and Health Research Ethics, the Data Protection Official for Research at the hospital, and by the managing authorities at the hospital and in the ED. Information was provided to all health professionals with potential for involvement in the study, and written informed consent from the participating healthcare professionals was collected at the scene or ahead of time.

Patient and Public involvement statement: Patients were not objects of this study and thus not involved in the planning of this research. However, both patients and relatives gave their informed consent to participate. The next of kin gave consent on behalf of four of the patients who were unable to do so because of their medical condition, in accordance with the ethical approvals. No participants or patients chose to withdraw from the study.

Context: According to hospital procedure, the emergency team is activated when non-trauma patients are admitted to the hospital with imminent problems with airways, breathing, and/ or circulation. All teams consisted of at least two internal medicine physicians, two ED nurses, one anaesthetist, and one nurse anaesthetist.

Data collection: The first author attended the ED with a mobile video camera and two microphones. A research assistant placed one of the microphones in the emergency room and provided information and written consent forms to participants. 10 teams admitting patients with critical illness were recorded and observed to capture the interconnections between team talk and actions. Patient ages ranged from 19-88 with a median of 73, and five were women. The number of healthcare professionals involved in each emergency team varied between 11-20 people, and some individuals were involved with more than one team. The 10 videos covered 144 health professional roles, including 65 physicians from various specialities (cardiology, pulmonary, internal medicine, neurology, ED, radiology, thoracic surgery, anaesthesiology, prehospital emergency), 46 nurses (ED, anaesthesiology, and intensive care), 7 radiographers, 4 medical students and 22 paramedics.

Analysis: The four authors have comprehensive experience in critical care and applied linguistics. We followed a standard procedure previously described.[36 37] Briefly, all 10 videotapes were first viewed repeatedly before making detailed depersonalised transcriptions marking parallel talk, pauses, and non-verbal activities. All authors reviewed the transcripts, and the first and the second author performed the analyses together. The analytical method is inspired by Levinson's socio-pragmatic theory of the role and function of speech in different social activity-types.[45] Activity type analysis is a version of discourse analysis used to perform sequential studies of the interconnections between naturally occurring language and professional practices, revealing the structural and interactional organization of the speech,[46-48] and builds on a perspective in which language is understood as principal for negotiating meaning.[49 50] First, we mapped the data across all teams into general recursive key activity phases defined as an overarching structure with associated sub-phases. Then SG and GTH individually performed a sequential approach to identify phases of both medical and linguistic relevance to the decision-making processes. Concurrency was shown by both authors in

identifying the same phases in the extensive data corpus, and all authors reached a consensus of interpretations through discussions. [51] A professional translator translated the transcripts from Norwegian to English for publication.

RESULTS

Structural mapping of all 10 videos illuminated four overarching activity phases with associated sub-phases. Phase 1 is characterized as *opening activity*: greeting both patient and colleagues, information hand-over, and patient movement from the stretcher to a hospital bed. Phase 2 is characterized as *initial activity*: monitoring the patient and performing primary ABC. Phase 3 is *core activity*: planning and accomplishing diagnostic examinations and treatment. Finally, phase 4 is *closing activity*: conclusions/tentative diagnosis, and patient preparation and movement from the emergency department for further examination and treatment.

We found that both ONC and MC generate progression in the decision-making process and tend to trigger action and distribute tasks and responsibility. ONC indicated critical situations and generated attention. MC was oriented towards both acknowledgment and doubt of expertise. OFC had a pedagogic function, expressing the speaker's expertise while seeking mutual understanding and creating a broader base for decisions. OFC also challenged the grounds for making decisions by demanding further evidence, putting the decision-making process temporarily on hold. Consecutive MC signalled urgency in coordinating team actions when there was limited time to obtain further evidence, and ONC conflating into MC seemed to accelerate the decision-making process (Figure 1).

We have selected four excerpts to illustrate the data and support the findings. The excerpts are taken from phase 3 and come from four different teams. Full transcripts can be found in

appendices 1-4, and utterances specified in the results section are referred to with numbers taken from the relevant appendix. XX: words not audible, (()): author's supplement.

Excerpt A (Appendix 1)

This extensive excerpt is divided in two for presentation of the results.

Part 1, before the anaesthetist's involvement in the CT decision.

Situation: Patient is < 40 years old. Indication for hospital admission: cardiac arrest. Cardiopulmonary resuscitation (CPR) was performed and return of spontaneous circulation (ROSC) occurred prior to hospital transport. The patient was unconscious and breathing inadequately at ED arrival. Team-members are separated in two "working-groups" during this phase of work; ED nurse 1, nurse anaesthetist, ED physician 1, and the anaesthetist are all involved in patient related practical tasks (ECG, suctioning, establishing an arterial line and sedation), while ED physician 1, physicians 1, 2, and 3 from internal medicine, and ED nurse 2 are standing next to the logging-desk. Physician 3 is standing in a small distance from the latter group answering his telephone.

The excerpt begins with physician 3 answering the caller with MC: "Yes. He is going to have a head CT-scan down here now." He then addresses the group of physicians at the foot of the bed, "Is he?" distributing responsibility to physician 2 by sight (276). The response uncovers diversities among the physicians: ED physician 1 agrees (277) while physician 2 disagrees (278). Physician 3's MC trigger action and the physicians start negotiating a mutual understanding. ED physician 1 and physician 2 contribute verbally, while physician 1 and physician 3 both contribute by bodily conduct (288, 294). ED physician 1's question "Are we 100 % sure that it is the heart?" (284) challenges physician 2's view by seeking more

evidence. In his next utterance, "It isn't hypoxia" (OFC 287), he provides an explanation framing his expertise and putting the decision temporarily on hold, seeking ONC. Physician 2 responds "Yes, but you have this and this," while pointing twice at something placed on the logging desk (ONC 288). ED physician 1 responds with an OFC, "But we would like to have a XX," using "we" as a strengthening factor (289) and again challenging the grounds of the decision and seeking more evidence. Physician 2 later distributes tasks and responsibilities to the other team-members framed as MC: "You can investigate but I XX up to the ICU myself" (294).

Part 2, after the anaesthetist's involvement in the CT-decision.

Negotiations of how to understand the available evidence continues with ED physician 1 seeking clarification about the necessity of cerebral CT prior to introducing hypothermia (OFC 298). The three physicians at the foot of the bed and the anaesthetist agree that CT is not necessary (299-301). The anaesthetist suspends his attempt to insert an arterial line and walks over to the other physicians, expressing his expertise with OFC: "It's more out of- If there's doubts about the diagnosis X." Physician 2 uses MC to continue to argue for direct transfer to the ICU: "Sedated. Get him up to the ICU," seeking to create progress (305). The anaesthetist responds with OFC: "But there is no rush to get him up to the ICU either," putting the decision temporarily on hold (310). Physician 2 challenges the decision-making basis by adding evidence for direct transfer to the ICU: "We're going to get him into hypothermia after all just get him up to the ICU," then continuing with an MC: "If you want to get him to CT then-" seeking progress and distributing tasks and responsibility (314). The nurse anaesthetist observes blood in the patient's mouth and tracheal-tube and calls for action in parallel with the CT-discussion: "It is bleeding in the mouth here." (ONC 304). The ONC

triggers redistribution of team resources when recognized, and the anaesthetist walks up to the nurse anaesthetist and works on the bleeding problem. Physician 3 summarizes the grounds for CT-scanning by "thinking out loud" (OFC 323). This OFC puts the decision temporarily on hold and initiates physician 1 to ask about arterial blood gas (MC 324). The excerpt ends with consecutive MC, starting with physician 2: "But (micropause) XX make a decision. If we are going to get him to CT then we get him to CT. Not XX." (343), building up to a mutual understanding.

Excerpt B (Appendix 2)

Situation: Patient is > 80 years old, living at home. Indication for hospital admission: inguinal pain and syncope. The patient was nodding adequately when spoken to (yes/no) and had possible face-drooping at ED admission. An oropharyngeal airway is established, and iv-fluid is ongoing. During this phase of work, the nurse anaesthetist is standing at the head of the bed providing the patient with oxygen, the anaesthetist is palpating the patient's inguinal pulse, physician 1 and ED nurse 1 are standing beside the bed, and ED nurse 2 is standing by the logging-desk while physician 2 is outside the room checking CT-lab availability. Physician 1, an intern at the hospital, activated the emergency team, and Physician 2 is a senior physician. The excerpt begins when the patient's medical condition is progressing to a life-threatening phase. Breathing is deteriorating, the inguinal pulse is weak, and it is difficult to measure blood pressure. The anaesthetist seeks attention to the patient's deteriorating medical condition with ONC (288): "we are in the process of ((collapsing))." This ONC draws attention and triggers action, physician 1 agrees (291) and the nurse anaesthetist encourages the patient to take a deep breath while ED nurse 2 places herself in a "stand-by" position at the foot of the bed. The anaesthetist triggers action and distributes tasks and

responsibility with MC (293): "I haven't fetched the defibrillator." ED nurse 1 announces that she will fetch the defibrillator and the automatic chest compression machine (MC 294), and the nurse anaesthetist asks for a bag-valve-mask (MC 295). Both utterances indicate a mutual understanding of the situation and acknowledge the anaesthetist's expertise. While the nurse anaesthetist and ED nurse 2 are about to connect the bag-valve-mask, the anaesthetist seeks attention to her observation of a weak carotid pulse (ONC) and then offers an MC related to the next step of action: "I'm about to lose the radial, no carotid pulse. I'll just X. Start X." (298). Physicians 1 and 2 are standing outside the room and the anaesthetist goes to the doorway and calls out the same message twice (300, 302). ONC conflating to an MC triggers action in the team and distributes tasks and responsibility, resulting in the decision expressed by Physician 2: "He's living at home and active and must start CPR (3 seconds pause) and intubate him." This results in confirmation from Physician 1 and the anaesthetist, and the nurse anaesthetist engages in the intubation while ED nurse 1 connects the defibrillator.

Excerpt C (Appendix 3)

Situation: Patient is > 70 years old, living at home. Indication for hospital admission: syncope. The patient was awake and adequate with no pain at arrival. The anaesthetist is performing an ultrasound and preparing to place a central venous line in the patient's neck area. ED nurse 1 is preparing to insert a urine catheter, and the ED physician is standing beside the bed. The nurse anaesthetist is securing the patient's arterial cannula, and physicians 1 and 2 are standing beside ED nurse 2 at the logging desk. The bed is not functioning properly and cannot be tilted head down for the central venous line procedure, and a chest X-ray has just been taken. The excerpt begins with the anaesthetist's ONC: "Her venous volume is good" seeking attention to her observation of high venous volume on the ultrasound screen

(311). This utterance distributes responsibility and triggers action as ED physician leans over to see the anaesthetist's ultrasound screen. ED physician responds by offering an OFC framed as a question negotiating mutual understanding: "Is it cardiogenic shock?" (312). The anaesthetist replies with an OFC in a pedagogical frame, building evidence: "If you look at the vein here. Can you see it?" (313). ED physician follows with an ONC: "Yes, I see. It's enormous," implying an understanding of a critical situation (314). The anaesthetist agrees and they both put the decision temporarily on hold with further OFC, building evidence for what to do next (316, 317). The radiographer announces that the chest X-ray is ready for examination and the anaesthetist seeks attention from the ED physician while looking at the x-ray screen: "Come and look at the X-ray here. The mediastinum is widened." (ONC 326). The ONC triggered action and redistributed tasks and responsibility, manifested by ED physician stopping his preparations for vena cava scanning and moving to the X-ray screen, followed by physicians 1 and 2. After explaining her evaluation of the X-ray (OFC 330 and 332), the anaesthetist directs attention to the patient's decreasing blood pressure and presents an ONC conflating to a MC: "Now her blood pressure is falling. Do we have some pressor-?" (335) indicating a critical situation. This utterance triggers action and distributes tasks and responsibility to the nurse anaesthetist, who shifts focus from communicating with the radiographer to informing the anaesthetist about available medication (OFC 339). While the anaesthetist and the nurse anaesthetist are handling the patient's low blood pressure, ED physician, physician 1, and physician 2 are deciding about the chest X-ray. Framed as an ONC supported by an OFC, ED physician announces their mutual understanding to the team: "Chest X-ray shows widened mediastinum. So, we must suspect there's an aortic dissection causing her low blood pressure" (343). This puts the decision temporarily on hold while many parallel activities are following. ED physician interviews the patient before continuing the vena cava examination, and the anaesthetist continues preparing for a central venous line

while discussing noradrenaline administration and communicating about the vena cava examination. At the same time, ED nurse 1 proceeds with inserting a urine catheter. Framed as an ONC conflating into an OFC, the ED physician evaluates the ultrasound-image: "The vena cava inferior is hardly moving. So it is obstructive or cardiogenic shock." (394). This utterance triggers action by the anaesthetist, asking "But is it-. Should a pericardiocentesis be done, or is it-?" (MC 395), acknowledging the present team's expertise in decision-making. The lack of response results in her rephrasing the question: "Has a thoracic surgeon been called? Or a thoracic anaesthetist- to come and assess- (3 seconds pause) In terms of status." (MC 402), challenging the present expertise including her own, and distributes the responsibility of seeking necessary expertise to the others. ED physician interprets the anaesthetist's MC as a decision and confirms.

Excerpt D (Appendix 4)

Situation: Patient is > 70 years old, living at home. Indication for hospital admission: cardiac arrest. CPR and ROSC prior to hospital transport. The patient was unconscious but breathing spontaneously at ED arrival and the airway was secured with a supraglottic airway device. During this phase of work, physician 1 is standing beside ED nurse 2 at the logging-desk and two physicians from the thoracic surgical department are called and stand a small distance from the bed. Two radiographers are standing in the back of the room. The anaesthetist is standing near the patient's head and the nurse anaesthetist, nurse anaesthetist student, and ED nurse 1 stand close to the anaesthetist. The excerpt begins with the anaesthetist's question to the radiographers: "X Haven't you taken the chest X-ray yet?" (MC 186), distributing responsibility for progress to the radiographers. The anaesthetist's next MC is framed as a question and directed to physician 1, reflecting his understanding of the situation while

specifying his opinion of necessary task priority: “Shall we take it now before we intubate him?” (192) Physician 1 decides “Yes, we’ll do that. We’ll take a chest X-ray.” (MC 193), resulting in the radiographer preparing to take a chest X-ray while the anaesthetist prepares for intubation. The anaesthetist removes the supraglottic airway device and asks about the patient’s name when the X-ray is about to be taken. He then distributes the task to ED nurse 1 with an MC: “Can you find a suction device for me?” (216). ED nurse 1 confirms and goes to fetch the necessary equipment. The anaesthetist tries to get contact with the patient after the x-ray and then addresses physician 1 with an ONC conflating into a MC: “No contact NAME ((Physician1)) I think we’ll intubate.” (223). This utterance triggers action and distributes tasks and responsibility, physician 1 turns towards the anaesthetist while nodding, the nurse anaesthetist asks for confirmation and begins to prepare for the intubation, and ED nurse 1 provides an ONC on the patient’s low oxygen saturation repeated by ED nurse 2, who is logging the events. The anaesthetist presents consecutive MCs: “Must have suction now!” (228), “I need it now! (8) Can you watch out for his arm.” (230), “Suction in the mouth.” (234), “Suxamethonium and fentanyl.” (237), and “XX turn up-” (243) triggering action, distributing tasks and responsibility, and indicating a critical situation.

Figure 1.

DISCUSSION

We observed and videotaped 10 real-life medical emergency teams admitting critically ill patients to the hospital to expand knowledge on the talk-work relationship in emergencies. We used activity type analysis to identify patterns related to the occasioning and functioning of ONC, MC, and OFC, and their influence on team decision-making processes.

A discourse analytical perspective on team-talk in medical emergencies uncovered the dynamics and complexity of interdisciplinary teamwork, and included simultaneous talk, parallel activities, distribution of tasks and responsibility, and negotiation of meaning. Securing mutual understanding and coordinating activities are both dependent on effective communication skills and are highlighted in emergencies to avoid errors.[23] Sharing mutual understanding is crucial for patient safety and gives team members the ability to predict developments in a situation and support team decisions.[27 41] A structure of adjustments in team decision-making processes is an important coordination mechanism that can facilitate progression toward team goals.[27] This study illuminates the ways in which team members negotiate meaning to utilize collective expertise, creating common grounds for making good decisions. Every utterance is anchored in an understanding of the situation. Negotiating meaning means to acknowledge and challenge understanding within the team.[50] Our analysis clarified the role of OFC to communicate expertise in which the speaker takes on a pedagogic role to seek mutual understanding within the team of experts and create a common basis for decisions. OFC also challenges the existing grounds for making decisions by demanding more evidence, putting decisions temporarily on hold to build mutual understanding and extend the basis for decisions. This mirrors a dilemma found in safe teamworking in non-algorithm driven activities, specifically sacrificing time to create common grounds for good decision-making. This study demonstrates how ONC and MC generate attention and indicate critical situations. Both bring progress to the decision-making processes and distribute responsibilities and tasks. Our analysis show examples of the ways in which team-members maneuver safely, creating mutual understanding and accelerating the decision-making process by using ONC conflating into MC. MC implies activity type-specific messages with implicit meaning, already negotiated within the community of practice and thus assumed to be understood within the specific context. “I think we have to intubate” is a good example of

this, as the nurse anaesthetist shows his correct interpretation by immediately providing medication and equipment for oral intubation. MC has similarities to what the anthropologist John J. Gumperz (1982) refers to as "contextualization cues," statements signalling contextual presumptions of what will happen next.[52] When discussion time is limited, using MC may appear to be timesaving. However, building a mutual communicative practice and negotiating interpretations of implicit meaning may be difficult in interdisciplinary ad-hoc emergency teams, and using MC could lead to misunderstandings or time-consuming explanations.

This study illuminates the dynamics, complexity, and "potential risks" connected to naturally occurring team communication in non-algorithm driven medical activities. The analysis uncovers the ways that modes of talk function to negotiate meaning in team decision-making processes and to distribute tasks and responsibilities within the team. We must increase our scientific focus on the ways that modes of talk trigger safe team practice and integrate this into team training to improve communication skills in ad-hoc emergency teams.

Strengths and limitations

Videotaping live hospital admissions in the emergency department was challenging due to low accessibility, the risk of disturbing ongoing life-saving activities, and the implications of observing patients in vulnerable situations. Data collection was planned comprehensively and the study was carefully discussed with ethical authorities. Much research on emergency teamwork has been performed in standardized simulation scenarios. The most advanced simulators enable highly realistic emergency scenarios, but cannot replace all the complexity present in real life. Collecting real-life data is thus a strength, ensuring adequate samples for analysis. Analysing the talk-work relationship in emergency settings also demands cultural insight into the communicative activity type. Norwegian culture is characterized by

informality and decentralized power, including a dislike of control.[53] Although both culture and body language are undeniably significant issues most likely influencing the talk-work relationship,[54 55] they were not addressed in this study.

Contributorship statement

SG and PAa made substantial contributions to the study conception and design. SG and GTH operationalised the research design according to principles in discourse analysis. All four authors were involved in data analysis and interpretation. All four authors helped draft the manuscript, revised it critically for important intellectual content and approved the final version.

Ethics approval and consent to participate

The study was approved by the Regional Committees for Medical and Health Ethics (REC) and the Data Protection Official for Research at St. Olavs hospital, University Hospital in Trondheim, Norway. All participants received information before providing written consent to participate and none chose to withdraw from the study.

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The authors declare that they have no competing interests.

Data sharing statement

The data supporting our findings are included in Appendix 1-4.

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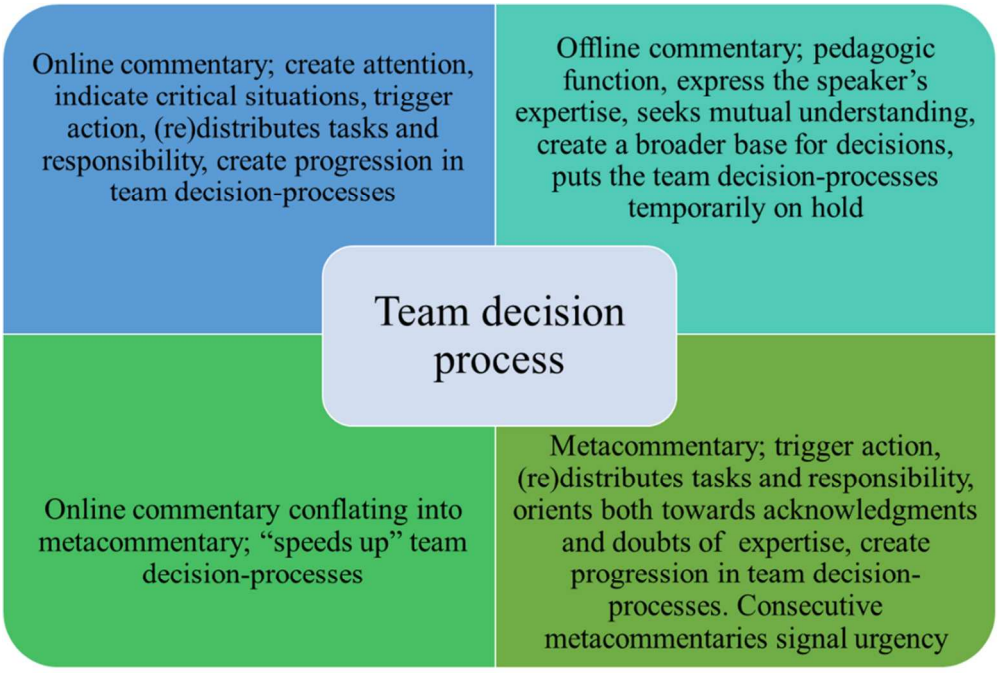
Figure legends

Figure 1. The influence of online commentary, metacommentary and offline commentary on team decision-making processes



The influence of online commentary, metacommentary and offline commentary on team decision-making processes

96x64mm (300 x 300 DPI)

Appendix 1, Excerpt A

Abbreviations: Phys1-3: Physicians from internal medicine department, EDphys-1-2: Physicians working in the emergency department, EDnurse1-3: Nurses working in the emergency department, AN: Anaesthetist, NurseAN: Nurse anaesthetist.

Transcript key: X: word not audible, XX: words not audible, [words][2]: overlapping speech (the numbers indicate the order of the nearby overlap), –: unfinished words or sentences, (.): micropause, (3): seconds pause, @: laughter.

Situation: Patient is < 40 years old. Indication for hospital admission: cardiac arrest. Cardiopulmonary resuscitation (CPR) was performed and return of spontaneous circulation (ROSC) occurred prior to hospital transport. The patient was unconscious and breathing inadequately at ED arrival. Team-members are separated in two "working-groups" during this phase of work; ED nurse 1, nurse anaesthetist, ED physician 1, and the anaesthetist are all involved in patient related practical tasks (ECG, suctioning, establishing an arterial line and sedation), while ED physician 1, physicians 1, 2, and 3 from internal medicine, and ED nurse 2 are standing next to the logging-desk. Physician 3 is standing in a small distance from the latter group answering his telephone.

Part 1, before the anaesthetist's involvement in the CT decision.

Utterance number	Speaker	Utterance	Speakers actions	Other actions
276	Phys3	Yes. He is going to have a head CT-scan down here now. Is he?	Stands next to Phys1 and looks at Phys2. Holds phone to ear.	
277	EDphys1	Yes.	Standing outside the video frame	Phys3 and EDphys2 looks in direction of EDphys1. Phys2 shakes her head.
278	Phys2	Is he?	Shakes head. Turns towards EDphys1.	
279	EDphys1	Don't you think so?		
280	Phys2	Why? (1) [Get him up to the ICU. Get him up to the ICU.][4]	Shakes head. Turns towards EDphys1.	Phys1 turns towards EDphys1 and nods.

281	Phys3	[No, he doesn't have any X indication XX][4]	Talks on the telephone, turns and walks away from the bed.	
282	EDphys1	Well-		Phys1's eyes follow the conversation between EDphys1 and Phys2.
283	Phys2	Or-? Don't you think XX?	Walks backward towards EDphys1. Stands next to EDphys1.	
284	EDphys1	Are we- Are we [100 % sure that][5] it is the heart?		
285	NurseAN	[X suction X X.][5]	Works with the patient's endotracheal tube. Moves to the patient-monitor and fetches the suction device	
286	Phys2	Jaah 100 (.) [but][6]	Looks at Phys1.	EDnurse1 looks at display on the ECG device
287	EDphys1	[It][6] isn't hypoxia -	Standing outside the video frame	Phys1 and Phys2 are standing together with EDphys1.
288	Phys2	Yes, but you have this and this. I don't know myself, but anyway that XX CT [already.][7]	Standing at the edge of the image. Looks at EDphys1 and ((points)) twice at something lying on	Phys1 looks at Phys2 and nods.

			the logging desk	
289	EDphys1	[But we][7] we would [like to have a XX][8]		NurseAN suctions secretion from the patient's mouth. AN is positioned close to the patients' right wrist - tries to insert an arterial line.
290	EDnurse1 is commenting on carrying out the ECG-test			
291	Phys2	Not necessarily a clear suspicion of that. (1) [Not because we have any clear suspicion of what it is then, but-][9]		
292 293	NurseAN informs AN about the patient's moving his arm and AN to decides to give the patient a sedative			
294	Phys2	You can [investigate but I XX up to the ICU myself.][11] Do you want to get him to CT-scanning?	Looks at Phys3.	Phys1 looks at Phys2 while she is talking. Then turns toward Phys3. Phys3 nods his head.
295	NurseAN asks for confirmation on AN's ordination			
296	Phys3	No. [I don't want][12] to interfere in that decision at all.	Looks at Phys2.	
297	AN	[XX.][12]	Looks at NurseAN.	
Part 2, after the anaesthetist's involvement in the CT-decision.				

298	EDphys1	OK. Is it an indication for inducing X hypothermia [then to][13] to do a CT of the brain?		
299	Phys2	[No.][13]		
300	Phys3	[No.][13]		
301	AN	No.	Straightens back, lets go of the patient's left hand, turns and walks towards Phys1, EDphys1, Phys2 and Phys3.	Phys2 outside the video-frame. Phys1, and Phys2 turn towards AN. Phys1is nods.
302	Phys2	No (.) no. I -		
303	AN	It's more out of- If there's doubt about the diagnosis [X][14]	Moves towards EDphys1 and Phys3.	
304	NurseAN	[It is bleeding][14] in the mouth here.	Suctions secretion from the patient's mouth.	
305	Phys2	Sedated. Get him up to the ICU.	Looks at AN.	Phys1 and Phys3 look alternately at AN and Phys2.
306	AN	Yes, but X XX.	Looks at Phys2.	
307	Phys1	X[X][15]	Stands facing EDphys1.	Phys3 stands facing EDphys1.
308	Phys2	[Yes.][15] True, that is more important.	Looks at AN.	Phys1 nods and turns towards the bed
309	NurseAN	Blood in the tube.	Suctions secretion from the patient's mouth.	

310	AN	But there's no rush to get him up to the ICU either.	Looks at Phys2.	EDphys2 looks at NurseAN. EDnurse1 is working with the ECG. The other team members are standing at the foot of the bed
311	Phys2	What?		
312	AN	There's no rush to get him [up to the ICU either][16]	Looks at Phys2.	Phys3 leans forward towards AN while AN is speaking
313	EDnurse 1	[Out of paper.][16]	Looks at ECG-machine.	
314	Phys2	[No.][16] It's just- But is he awake X or isn't he. We're going to get him into hypothermia after all just get him up to the ICU. (2) If [you want to get him to CT then-][17]	Looks at AN, Phys1 and Phys3.	AN is looks at Phys2 and nods while she is talking.
315	NurseAN	Did anyone hear that? [Is there anyone who heard][17] [that there's blood in the tube?][18]	Looks at AN.	
316	AN	[No but whether we should do a CT scan or not][18] that's one thing. But there is no rush to get [X][19]	Looks at Phys2.	
317	EDphys2	[Blood in the tube.][19]	Looks at EDphys1.	
318	Phys2	[No, it's not][19] like you have to sprint up to the ICU [but	Takes a step towards AN and lifts up both	EDnurse1 loads the ECG machine with paper

		XX][20] is a CT scan necessary?	hands as she speaks	
319	EDphys1	[What?][20]		
320	EDphys2	[Blood in the tube.][20]	Looks at EDphys1 and points back towards the patient with his thumb	AN walks up to NurseAN
321	EDphys1	[Blood in the tube.][20]		
322	NurseAN	[Look NAME (AN)][21]	Looks at AN and continues suctioning	
323	Phys3	[What a CT can tell us][21] is whether there are major signs of anoxic brain injury. And maybe whether there's an additional [component such as when -][22]	Alternates between looking at Phys2 and at the patient.	
324	Phys1	[Blood gas. Has that been taken][22] then?	Looks at EDphys2.	
325	EDphys2	No.		
326	Phys3	[XX][23]	Looks at EDphys2 and then turns toward Phys1.	
327	Phys2	XX blood gas [X.][23]	Shakes head slightly.	
328	Phys1	It would have been helpful to have a blood gas-		
329	EDnurse 1	[He][23] is reacting a bit with his (.) hand here you see.		
330	EDphys2	Yes [X. Could you get][24] [XX?][25]	Looks at Phys1. Points towards the emergency table.	Phys1 goes to the emergency table and gets equipment for blood gas

				testing which he gives to EDphys2.
331	AN	[Isn't there any Propofol left?][24] (2) [Give XX at least.][25] (1) Have you got any Propofol then? Don't [we have anything?][26](.) [Have you got Propofol? X][27]	Stands beside the anaesthesia table and looks at NurseAN.	
332	NurseAN	[What?][26] (2) [It's over there][27] [Over there on the table][28]	Points towards the emergency table.	EDnurse1 takes out the Propofol syringe and hands it to NurseAN who passes it on to AN
333	Phys3	[X looks as though it's one of those-][24] [One of those two.][25] And if there's no (2) [risk of XX][26] [that he's not cooled down so quickly-][27]	Stands together with Phys2 at the left side of the bed.	
334	Phys2	[Yes but-][28] (2) XX perhaps but that's exactly what is- Because he's not sedated at all (.) is he?		Phys3's telephone rings.
335	AN	[XX][29]	Administers Propofol to the patient	
336	EDphys1	[No. Yes][29] yes that is he has of course- was of course sedated during intubation then but [X-][30]		
337	Phys2	[Yes yes][30] but nothing more than that?		

338	NurseAN	Oh yes. [XX][31] [XX][32]	Looks downward at the suction catheter	
339	Phys3	[Hello.][31]	Answers the telephone.	
340	EDphys1	[He is moving his extremities after all][31]		
341	Phys2	[It doesn't matter][32] because it doesn't mean anything		
342	Phys3	The answer is no. @ Thank you.	Answers the telephone. Stands next to Phys2.	
343	Phys2	But (.) XX make a decision. If we're going to get him to CT then we get him to CT. Not [XX][33]	Shakes head. Looks out into the air.	
344	EDphys1	[Then we'll get][33] that across the corridor here and then we'll go up.		
345	Phys3	What?	Looks at EDphys1.	
346	EDphys1	The alternative is to take the CT now here and then we'll take him up to the ICU.		AN is placing a gastrointestinal tube
347	Phys3	My recommendation is CT now if we can get it fast.		
348	EDnurse 3	Shall I go and check with CT now?	Standing outside the video frame.	
349	EDphys1	Yes.		

Appendix 2, Excerpt B

Abbreviations: Phys1-2: Physicians from internal medicine department (Phys1 is an intern), EDnurse1-2: Nurses working in the emergency department, AN: Anaesthetist, NurseAN: Nurse anaesthetist.

Transcript key: X: word not audible, XX: words not audible, [words][2]: overlapping speech (the numbers indicate the order of the nearby overlap), –: unfinished words or sentences, (.): micropause, (3): seconds pause, (()): authors interpretation.

Situation: Patient is > 80 years old, living at home. Indication for hospital admission: inguinal pain and syncope. The patient was nodding adequately when spoken to (yes/no) and had possible face-drooping at ED admission. An oropharyngeal airway is established, and iv-fluid is ongoing. During this phase of work, the nurse anaesthetist is standing at the head of the bed providing the patient with oxygen, the anaesthetist is palpating the patient's inguinal pulse, physician 1 and ED nurse 1 are standing beside the bed, and ED nurse 2 is standing by the logging-desk while physician 2 is outside the room checking CT-lab availability.

Utterance number	Speaker	Utterance	Speakers action	Other action
288	AN	[XX][4] we are in the process of ((collapsing)) X	Stands by the bed.	
289	Phys1	What did you say?		
290	AN	We are in the process of X		
291	Phys1	Yes.	Goes to stand at the head of the bed, then turns and leaves the room	
292	NurseAN	Take a deep breath.	Looking down at the patient's chest	EDnurse2 goes to the foot of the bed.
293	AN	I haven't- I haven't fetched the defibrillator.		
294	EDnurse 1	I can get it. Then I'll fetch the automatic chest compression machine at the same time.	Looks at AN and then leaves the room.	
295	NurseAN	I need a bag-valve-mask.	Low voice. Looks around the room	
296	AN	Can you find a bag-valve-mask?	Looks at EDnurse2.	

297	EDnurse 2	Yes.	Goes to the wall where the bag-valve-mask is suspended	
298	AN	I'm losing the radial, no the carotid pulse (1) I'm just going to X. Start X.	Palpates the patient's neck. Turns toward the door as she talks (loudly). Then goes to the doorway	EDnurse2 is handing the bag-valve-mask to NurseAN.
299	NurseAN	Will you [connect to X?][1]	NurseAN receives the bag-mask ventilator from EDnurse2 and gives back the oxygen tube	EDnurse2 looks for the flowmeter
300	AN	[I'm losing the carotid pulse now.][1]	Standing in the doorway.	
301	Phys2	What?	Comes in to the room.	EDnurse1 (with defibrillator), Phys2 and Phys1 enter the room
302	AN	I', losing the carotid pulse.		
303	Phys1	XX.		
304	EDnurse 2	Can you take this?	Gives the oxygen tube to AN, who connects it	
305	Phys2	But then we must. He's living at home and [active and][2] must start CPR (3) and intubate him.	Leaning over the bed.	EDnurse1 connects the defibrillator.
306	Phys1	[Yes, he is][2] Yes.		
307	AN	Yes.	Looks at Phys2.	
308	NurseAN	Then I'll intubate him.		

Appendix 3, Excerpt C

Abbreviations: Phys1-2: Physicians from internal medicine department, EDphys: Physician working in the emergency department, EDnurse1-3: Nurses working in the emergency department, AN: Anaesthetist, NurseAN: Nurse anaesthetist. Radiographer.

Transcript key: X: word not audible, XX: words not audible, [words][2]: overlapping speech (the numbers indicate the order of the nearby overlap), –: unfinished words or sentences, (.): micropause, (3): seconds pause.

Situation: Patient is > 70 years old, living at home. Indication for hospital admission: syncope. The patient was awake and adequate with no pain at arrival. The anaesthetist is performing an ultrasound and preparing to place a central venous line in the patient's neck area. ED nurse 1 is preparing to insert a urine catheter, and the ED physician is standing beside the bed. The nurse anaesthetist is securing the patient's arterial cannula, and physicians 1 and 2 are standing beside ED nurse 2 at the logging desk. The bed is not functioning properly and cannot be tilted head down for the central venous line procedure, and a chest X-ray has just been taken.

Utterance number	Speaker	Utterance	Speakers action	Other action
311	AN	[Her venous volume][1] is good. The question is if it's simply turned off-	Looks at the ultrasound screen to be used during insertion of the central venous line.	EDphys leans forward to look at the same ultrasound screen as AN.
312	EDphys	Is it cardiogenic shock?	Looks at AN.	
313	AN	Well-. But, I mean. If you take- If you look at the vein here. Can you see it?		
314	EDphys	Yes, I see. It's enor[mous][2].	Looks briefly at the patient.	
315	AN	[Yes.][2] Yes.		
316	EDphys	She is actually lying well X as well.		
317	AN	That might [indicate that she has-][3]		
318	EDphys	[We could look at the][3] [vena		

		cava also.][4]		
319	Radiographer	[Thorax is fine at least][4] or at least technically speaking. Must look at the image yourself. Take this away now. Anyone who could help to lift a bit? (3) [Thank you][5]	Looks towards EDphys. Removes the X-ray cartridge beneath the patient's back.	Phys1 approaches and lifts the patient on the opposite side of the radiographer. AN looks at the X-ray image on the screen at the back of the room.
320	AN	She does have a [wi-][5-] [She has-][6](2) [I think ehm-][7] Come and have a look here (3). What's his name again-?	Switches off the alarm on the monitor. Looks at EDphys. Beckons with her hand, "here"	EDphys stands with his back to AN at the foot of the bed and works at ultrasound machine 2.
321	EDphys	[Would you fetch more gel?][6]	Looks at EDnurse2, who is standing at the logging desk. Then turns towards AN	
322	X	I don't know where [XX][7]		
323	X	The small heating cabinet innermost over there.		
324	NurseAN	NAME (patient)? Are you awake?	Secures the patient's arterial cannula and looks briefly at the patient	
325	EDphys	XX	Looks at AN and brings ultrasound machine 2 and rolls it towards the bed	
326	AN	Come and look at the X-ray here. The mediastinum is widened.	Returns to the screen with the X-ray image	EDphys walks around the bed on AN's right-hand side. Together with Phys1 and Phys2
327	Patient	Ouch.		

328	NurseAN	Was it your hand that was hurting?		AN points at the X-ray screen
329	Patient	[Yes XX][1]		
330	AN	[I don't know if there's something ongoing][1] X just-	Looks at EDphys pointing to the X-ray screen	
331	EDphys	Yes	Looks at the X-ray screen.	Phys1 and 3 look over EDphys's shoulder. AN walks to the patient monitor and pauses the alarm, then turns to EDphys again.
332	AN	Yes. Eeh that is, it is X.	Standing together with EDphys, Phys1 and Phys2.	
333	NurseAN	Are you going to take more here?	Taking off her lead apron Looks at the radiographer.	Radiographer is moving the X-ray scanner.
334	Radiographer	[Finished, yes][2]	Pushes the X-ray scanner back into place	EDphys shrugs his shoulders slightly when he turns to walk towards Phys1 and Phys2
335	AN	[Now her blood pressure is falling.][2] Do we have some pressor-?	Looks at the patient-monitor.	EDnurse2 is standing with ultrasound -gel in his hand.
336	NurseAN	What would you like?	Takes off the lead apron and walks around the bed to put it away	
337	AN	Eeeh. What's the pulse rate then?	Unpacks the kit for central venous line placement.	
338	Phys1	[XX][3]	Walks behind EDphys, turning his head back to look at	

			Phys2	
339	NurseAN	I've got phenylephrine, ephedrine and [epinephrine][3]	Walks back around the bed and to the anaesthesia table next to AN at the head of the bed..	EDphys stands at the foot of the bed next to the ultrasound machine 2.
340	AN	[Give her][3] [ephedrine now][4]	Looks at the patient monitor. Continues unpacking equipment as she speaks.	
341	Phys2	[Could it mean anything other than XX?][4]	Walks up to EDphys, behind Phys1.	
342	NurseAN	X	stands next to the anaesthesia table next to AN.	
343	EDphys	Then I will- (2) Chest X-ray shows widened mediastinum. So, we must suspect there's an aortic dissection causing her low blood pressure.	Stands at the foot of the bed. Looks first at EDnurse2, who is standing behind him, then turns towards the room. Talking aloud.	
344-363	AN asks for a gauze mask. EDphys seeks supplementary information from the patient and then prepares for the ultrasound examination of vena cava. EDnurse1 informs the patient about inserting the urine catheter.			
364	AN	We are working a bit on (.)-. A bit from different angles here now. (4) Eeh. [Look at the liver][6] then eeh vena cava.	Putts on the gauze mask.	EDphys examines the thorax and abdomen using ultrasound. Phys1 leaves the video frame, walking to the left.
365	X	[XX][6]		Phys2 stands next to Phys1 at the outer edge of the video frame (left)
366	EDphys	I'll look at that too.		

367	AN	Yes. (1) I'm going to insert a central venous line, so we could start with norepinephrine if necessary while- because if it gets XX then it is after all- (2) [But then-][7]		EDnurse1 is preparing for placing a urinary catheter.
368	NurseAN	[Do you want ephedrine?][7]	Turns towards AN.	
369	AN	Yes. But someone mix norepinephrine in like a eeh constant infusion pump?	Does not raise her eyes from what she is doing while she is speaking	NurseAN walks around the bed with medication
370	EDnurse 2	Are you inserting one with a temperature sensor?	Standing at the logging desk.	EDnurse1 turns towards EDnurse2.
371	EDnurse 1	No sensor on the one I have here now, no. [Did you][8] want one?	Turns toward EDnurse2, who is standing at the logging desk.	
372	EDnurse 2	[Not?][8] XX		
373	EDnurse 1	Would you go and get one then?		
374	EDnurse 2	Yes		
375	AN	Let's see-		
376	EDphys	Doesn't it look widened here then?	Points at his ultrasound screen.	Phys1 and Phys2 stand next to EDphys and look at the ultrasound screen. Phys1 and Phys2 shake their heads
377	NurseAN	5 milligram ephedrine given	Adjusts the roller clamp on the IV administration set for the infusion bag connected to the intravenous catheter on the patient's left hand	EDnurse3 enters.
378	AN	Then we must keep an eye on XX. Let's see- Take a deep	Looks to the patient monitor and	

		[breath][1]	touches the screen	
379-393	AN asks NurseAN to help her to put on a sterile gown. EDphys says he can see vena cava on the ultrasound screen.			
394	EDphys	The vena cava inferior is hardly moving. [So it][1] is obstructive or cardiogenic shock.	Looks at AN	
395	AN	[XX][1](3) Yes.(1) But is it-. Should a pericardiocentesis be done, or is it-? (2) Let's see-	Waves her hands and turns toward NurseAN.	NurseAN stands at the cabinet at the back of the room EDphys looks at the ultrasound screen
396	EDnurse 3	XX	Brings new urinary catheter	
397	EDnurse 1	Yes. Could you help me with this [XX][2] NAME (EDnurse3)	Looks at EDnurse3	EDnurse3 helps the patient bending her knees.
398	AN	[Sterile glows?][2]		
399	EDnurse 3	XX. Someone is fetching them.	Looks at EDnurse3, then EDnurse1.	NurseAN walks towards the foot of the bed
400	AN	Someone's fetching them, OK.		EDnurse2 brings sterile gloves, which he gives to NurseAN
401	NurseAN	Bring XX with X and two of X	Takes the package of sterile gloves from EDnurse2 and goes to AN	
402	AN	Remind me to phone X. (2) Has a thoracic surgeon been called? Or a thoracic anaesthetist- to come and assess- (3) In terms of status.	Opens the glove package	EDnurse1 and EDnurse3 insert the urinary catheter
403	EDphys	Yes.		

Appendix 4, Excerpt D

Abbreviations: Phys1-2: Physicians from internal medicine department, PhysTh2: Physician from thoracic surgical department, EDnurse1-3: Nurses working in the emergency department, AN: Anaesthetist, NurseAN: Nurse anaesthetist, NurseAN student: Nurse anaesthetist student, Radiographers 1-2.

Transcript key: X: word not audible, XX: words not audible, [words][2]: overlapping speech (the numbers indicate the order of the nearby overlap), –: unfinished words or sentences, (.): micropause, (3): seconds pause.

Situation: Patient is > 70 years old, living at home. Indication for hospital admission: cardiac arrest. CPR and ROSC prior to hospital transport. The patient was unconscious but breathing spontaneously at ED arrival and the airway was secured with a supraglottic airway device. During this phase of work, physician 1 is standing beside ED nurse 2 at the logging-desk and two physicians from the thoracic surgical department are called and stand a small distance from the bed. Two radiographers are standing in the back of the room. The anaesthetist is standing near the patient's head and the nurse anaesthetist, nurse anaesthetist student, and ED nurse 1 stand close to the anaesthetist.

Utterance number	Speaker	Utterance	Speakers action	Other action
186	AN	X Haven't you taken the chest X-ray yet?	Looks at the radiographers standing behind the head end of the bed.	
187	Radiographer1	No. We haven't taken it yet. Shall [we-][1]	Looks at AN.	
188	AN	[NAME (Phys1)][1]. (1) [Should we take a chest X-ray?][2]	Turns towards Phys1.	Phys1 standing at the logging desk with his back to the bed.
189	Phys1	Yes.	Turns towards AN and walks towards the bed while he answers.	
190	Radiograph	[Should he have any X-		

	er1	rays?][2]		
191	Phys1	Yes.	Looks at AN.	
192	AN	Shall we take it now before we intubate him?	Looks at Phys1.	
193	Phys1	Yes, we'll do that. We'll take a chest X-ray.	Looks at AN.	Radiographers start getting ready.
194	AN	X cuff-syringe have you seen it? [Isn't it somewhere here?][3]	Looks at EDnurse1 then turns towards the monitor.	
195	EDnurse1	[A cuff syringe, OK.][3] (1) [Can just take one like this then, can't you? (.) What XXX?][4]	Gets a syringe from the emergency table and goes towards AN	Radiographer 2 moves the X-ray equipment suspended from the ceiling. Radiographer 1 pushes the patient's bed slightly.
196-202	Radiographer1 and 2 speaks about preparations; how to position the X-ray unit and the patient.			
203	AN	Take out this [then XX][6]	Looks to NurseAN.	
204	Radiographer1	[Help me to][6] move. Could you [help me a bit][7] on that side?		
205	NurseAN	[What?][7]	Looks at AN.	
206	AN	We will [take that XX][8]	Stands by the head of the bed.	
207	Radiographer2	[Yes. Will just see][8] how far down we need it.	Adjusts the position of the X-ray unit.	
208	NurseAN	Take out -		
209-212	EDnurse2 asks for information for documentation.			
213	AN	What is this man's name?	Removes the patient's I-gel airway	
214	NurseAN student	His name is NAME (patient).	Looks at AN.	NurseAN is looks at NurseAN student.

215	NurseAN	NAME (patient) NAME (patient)	Bends over the patient. Speaks loudly	
216	AN	X suction. Can you find a suction device for me?	Looks at EDnurse1.	
217	EDnurse1	Yes.	Goes to find suction device.	
218	Radiographer2	Then it's ready for chest X-ray.	Moves away from the patient's bed.	Phys1 moves away from the bed
219	AN	Then you need to hurry up.	Leans over the patient's head.	
220	Radiographer1	You must move your head away or you'll be included in the picture.	To AN	
221	Radiographer2	X-ray taken.	Goes back to the bed.	Phys1 goes up to the bed.
222	EDnurse2	X-ray taken.		
223	AN	NAME (patient) (6) ehh. No contact NAME (Phys1) I think we'll intubate.	Looks at Phys1, who is moving towards the X-ray image behind the patient's bed.	Phys1 turns and looks at AN nodding. NurseAN gets a bag-valve-mask from the wall behind the head end of the bed. The patient monitor alarm starts.
224	NurseAN	Intubate? [Do you want that?][1]	Puts the bag-valve-mask beside the patient's shoulder and walks over to the anaesthesia table.	
225	AN	[The question is if I should-][1]		
226	EDnurse1	85 in saturation.		
227	EDnurse2	85 in saturation.		
228	AN	Must have suction now!	Turns toward EDnurse1.	EDnurse1 is setting up the suction unit that is

				standing on the floor.
229	EDnurse1	Yes, but I've got no adaptor.	Connects the suction unit standing on the floor.	AN walks towards the patient monitor but turns back.
230	AN	I need it now! (8) [can you watch out for his arm][2]	Moves from the patient's side to behind the head end of the bed. Has to climb between cables hanging between the patient monitor and the patient.	EDnurse1 is standing next to AN. Suctions secretion from the patient's mouth with a suction catheter.
231	Phys1	[I think we must have a CT scan.][2]	Stands at the X-ray screen looking at Radiographer2.	PhysTh2 walks towards Phys1.
232	Radiographer 2	XX requisition.	Standing next to Phys1.	
233	EDnurse1	Yes.		
234	AN	Suction in the mouth.	Looks down at the patient.	
235	Phys1	It looks as- a bit like-	Looks at the screen showing the X-ray images	PhysTh2 stands next to Phys1 and look at the screen showing X-ray images.
236	PhysTh2	XX it looks [as though there's XX][3]	Looks at Phys1.	
237	AN	[Suxamethonium and fentanyl.][3]	Turns towards NurseAN when he is talking about medications.	
238	Phys1	[Yes, mhm][3] It might well be that too.		
239	NurseAN	NAME (NurseAN student) Insert a stylet in the tube here.	Looks at the NurseAN student who is standing by the anaesthesia machine.	

240	NurseAN student	Yes. A stylet?		
241	NurseAN	A stylet.		
242	Phys2	Is there something I should requisition?	Walks towards Phys1.	
243	AN	XX [turn up-][4]	Holds the bag-valve-mask to his ear then points towards the oxygen flowmeter.	EDnurse1 turns up the oxygen flowmeter.
244	Phys1	[Requisition a CT][4] chest (2) and a [CT lung and head.][5]	Facing Phys2.	

Standards for Reporting Qualitative Research (SRQR)*

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	Page no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	1
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	3
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	4
Purpose or research question - Purpose of the study and specific objectives or questions	5
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	7
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Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	6
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	6-7

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	7
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	7
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	7
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Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	8
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	9-15

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	16
Limitations - Trustworthiness and limitations of findings	17

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	18
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	18

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

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Team-talk and team decision-processes: A qualitative discourse analytical approach to ten real-life medical emergency team encounters.

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Team-talk and team decision-processes: A qualitative discourse analytical approach to ten real-life medical emergency team encounters.

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ABSTRACT

Objectives: Explore how interdisciplinary emergency teams use three specific modes of talk (discourse types) in decision-making processes.

Design: Exploratory study. Ten real-life admissions of patients with critical illness were audio/video recorded and transcribed. Activity type analysis (a qualitative discourse analytical method) was applied.

Setting: Interdisciplinary emergency teams admitting patients with critical illness in a Norwegian university hospital emergency department.

Participants: All emergency teams consisted of at least two internal medicine physicians, two ED nurses, one anaesthetist, and one nurse anaesthetist. The number of healthcare professionals involved in each emergency team varied between 11-20, and some individuals were involved with more than one team.

Results: The three discourse types played significant roles in team decision-making processes when negotiating meaning. Online commentaries (ONC) and metacommentaries (MC) created progression while offline commentaries (OFC) temporarily placed decisions on hold. Both ONC and MC triggered action and distributed tasks, resources, and responsibility in the team. OFC sought mutual understanding and created a broader base for decisions.

Conclusion: A discourse analytical perspective on team-talk in medical emergencies illuminates both the dynamics and complexity of teamwork. Here we draw attention to the way specific modes of talk function in negotiating mutual understanding and distributing tasks and responsibilities in non-algorithm driven activities. The analysis uncovers a need for an enhanced focus on how language can trigger safe team practice and integrate this

knowledge in teamwork training to improve communication skills in ad-hoc emergency teams.

Article summary

Strengths and limitations of this study

- Videotaping of emergency teams during real-life admissions of patients with critical illness ensured authentic samples for analysis.
- The activity-type analysis provided new insight in how team-talk influences teamwork in non-algorithm driven medical emergencies.
- Culture and body language, significant issues in talk-work relationship, were not addressed in this study.

INTRODUCTION

Communication error is a common cause of adverse events in healthcare [1-6]. There has been a growing scientific focus on cognitive and social skills, "Non-Technical Skills" (NTS), for health professionals in an effort to improve patient safety.[7-9] NTS are crucial for avoiding errors, especially in emergency teamwork.[10-14] Crew Resource Management principles (CRM) have been adapted to medical NTS training from aviation in order to improve teamwork in emergency care,[15-17] and communication-skills are integrated in CRM-guided team frameworks in several medical specialties.[18-20] Studies show that team training improves team processes,[21-24] and evidence connecting team training to improved patient outcomes is accumulating.[25 26] Standardized communication strategies such as Closed Loop Communication (CLC) are recommended in critical care.[27-29] Recent studies indicate,

however, that the use of CLC is limited despite recommendations and extensive training, especially in non-algorithm driven activities implying high cognitive load (identification of cues, interpretations, integration of existing knowledge and decisions).[13 30-33] Studies of naturally occurring team talk have increased our understanding of the talk-work relationship. Lingard and colleagues found communication patterns benefitting safety in interdisciplinary team discussions during pre-surgical checklist-driven team briefings,[34] and Kolbe and colleagues found that high performing anaesthesia teams used monitoring and talking to the room during general anaesthesia induction.[35] Previous reports have also uncovered specific modes of talk constructing and supporting coordination in emergency team activity during standardized-scenario in-situ simulation training.[36 37]

Interdisciplinary ad-hoc teams composed to meet specific patient needs in critical and complex medical situations attend most in-hospital medical emergencies. Communication is crucial in such teams to converge joint expertise in support of team decisions, defined as "a team process that involves gathering, processing, integrating, and communicating information in support of arriving at a task-relevant decision."[38-41] Here we investigate how three discourse types defined as "online commentary" (ONC), "meta-commentary" (MC), and "offline commentary" (OFC) influence team decision-making processes in real-life interdisciplinary medical emergency teams while admitting non-trauma patients with critical illness to the hospital. ONC was defined by Heritage and Stivers (1999) as descriptions or evaluations of real-time observations,[42] Bateson (1972) described MC as implicit messages framing the activity type orienting to next action or a plan,[43] and OFC is defined by Sarangi (2010) as clarifications and explanations implying a pedagogic role. [44] Examples of these discourse types are summarized in Table 1.

Table 1

Discourse types

Discourse type	Definition	Example
Online commentary (ONC)	Description or evaluation of real-time observations [42]	"His oxygen-saturation isn't getting any better"
Metacommentary (MC)	Implicit message framing the activity type, orienting to next action or a plan [43]	"I think we should intubate"
Offline commentary (OFC)	Clarification and explanation, building evidence [44]	"A CT-scan can tell us if there are significant signs of brain anoxia"

METHODS

Data were collected in the emergency department (ED) of a Norwegian university hospital from May 2015 to March 2016. This study was approved by the Regional Committees for Medical and Health Research Ethics, the Data Protection Official for Research at the hospital, and by the managing authorities at the hospital and in the ED. Information was provided to all health professionals with potential for involvement in the study, and written informed consent from the participating healthcare professionals was collected at the scene or ahead of time. Although patients were not objects of this study, both patients and relatives gave their informed consent to participate. The next of kin gave consent on behalf of four of the patients who were unable to do so because of their medical condition, in accordance with the ethical approvals. No participants, patients or relatives chose to withdraw from the study.

Patient and Public involvement statement: Patients and the public were not objects of this study and thus not involved in study design or conduct of this research.

Context: According to hospital procedure, the emergency team is activated when non-trauma patients are admitted to the hospital with imminent problems with airways, breathing, and/ or circulation. All teams consisted of at least two internal medicine physicians, two ED nurses, one anaesthetist, and one nurse anaesthetist.

Data collection: The first author attended the ED with a mobile video camera and two microphones. A research assistant placed one of the microphones in the emergency room and provided information and written consent forms to participants. 10 teams admitting patients with critical illness were recorded and observed to capture the interconnections between team talk and actions. Patient ages ranged from 19-88 with a median of 73, and five were women. The number of healthcare professionals involved in each emergency team varied between 11-20 people, and some individuals were involved with more than one team. The 10 videos covered 144 health professional roles, including 65 physicians from various specialities (cardiology, pulmonary, internal medicine, neurology, ED, radiology, thoracic surgery, anaesthesiology, prehospital emergency), 46 nurses (ED, anaesthesiology, and intensive care), 7 radiographers, 4 medical students and 22 paramedics.

Analysis: The four authors have comprehensive experience in critical care and applied linguistics. We followed a standard procedure previously described.[36 37] Briefly, all 10 videotapes were first viewed repeatedly before making detailed depersonalised transcriptions marking parallel talk, pauses, and non-verbal activities. All authors reviewed the transcripts, and the first and the second author performed the analyses together. The analytical method is inspired by Levinson's socio-pragmatic theory of the role and function of speech in different social activity-types.[45] Activity type analysis is a version of discourse analysis used to perform sequential studies of the interconnections between naturally occurring language and professional practices, revealing the structural and interactional organization of the speech,[46-

[48] and builds on a perspective in which language is understood as principal for negotiating meaning.[49 50] First, we mapped the data across all teams into general recursive key activity phases defined as an overarching structure with associated sub-phases. Then SG and GT individually performed a sequential approach to identify phases of both medical and linguistic relevance to the decision-making processes. Concurrency was shown by both authors in identifying the same phases in the extensive data corpus, and all authors reached a consensus of interpretations through discussions. [51] A professional translator translated the transcripts from Norwegian to English for publication.

RESULTS

Structural mapping of all 10 videos illuminated four overarching activity phases with associated sub-phases. Phase 1 is characterized as *opening activity*: greeting both patient and colleagues, information hand-over, and patient movement from the stretcher to a hospital bed. Phase 2 is characterized as *initial activity*: monitoring the patient and performing primary ABC. Phase 3 is *core activity*: planning and accomplishing diagnostic examinations and treatment. Finally, phase 4 is *closing activity*: conclusions/tentative diagnosis, and patient preparation and movement from the emergency department for further examination and treatment.

Analysing the function of ONC, MC and OFC in team-work show the complexity in talk-work relationship. An abbreviated summary of the findings is presented in Table 2. We have selected four excerpts to illustrate the data and support the findings. The excerpts are taken from phase 3 and come from four different teams. Full transcripts can be found in appendices 1-4, and utterances specified in the results section are referred to with numbers taken from the relevant appendix. XX: words not audible, (()): author's supplement.

Table 2

Influence of ONC, MC and OFC in team decision-making processes, abbreviated summary of findings

Discourse types	Findings	Examples
Online commentary (ONC)	created attention and indicated critical situations triggered action (re)distributed tasks and responsibility created progression in team-decision-processes	Nurse anaesthetist: "It is bleeding in the mouth here." Leading to: The anaesthetist leaves the CT-discussion and walks up to the nurse anaesthetist to manage the bleeding problem (Excerpt A, Appendix 1, turn 304 and following)
Metacommentary (MC)	triggered action (re)distributed tasks and responsibility oriented both towards acknowledgements and doubts of expertise created progression in team decision-processes consecutive MC signalled urgency	Anaesthetist: "I haven't fetched the defibrillator." Leading to: ED nurse 1 announces that she will fetch the defibrillator and the automatic chest compression machine, and the nurse anaesthetist asks for a bag-valve-mask. (Excerpt B, Appendix 2, turn 293 and following) Anaesthetist: "But is it-. Should a pericardiocentesis be done, or is it-?" acknowledging the present team's expertise in decision-making. The lack of response results in her rephrasing the question: "Has a thoracic surgeon been called? Or a thoracic anaesthetist- to come and assess- (3 seconds pause) In terms of status.", challenging the present expertise including her own, and distributing the responsibility of seeking necessary expertise to the others. (Excerpt C, Appendix 3, turn 395 and following) Anaesthetist: "Must have suction now!", "I need it now! (8) Can you watch out for his arm.", "Suction in the mouth.", "Suxamethonium and fentanyl" Leading to: ED nurse 1 sets up the suction device and starts suctioning secretions from the patient's mouth, the nurse anaesthetist delegate inserting a stylet in the tube to the nurse anaesthetist student while managing the medication herself. (Excerpt D, Appendix 4, turn 228 and following)
Offline commentary (OFC)	expressed the speaker's expertise sought mutual understanding created a broader base for decisions put the team decision-processes temporarily on hold	ED physician 1 question: "Are we 100 % sure that it is the heart?" seeking more evidence. And in his next utterance, "It isn't hypoxia" he provides an explanation framing his expertise putting the decision temporarily on hold. (Excerpt A, Appendix 1, turn 284 and following)
ONC conflating into MC	Seemed to "speed up" team decision-processes	Anaesthetist: "No contact. I think we'll intubate." Leading to: Physician 1 turns towards the anaesthetist nodding, the nurse anaesthetist asks for confirmation and starts preparing for the intubation, and ED nurse 1 reports the patient's oxygen saturation. (Excerpt D,

		Appendix 1, turn 223 and following).

Excerpt A (Appendix 1)

This extensive excerpt is divided in two for presentation of the results.

Part 1, before the anaesthetist's involvement in the CT decision.

Situation: Patient is < 40 years old. Indication for hospital admission: cardiac arrest. Cardiopulmonary resuscitation (CPR) was performed and return of spontaneous circulation (ROSC) occurred prior to hospital transport. The patient was unconscious and breathing inadequately at ED arrival. Team-members are separated in two "working-groups" during this phase of work; ED nurse 1, nurse anaesthetist, ED physician 1, and the anaesthetist are all involved in patient related practical tasks (ECG, suctioning, establishing an arterial line and sedation), while ED physician 1, physicians 1, 2, and 3 from internal medicine, and ED nurse 2 are standing next to the logging-desk. Physician 3 is standing in a small distance from the latter group answering his telephone.

The excerpt begins with physician 3 answering the caller with MC: "Yes. He is going to have a head CT-scan down here now." He then addresses the group of physicians at the foot of the bed, "Is he?" distributing responsibility to physician 2 by sight (276). The response uncovers diversities among the physicians: ED physician 1 agrees (277) while physician 2 disagrees (278). Physician 3's MC trigger action and the physicians start negotiating a mutual understanding. ED physician 1 and physician 2 contribute verbally, while physician 1 and physician 3 both contribute by bodily conduct (288, 294). ED physician 1's question "Are we 100 % sure that it is the heart?" (284) challenges physician 2's view by seeking more evidence. In his next utterance, "It isn't hypoxia" (OFC 287), he provides an explanation

framing his expertise and putting the decision temporarily on hold, seeking ONC. Physician 2 responds "Yes, but you have this and this," while pointing twice at something placed on the logging desk (ONC 288). ED physician 1 responds with an OFC, "But we would like to have a XX," using "we" as a strengthening factor (289) and again challenging the grounds of the decision and seeking more evidence. Physician 2 later distributes tasks and responsibilities to the other team-members framed as MC: "You can investigate but I XX up to the ICU myself" (294).

Part 2, after the anaesthetist's involvement in the CT-decision.

Negotiations of how to understand the available evidence continues with ED physician 1 seeking clarification about the necessity of cerebral CT prior to introducing hypothermia (OFC 298). The three physicians at the foot of the bed and the anaesthetist agree that CT is not necessary (299-301). The anaesthetist suspends his attempt to insert an arterial line and walks over to the other physicians, expressing his expertise with OFC: "It's more out of- If there's doubts about the diagnosis X." Physician 2 uses MC to continue to argue for direct transfer to the ICU: "Sedated. Get him up to the ICU," seeking to create progress (305). The anaesthetist responds with OFC: "But there is no rush to get him up to the ICU either," putting the decision temporarily on hold (310). Physician 2 challenges the decision-making basis by adding evidence for direct transfer to the ICU: "We're going to get him into hypothermia after all just get him up to the ICU," then continuing with an MC: "If you want to get him to CT then-" seeking progress and distributing tasks and responsibility (314). The nurse anaesthetist observes blood in the patient's mouth and tracheal-tube and calls for action in parallel with the CT-discussion: "It is bleeding in the mouth here." (ONC 304). The ONC triggers redistribution of team resources when recognized, and the anaesthetist walks up to the

nurse anaesthetist and works on the bleeding problem. Physician 3 summarizes the grounds for CT-scanning by "thinking out loud" (OFC 323). This OFC puts the decision temporarily on hold and initiates physician 1 to ask about arterial blood gas (MC 324). The excerpt ends with consecutive MC, starting with physician 2: "But (micropause) XX make a decision. If we are going to get him to CT then we get him to CT. Not XX." (343), building up to a mutual understanding.

Excerpt B (Appendix 2)

Situation: Patient is > 80 years old, living at home. Indication for hospital admission: inguinal pain and syncope. The patient was nodding adequately when spoken to (yes/no) and had possible face-drooping at ED admission. An oropharyngeal airway is established, and iv-fluid is ongoing. During this phase of work, the nurse anaesthetist is standing at the head of the bed providing the patient with oxygen, the anaesthetist is palpating the patient's inguinal pulse, physician 1 and ED nurse 1 are standing beside the bed, and ED nurse 2 is standing by the logging-desk while physician 2 is outside the room checking CT-lab availability. Physician 1, an intern at the hospital, activated the emergency team, and Physician 2 is a senior physician. The excerpt begins when the patient's medical condition is progressing to a life-threatening phase. Breathing is deteriorating, the inguinal pulse is weak, and it is difficult to measure blood pressure. The anaesthetist seeks attention to the patient's deteriorating medical condition with ONC (288): "we are in the process of ((collapsing))." This ONC draws attention and triggers action, physician 1 agrees (291) and the nurse anaesthetist encourages the patient to take a deep breath while ED nurse 2 places herself in a "stand-by" position at the foot of the bed. The anaesthetist triggers action and distributes tasks and responsibility with MC (293): "I haven't fetched the defibrillator." ED nurse 1 announces that

she will fetch the defibrillator and the automatic chest compression machine (MC 294), and the nurse anaesthetist asks for a bag-valve-mask (MC 295). Both utterances indicate a mutual understanding of the situation and acknowledge the anaesthetist's expertise. While the nurse anaesthetist and ED nurse 2 are about to connect the bag-valve-mask, the anaesthetist seeks attention to her observation of a weak carotid pulse (ONC) and then offers an MC related to the next step of action: "I'm about to lose the radial, no carotid pulse. I'll just X. Start X." (298). Physicians 1 and 2 are standing outside the room and the anaesthetist goes to the doorway and calls out the same message twice (300, 302). ONC conflating to an MC triggers action in the team and distributes tasks and responsibility, resulting in the decision expressed by Physician 2: "He's living at home and active and must start CPR (3 seconds pause) and intubate him." This results in confirmation from Physician 1 and the anaesthetist, and the nurse anaesthetist engages in the intubation while ED nurse 1 connects the defibrillator.

Excerpt C (Appendix 3)

Situation: Patient is > 70 years old, living at home. Indication for hospital admission: syncope. The patient was awake and adequate with no pain at arrival. The anaesthetist is performing an ultrasound and preparing to place a central venous line in the patient's neck area. ED nurse 1 is preparing to insert a urine catheter, and the ED physician is standing beside the bed. The nurse anaesthetist is securing the patient's arterial cannula, and physicians 1 and 2 are standing beside ED nurse 2 at the logging desk. The bed is not functioning properly and cannot be tilted head down for the central venous line procedure, and a chest X-ray has just been taken. The excerpt begins with the anaesthetist's ONC: "Her venous volume is good" seeking attention to her observation of high venous volume on the ultrasound screen (311). This utterance distributes responsibility and triggers action as ED physician leans over

to see the anaesthetist's ultrasound screen. ED physician responds by offering an OFC framed as a question negotiating mutual understanding: "Is it cardiogenic shock?" (312). The anaesthetist replies with an OFC in a pedagogical frame, building evidence: "If you look at the vein here. Can you see it?" (313). ED physician follows with an ONC: "Yes, I see. It's enormous," implying an understanding of a critical situation (314). The anaesthetist agrees and they both put the decision temporarily on hold with further OFC, building evidence for what to do next (316, 317). The radiographer announces that the chest X-ray is ready for examination and the anaesthetist seeks attention from the ED physician while looking at the x-ray screen: "Come and look at the X-ray here. The mediastinum is widened." (ONC 326). The ONC triggered action and redistributed tasks and responsibility, manifested by ED physician stopping his preparations for vena cava scanning and moving to the X-ray screen, followed by physicians 1 and 2. After explaining her evaluation of the X-ray (OFC 330 and 332), the anaesthetist directs attention to the patient's decreasing blood pressure and presents an ONC conflating to a MC: "Now her blood pressure is falling. Do we have some pressor-?" (335) indicating a critical situation. This utterance triggers action and distributes tasks and responsibility to the nurse anaesthetist, who shifts focus from communicating with the radiographer to informing the anaesthetist about available medication (OFC 339). While the anaesthetist and the nurse anaesthetist are handling the patient's low blood pressure, ED physician, physician 1, and physician 2 are deciding about the chest X-ray. Framed as an ONC supported by an OFC, ED physician announces their mutual understanding to the team: "Chest X-ray shows widened mediastinum. So, we must suspect there's an aortic dissection causing her low blood pressure" (343). This puts the decision temporarily on hold while many parallel activities are following. ED physician interviews the patient before continuing the vena cava examination, and the anaesthetist continues preparing for a central venous line while discussing noradrenaline administration and communicating about the vena cava

examination. At the same time, ED nurse 1 proceeds with inserting a urine catheter. Framed as an ONC conflating into an OFC, the ED physician evaluates the ultrasound-image: "The vena cava inferior is hardly moving. So it is obstructive or cardiogenic shock." (394). This utterance triggers action by the anaesthetist, asking "But is it-. Should a pericardiocentesis be done, or is it-?" (MC 395), acknowledging the present team's expertise in decision-making. The lack of response results in her rephrasing the question: "Has a thoracic surgeon been called? Or a thoracic anaesthetist- to come and assess- (3 seconds pause) In terms of status." (MC 402), challenging the present expertise including her own, and distributes the responsibility of seeking necessary expertise to the others. ED physician interprets the anaesthetist's MC as a decision and confirms.

Excerpt D (Appendix 4)

Situation: Patient is > 70 years old, living at home. Indication for hospital admission: cardiac arrest. CPR and ROSC prior to hospital transport. The patient was unconscious but breathing spontaneously at ED arrival and the airway was secured with a supraglottic airway device. During this phase of work, physician 1 is standing beside ED nurse 2 at the logging-desk and two physicians from the thoracic surgical department are called and stand a small distance from the bed. Two radiographers are standing in the back of the room. The anaesthetist is standing near the patient's head and the nurse anaesthetist, nurse anaesthetist student, and ED nurse 1 stand close to the anaesthetist. The excerpt begins with the anaesthetist's question to the radiographers: "X Haven't you taken the chest X-ray yet?" (MC 186), distributing responsibility for progress to the radiographers. The anaesthetist's next MC is framed as a question and directed to physician 1, reflecting his understanding of the situation while specifying his opinion of necessary task priority: "Shall we take it now before we intubate

him?" (192) Physician 1 decides "Yes, we'll do that. We'll take a chest X-ray." (MC 193), resulting in the radiographer preparing to take a chest X-ray while the anaesthetist prepares for intubation. The anaesthetist removes the supraglottic airway device and asks about the patient's name when the X-ray is about to be taken. He then distributes the task to ED nurse 1 with an MC: "Can you find a suction device for me?" (216). ED nurse 1 confirms and goes to fetch the necessary equipment. The anaesthetist tries to get contact with the patient after the x-ray and then addresses physician 1 with an ONC conflating into a MC: "No contact NAME ((Physician1)) I think we'll intubate." (223). This utterance triggers action and distributes tasks and responsibility, physician 1 turns towards the anaesthetist while nodding, the nurse anaesthetist asks for confirmation and begins to prepare for the intubation, and ED nurse 1 provides an ONC on the patient's low oxygen saturation repeated by ED nurse 2, who is logging the events. The anaesthetist presents consecutive MCs: "Must have suction now!" (228), "I need it now! (8) Can you watch out for his arm." (230), "Suction in the mouth." (234), "Suxamethonium and fentanyl." (237), and "XX turn up-" (243) triggering action, distributing tasks and responsibility, and indicating a critical situation.

DISCUSSION

We observed and videotaped 10 real-life medical emergency teams admitting critically ill patients to the hospital to expand knowledge on the talk-work relationship in emergencies. We used activity type analysis to identify patterns related to the occasioning and functioning of ONC, MC, and OFC, and their influence on team decision-making processes.

A discourse analytical perspective on team-talk in medical emergencies uncovered the dynamics and complexity of interdisciplinary teamwork, and included simultaneous talk, parallel activities, distribution of tasks and responsibility, and negotiation of meaning.

Securing mutual understanding and coordinating activities are both dependent on effective communication skills and are highlighted in emergencies to avoid errors.[23] Sharing mutual understanding is crucial for patient safety and gives team members the ability to predict developments in a situation and support team decisions.[27 41] A structure of adjustments in team decision-making processes is an important coordination mechanism that can facilitate progression toward team goals.[27] This study illuminates the ways in which team members negotiate meaning to utilize collective expertise, creating common grounds for making good decisions. Every utterance is anchored in an understanding of the situation. Negotiating meaning means to acknowledge and challenge understanding within the team.[50] Our analysis clarified the role of OFC to communicate expertise in which the speaker takes on a pedagogic role to seek mutual understanding within the team of experts and create a common basis for decisions. OFC also challenges the existing grounds for making decisions by demanding more evidence, putting decisions temporarily on hold to build mutual understanding and extend the basis for decisions. This mirrors a dilemma found in safe teamworking in non-algorithm driven activities, specifically sacrificing time to create common grounds for good decision-making. Future studies should focus on how emergency teams communicate when time is a limiting factor and relate this to patient outcome. This study demonstrates how ONC and MC generate attention and indicate critical situations. Both bring progress to the decision-making processes and distribute responsibilities and tasks. Our analysis show examples of the ways in which team-members maneuver safely, creating mutual understanding and accelerating the decision-making process by using ONC conflating into MC. MC implies activity type-specific messages with implicit meaning, already negotiated within the community of practice and thus assumed to be understood within the specific context. “I think we have to intubate” is a good example of this, as the nurse anaesthetist shows his correct interpretation by immediately providing medication and equipment for oral intubation. MC has similarities to

what the anthropologist John J. Gumperz (1982) refers to as "contextualization cues," statements signalling contextual presumptions of what will happen next.[52] When discussion time is limited, using MC may appear to be timesaving. However, building a mutual communicative practice and negotiating interpretations of implicit meaning may be difficult in interdisciplinary ad-hoc emergency teams, and using MC could lead to misunderstandings or time-consuming explanations. There is a need for further investigations of whether team training could improve mutual communicative practice to avoid misunderstandings when time is a limiting factor.

This study illuminates the dynamics, complexity, and "potential risks" connected to naturally occurring team communication in non-algorithm driven medical activities. The analysis uncovers the ways that modes of talk function to negotiate meaning in team decision-making processes and to distribute tasks and responsibilities within the team. We must increase our scientific focus on the ways that modes of talk trigger safe team practice and integrate this into team training to improve communication skills in ad-hoc emergency teams.

Strengths and limitations

Videotaping live hospital admissions in the emergency department was challenging due to low accessibility, the risk of disturbing ongoing life-saving activities, and the implications of observing patients in vulnerable situations. Data collection was planned comprehensively and the study was carefully discussed with ethical authorities. Much research on emergency teamwork has been performed in standardized simulation scenarios. The most advanced simulators enable highly realistic emergency scenarios, but cannot replace all the complexity present in real life. Collecting real-life data is thus a strength, ensuring adequate samples for analysis. Analysing the talk-work relationship in emergency settings also demands cultural

insight into the communicative activity type. Norwegian culture is characterized by informality and decentralized power, including a dislike of control.[53] Although both culture and body language are undeniably significant issues most likely influencing the talk-work relationship,[54 55] they were not addressed in this study.

Contributorship statement

S. Gundrosen (SG) and P. Aadahl (PAa) made the study conception and design. SG made the audio/video recordings in the emergency department and transcribed the recordings. SG and G. Thomassen (GT) operationalised the research design according to principles in discourse analysis. SG, PAa, GT and T. Wisborg (TW) were all involved in data analysis and interpretation. SG drafted the article. SG, PAa, GT and TW revised the manuscript critically for important intellectual content together, and all approved the final version.

Ethics approval and consent to participate

The study was approved by the Regional Committees for Medical and Health Ethics (REC) and the Data Protection Official for Research at St. Olavs hospital, University Hospital in Trondheim, Norway. All participants received information before providing written consent to participate and none chose to withdraw from the study.

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The authors declare that they have no competing interests.

Data sharing statement

The data supporting our findings are included in Appendix 1-4.

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Appendix 1, Excerpt A

Abbreviations: Phys1-3: Physicians from internal medicine department, EDphys-1-2: Physicians working in the emergency department, EDnurse1-3: Nurses working in the emergency department, AN: Anaesthetist, NurseAN: Nurse anaesthetist.

Transcript key: X: word not audible, XX: words not audible, [words][2]: overlapping speech (the numbers indicate the order of the nearby overlap), –: unfinished words or sentences, (.): micropause, (3): seconds pause, @: laughter.

Situation: Patient is < 40 years old. Indication for hospital admission: cardiac arrest. Cardiopulmonary resuscitation (CPR) was performed and return of spontaneous circulation (ROSC) occurred prior to hospital transport. The patient was unconscious and breathing inadequately at ED arrival. Team-members are separated in two "working-groups" during this phase of work; ED nurse 1, nurse anaesthetist, ED physician 1, and the anaesthetist are all involved in patient related practical tasks (ECG, suctioning, establishing an arterial line and sedation), while ED physician 1, physicians 1, 2, and 3 from internal medicine, and ED nurse 2 are standing next to the logging-desk. Physician 3 is standing in a small distance from the latter group answering his telephone.

Part 1, before the anaesthetist's involvement in the CT decision.

Utterance number	Speaker	Utterance	Speakers actions	Other actions
276	Phys3	Yes. He is going to have a head CT-scan down here now. Is he?	Stands next to Phys1 and looks at Phys2. Holds phone to ear.	
277	EDphys1	Yes.	Standing outside the video frame	Phys3 and EDphys2 looks in direction of EDphys1. Phys2 shakes her head.
278	Phys2	Is he?	Shakes head. Turns towards EDphys1.	
279	EDphys1	Don't you think so?		
280	Phys2	Why? (1) [Get him up to the ICU. Get him up to the ICU.][4]	Shakes head. Turns towards EDphys1.	Phys1 turns towards EDphys1 and nods.

281	Phys3	[No, he doesn't have any X indication XX][4]	Talks on the telephone, turns and walks away from the bed.	
282	EDphys1	Well-		Phys1's eyes follow the conversation between EDphys1 and Phys2.
283	Phys2	Or-? Don't you think XX?	Walks backward towards EDphys1. Stands next to EDphys1.	
284	EDphys1	Are we- Are we [100 % sure that][5] it is the heart?		
285	NurseAN	[X suction X X.][5]	Works with the patient's endotracheal tube. Moves to the patient-monitor and fetches the suction device	
286	Phys2	Jaah 100 (.) [but][6]	Looks at Phys1.	EDnurse1 looks at display on the ECG device
287	EDphys1	[It][6] isn't hypoxia -	Standing outside the video frame	Phys1 and Phys2 are standing together with EDphys1.

288	Phys2	Yes, but you have this and this. I don't know myself, but anyway that XX CT [already.][7]	Standing at the edge of the image. Looks at EDphys1 and ((points)) twice at something lying on the logging desk	Phys1 looks at Phys2 and nods.
289	EDphys1	[But we][7] we would [like to have a XX][8]		NurseAN suctions secretion from the patient's mouth. AN is positioned close to the patients' right wrist - tries to insert an arterial line.
290	EDnurse1 is commenting on carrying out the ECG-test			
291	Phys2	Not necessarily a clear suspicion of that. (1) [Not because we have any clear suspicion of what it is then, but-][9]		
292 293	NurseAN informs AN about the patient's moving his arm and AN to decides to give the patient a sedative			
294	Phys2	You can [investigate but I XX up to the ICU myself.][11] Do you want to get him to CT-scanning?	Looks at Phys3.	Phys1 looks at Phys2 while she is talking. Then turns toward Phys3. Phys3 nods his head.
295	NurseAN asks for confirmation on AN's ordination			

296	Phys3	No. [I don't want][12] to interfere in that decision at all.	Looks at Phys2.	
297	AN	[XX.][12]	Looks at NurseAN.	
Part 2, after the anaesthetist's involvement in the CT-decision.				
298	EDphys1	OK. Is it an indication for inducing X hypothermia [then to][13] to do a CT of the brain?		
299	Phys2	[No.][13]		
300	Phys3	[No.][13]		
301	AN	No.	Straightens back, lets go of the patient's left hand, turns and walks towards Phys1, EDphys1, Phys2 and Phys3.	Phys2 outside the video-frame. Phys1, and Phys2 turn towards AN. Phys1is nods.
302	Phys2	No (.) no. I -		
303	AN	It's more out of- If there's doubt about the diagnosis [X][14]	Moves towards EDphys1 and Phys3.	
304	NurseAN	[It is bleeding][14] in the mouth here.	Suctions secretion from the patient's mouth.	
305	Phys2	Sedated. Get him up to the ICU.	Looks at AN.	Phys1 and Phys3 look alternately at AN and Phys2.
306	AN	Yes, but X XX.	Looks at Phys2.	

307	Phys1	X[X][15]	Stands facing EDphys1.	Phys3 stands facing EDphys1.
308	Phys2	[Yes.][15] True, that is more important.	Looks at AN.	Phys1 nods and turns towards the bed
309	NurseAN	Blood in the tube.	Suctions secretion from the patient's mouth.	
310	AN	But there's no rush to get him up to the ICU either.	Looks at Phys2.	EDphys2 looks at NurseAN. EDnurse1 is working with the ECG. The other team members are standing at the foot of the bed
311	Phys2	What?		
312	AN	There's no rush to get him [up to the ICU either][16]	Looks at Phys2.	Phys3 leans forward towards AN while AN is speaking
313	EDnurse 1	[Out of paper.][16]	Looks at ECG-machine.	
314	Phys2	[No.][16] It's just- But is he awake X or isn't he. We're going to get him into hypothermia after all just get him up to the ICU. (2) If [you want to get him to CT then-][17]	Looks at AN, Phys1 and Phys3.	AN is looks at Phys2 and nods while she is talking.
315	NurseAN	Did anyone hear that? [Is there anyone who heard][17] [that there's blood in the tube?][18]	Looks at AN.	

316	AN	[No but whether we should do a CT scan or not][18] that's one thing. But there is no rush to get [X][19]	Looks at Phys2.	
317	EDphys2	[Blood in the tube.][19]	Looks at EDphys1.	
318	Phys2	[No, it's not][19] like you have to sprint up to the ICU [but XX][20] is a CT scan necessary?	Takes a step towards AN and lifts up both hands as she speaks	EDnurse1 loads the ECG machine with paper
319	EDphys1	[What?][20]		
320	EDphys2	[Blood in the tube.][20]	Looks at EDphys1 and points back towards the patient with his thumb	AN walks up to NurseAN
321	EDphys1	[Blood in the tube.][20]		
322	NurseAN	[Look NAME (AN)][21]	Looks at AN and continues suctioning	
323	Phys3	[What a CT can tell us][21] is whether there are major signs of anoxic brain injury. And maybe whether there's an additional [component such as when -][22]	Alternates between looking at Phys2 and at the patient.	
324	Phys1	[Blood gas. Has that been taken][22] then?	Looks at EDphys2.	
325	EDphys2	No.		
326	Phys3	[XX][23]	Looks at EDphys2 and then turns toward Phys1.	
327	Phys2	XX blood gas [X.][23]	Shakes head slightly.	

328	Phys1	It would have been helpful to have a blood gas-		
329	EDnurse 1	[He][23] is reacting a bit with his (.) hand here you see.		
330	EDphys2	Yes [X. Could you get][24] [XX?][25]	Looks at Phys1. Points towards the emergency table.	Phys1 goes to the emergency table and gets equipment for blood gas testing which he gives to EDphys2.
331	AN	[Isn't there any Propofol left?][24] (2) [Give XX at least.][25] (1) Have you got any Propofol then? Don't [we have anything?][26](.) [Have you got Propofol? X][27]	Stands beside the anaesthesia table and looks at NurseAN.	
332	NurseAN	[What?][26] (2) [It's over there][27] [Over there on the table][28]	Points towards the emergency table.	EDnurse1 takes out the Propofol syringe and hands it to NurseAN who passes it on to AN
333	Phys3	[X looks as though it's one of those-][24] [One of those two.][25] And if there's no (2) [risk of XX][26] [that he's not cooled down so quickly-][27]	Stands together with Phys2 at the left side of the bed.	
334	Phys2	[Yes but-][28] (2) XX perhaps but that's exactly what is- Because he's not sedated at all (.) is he?		Phys3's telephone rings.

335	AN	[XX][29]	Administers Propofol to the patient	
336	EDphys1	[No. Yes][29] yes that is he has of course- was of course sedated during intubation then but [X-][30]		
337	Phys2	[Yes yes][30] but nothing more than that?		
338	NurseAN	Oh yes. [XX][31] [XX][32]	Looks downward at the suction catheter	
339	Phys3	[Hello.][31]	Answers the telephone.	
340	EDphys1	[He is moving his extremities after all][31]		
341	Phys2	[It doesn't matter][32] because it doesn't mean anything		
342	Phys3	The answer is no. @ Thank you.	Answers the telephone. Stands next to Phys2.	
343	Phys2	But (.) XX make a decision. If we're going to get him to CT then we get him to CT. Not [XX][33]	Shakes head. Looks out into the air.	
344	EDphys1	[Then we'll get][33] that across the corridor here and then we'll go up.		
345	Phys3	What?	Looks at EDphys1.	
346	EDphys1	The alternative is to take the CT now here and then we'll take him up to the ICU.		AN is placing a gastrointestinal tube

347	Phys3	My recommendation is CT now if we can get it fast.		
348	EDnurse 3	Shall I go and check with CT now?	Standing outside the video frame.	
349	EDphys1	Yes.		

Appendix 2, Excerpt B

Abbreviations: Phys1-2: Physicians from internal medicine department (Phys1 is an intern), EDnurse1-2: Nurses working in the emergency department, AN: Anaesthetist, NurseAN: Nurse anaesthetist.

Transcript key: X: word not audible, XX: words not audible, [words][2]: overlapping speech (the numbers indicate the order of the nearby overlap), –: unfinished words or sentences, (.): micropause, (3): seconds pause, (()): authors interpretation.

Situation: Patient is > 80 years old, living at home. Indication for hospital admission: inguinal pain and syncope. The patient was nodding adequately when spoken to (yes/no) and had possible face-drooping at ED admission. An oropharyngeal airway is established, and iv-fluid is ongoing. During this phase of work, the nurse anaesthetist is standing at the head of the bed providing the patient with oxygen, the anaesthetist is palpating the patient's inguinal pulse, physician 1 and ED nurse 1 are standing beside the bed, and ED nurse 2 is standing by the logging-desk while physician 2 is outside the room checking CT-lab availability.

Utterance number	Speaker	Utterance	Speakers action	Other action
288	AN	[XX][4] we are in the process of ((collapsing)) X	Stands by the bed.	
289	Phys1	What did you say?		
290	AN	We are in the process of X		
291	Phys1	Yes.	Goes to stand at the head of the bed, then turns and leaves the room	
292	NurseAN	Take a deep breath.	Looking down at the patient's chest	EDnurse2 goes to the foot of the bed.
293	AN	I haven't- I haven't fetched the defibrillator.		
294	EDnurse 1	I can get it. Then I'll fetch the automatic chest compression machine at the same time.	Looks at AN and then leaves the room.	
295	NurseAN	I need a bag-valve-mask.	Low voice. Looks around the room	
296	AN	Can you find a bag-valve-mask?	Looks at EDnurse2.	

297	EDnurse 2	Yes.	Goes to the wall where the bag-valve-mask is suspended	
298	AN	I'm losing the radial, no the carotid pulse (1) I'm just going to X. Start X.	Palpates the patient's neck. Turns toward the door as she talks (loudly). Then goes to the doorway	EDnurse2 is handing the bag-valve-mask to NurseAN.
299	NurseAN	Will you [connect to X?][1]	NurseAN receives the bag-mask ventilator from EDnurse2 and gives back the oxygen tube	EDnurse2 looks for the flowmeter
300	AN	[I'm losing the carotid pulse now.][1]	Standing in the doorway.	
301	Phys2	What?	Comes in to the room.	EDnurse1 (with defibrillator), Phys2 and Phys1 enter the room
302	AN	I', losing the carotid pulse.		
303	Phys1	XX.		
304	EDnurse 2	Can you take this?	Gives the oxygen tube to AN, who connects it	
305	Phys2	But then we must. He's living at home and [active and][2] must start CPR (3) and intubate him.	Leaning over the bed.	EDnurse1 connects the defibrillator.
306	Phys1	[Yes, he is][2] Yes.		
307	AN	Yes.	Looks at Phys2.	
308	NurseAN	Then I'll intubate him.		

Appendix 3, Excerpt C

Abbreviations: Phys1-2: Physicians from internal medicine department, EDphys: Physician working in the emergency department, EDnurse1-3: Nurses working in the emergency department, AN: Anaesthetist, NurseAN: Nurse anaesthetist. Radiographer.

Transcript key: X: word not audible, XX: words not audible, [words][2]: overlapping speech (the numbers indicate the order of the nearby overlap), –: unfinished words or sentences, (.): micropause, (3): seconds pause.

Situation: Patient is > 70 years old, living at home. Indication for hospital admission: syncope. The patient was awake and adequate with no pain at arrival. The anaesthetist is performing an ultrasound and preparing to place a central venous line in the patient's neck area. ED nurse 1 is preparing to insert a urine catheter, and the ED physician is standing beside the bed. The nurse anaesthetist is securing the patient's arterial cannula, and physicians 1 and 2 are standing beside ED nurse 2 at the logging desk. The bed is not functioning properly and cannot be tilted head down for the central venous line procedure, and a chest X-ray has just been taken.

Utterance number	Speaker	Utterance	Speakers action	Other action
311	AN	[Her venous volume][1] is good. The question is if it's simply turned off-	Looks at the ultrasound screen to be used during insertion of the central venous line.	EDphys leans forward to look at the same ultrasound screen as AN.
312	EDphys	Is it cardiogenic shock?	Looks at AN.	
313	AN	Well-. But, I mean. If you take- If you look at the vein here. Can you see it?		
314	EDphys	Yes, I see. It's enor[mous][2].	Looks briefly at the patient.	
315	AN	[Yes.][2] Yes.		
316	EDphys	She is actually lying well X as well.		
317	AN	That might [indicate that she has-][3]		

318	EDphys	[We could look at the][3] [vena cava also.][4]		
319	Radio-grapher	[Thorax is fine at least][4] or at least technically speaking. Must look at the image yourself. Take this away now. Anyone who could help to lift a bit? (3) [Thank you][5]	Looks towards EDphys. Removes the X-ray cartridge beneath the patient's back.	Phys1 approaches and lifts the patient on the opposite side of the radiographer. AN looks at the X-ray image on the screen at the back of the room.
320	AN	She does have a [wi-][5-] [She has-][6](2) [I think ehm-][7] Come and have a look here (3). What's his name again-?	Switches off the alarm on the monitor. Looks at EDphys. Beckons with her hand, "here"	EDphys stands with his back to AN at the foot of the bed and works at ultrasound machine 2.
321	EDphys	[Would you fetch more gel?][6]	Looks at EDnurse2, who is standing at the logging desk. Then turns towards AN	
322	X	I don't know where [XX][7]		
323	X	The small heating cabinet innermost over there.		
324	NurseAN	NAME (patient)? Are you awake?	Secures the patient's arterial cannula and looks briefly at the patient	
325	EDphys	XX	Looks at AN and brings ultrasound machine 2 and rolls it towards the bed	
326	AN	Come and look at the X-ray here. The mediastinum is widened.	Returns to the screen with the X-ray image	EDphys walks around the bed on AN's right-hand side. Together with Phys1 and Phys2

327	Patient	Ouch.		
328	NurseAN	Was it your hand that was hurting?		AN points at the X-ray screen
329	Patient	[Yes XX][1]		
330	AN	[I don't know if there's something ongoing][1] X just-	Looks at EDphys pointing to the X-ray screen	
331	EDphys	Yes	Looks at the X-ray screen.	Phys1 and 3 look over EDphys's shoulder. AN walks to the patient monitor and pauses the alarm, then turns to EDphys again.
332	AN	Yes. Eeh that is, it is X.	Standing together with EDphys, Phys1 and Phys2.	
333	NurseAN	Are you going to take more here?	Taking off her lead apron Looks at the radiographer.	Radiographer is moving the X-ray scanner.
334	Radio-grapher	[Finished, yes][2]	Pushes the X-ray scanner back into place	EDphys shrugs his shoulders slightly when he turns to walk towards Phys1 and Phys2
335	AN	[Now her blood pressure is falling.][2] Do we have some pressor-?	Looks at the patient-monitor.	EDnurse2 is standing with ultrasound -gel in his hand.
336	NurseAN	What would you like?	Takes off the lead apron and walks around the bed to put it away	
337	AN	Eeeh. What's the pulse rate then?	Unpacks the kit for central venous line placement.	
338	Phys1	[XX][3]	Walks behind EDphys, turning his	

			head back to look at Phys2	
339	NurseAN	I've got phenylephrine, ephedrine and [epinephrine][3]	Walks back around the bed and to the anaesthesia table next to AN at the head of the bed..	EDphys stands at the foot of the bed next to the ultrasound machine 2.
340	AN	[Give her][3] [ephedrine now][4]	Looks at the patient monitor. Continues unpacking equipment as she speaks.	
341	Phys2	[Could it mean anything other than XX?][4]	Walks up to EDphys, behind Phys1.	
342	NurseAN	X	stands next to the anaesthesia table next to AN.	
343	EDphys	Then I will- (2) Chest X-ray shows widened mediastinum. So, we must suspect there's an aortic dissection causing her low blood pressure.	Stands at the foot of the bed. Looks first at EDnurse2, who is standing behind him, then turns towards the room. Talking aloud.	
344-363	AN asks for a gauze mask. EDphys seeks supplementary information from the patient and then prepares for the ultrasound examination of vena cava. EDnurse1 informs the patient about inserting the urine catheter.			
364	AN	We are working a bit on (.)-. A bit from different angles here now. (4) Eeh. [Look at the liver][6] then eeh vena cava.	Putts on the gauze mask.	EDphys examines the thorax and abdomen using ultrasound. Phys1 leaves the video frame, walking to the left.
365	X	[XX][6]		Phys2 stands next to Phys1 at the outer edge of the video frame (left)
366	EDphys	I'll look at that too.		

367	AN	Yes. (1) I'm going to insert a central venous line, so we could start with norepinephrine if necessary while- because if it gets XX then it is after all- (2) [But then-][7]		EDnurse1 is preparing for placing a urinary catheter.
368	NurseAN	[Do you want ephedrine?][7]	Turns towards AN.	
369	AN	Yes. But someone mix norepinephrine in like a eeh constant infusion pump?	Does not raise her eyes from what she is doing while she is speaking	NurseAN walks around the bed with medication
370	EDnurse 2	Are you inserting one with a temperature sensor?	Standing at the logging desk.	EDnurse1 turns towards EDnurse2.
371	EDnurse 1	No sensor on the one I have here now, no. [Did you][8] want one?	Turns toward EDnurse2, who is standing at the logging desk.	
372	EDnurse 2	[Not?][8] XX		
373	EDnurse 1	Would you go and get one then?		
374	EDnurse 2	Yes		
375	AN	Let's see-		
376	EDphys	Doesn't it look widened here then?	Points at his ultrasound screen.	Phys1 and Phys2 stand next to EDphys and look at the ultrasound screen. Phys1 and Phys2 shake their heads
377	NurseAN	5 milligram ephedrine given	Adjusts the roller clamp on the IV administration set for the infusion bag connected to the intravenous catheter on the patient's left hand	EDnurse3 enters.

378	AN	Then we must keep an eye on XX. Let's see- Take a deep [breath][1]	Looks to the patient monitor and touches the screen	
379-393	AN asks NurseAN to help her to put on a sterile gown. EDphys says he can see vena cava on the ultrasound screen.			
394	EDphys	The vena cava inferior is hardly moving. [So it][1] is obstructive or cardiogenic shock.	Looks at AN	
395	AN	[XX][1](3) Yes.(1) But is it-. Should a pericardiocentesis be done, or is it-? (2) Let's see-	Waves her hands and turns toward NurseAN.	NurseAN stands at the cabinet at the back of the room EDphys looks at the ultrasound screen
396	EDnurse 3	XX	Brings new urinary catheter	
397	EDnurse 1	Yes. Could you help me with this [XX][2] NAME (EDnurse3)	Looks at EDnurse3	EDnurse3 helps the patient bending her knees.
398	AN	[Sterile glows?][2]		
399	EDnurse 3	XX. Someone is fetching them.	Looks at EDnurse3, then EDnurse1.	NurseAN walks towards the foot of the bed
400	AN	Someone's fetching them, OK.		EDnurse2 brings sterile gloves, which he gives to NurseAN
401	NurseAN	Bring XX with X and two of X	Takes the package of sterile gloves from EDnurse2 and goes to AN	
402	AN	Remind me to phone X. (2) Has a thoracic surgeon been called? Or a thoracic anaesthetist- to come and assess- (3) In terms of status.	Opens the glove package	EDnurse1 and EDnurse3 insert the urinary catheter
403	EDphys	Yes.		

Appendix 4, Excerpt D

Abbreviations: Phys1-2: Physicians from internal medicine department, PhysTh2: Physician from thoracic surgical department, EDnurse1-3: Nurses working in the emergency department, AN: Anaesthetist, NurseAN: Nurse anaesthetist, NurseAN student: Nurse anaesthetist student, Radiographers 1-2.

Transcript key: X: word not audible, XX: words not audible, [words][2]: overlapping speech (the numbers indicate the order of the nearby overlap), –: unfinished words or sentences, (.): micropause, (3): seconds pause.

Situation: Patient is > 70 years old, living at home. Indication for hospital admission: cardiac arrest. CPR and ROSC prior to hospital transport. The patient was unconscious but breathing spontaneously at ED arrival and the airway was secured with a supraglottic airway device. During this phase of work, physician 1 is standing beside ED nurse 2 at the logging-desk and two physicians from the thoracic surgical department are called and stand a small distance from the bed. Two radiographers are standing in the back of the room. The anaesthetist is standing near the patient's head and the nurse anaesthetist, nurse anaesthetist student, and ED nurse 1 stand close to the anaesthetist.

Utterance number	Speaker	Utterance	Speakers action	Other action
186	AN	X Haven't you taken the chest X-ray yet?	Looks at the radiographers standing behind the head end of the bed.	
187	Radio-grapher1	No. We haven't taken it yet. Shall [we-][1]	Looks at AN.	
188	AN	[NAME (Phys1)][1]. (1) [Should we take a chest X-ray?][2]	Turns towards Phys1.	Phys1 standing at the logging desk with his back to the bed.
189	Phys1	Yes.	Turns towards AN and walks towards the bed while he answers.	

190	Radio-grapher1	[Should he have any X-rays?][2]		
191	Phys1	Yes.	Looks at AN.	
192	AN	Shall we take it now before we intubate him?	Looks at Phys1.	
193	Phys1	Yes, we'll do that. We'll take a chest X-ray.	Looks at AN.	Radiographers start getting ready.
194	AN	X cuff-syringe have you seen it? [Isn't it somewhere here?][3]	Looks at EDnurse1 then turns towards the monitor.	
195	EDnurse1	[A cuff syringe, OK.][3] (1) [Can just take one like this then, can't you? (.) What XXX?][4]	Gets a syringe from the emergency table and goes towards AN	Radiographer 2 moves the X-ray equipment suspended from the ceiling. Radiographer 1 pushes the patient's bed slightly.
196-202	Radiographer1 and 2 speaks about preparations; how to position the X-ray unit and the patient.			
203	AN	Take out this [then XX][6]	Looks to NurseAN.	
204	Radio-grapher1	[Help me to][6] move. Could you [help me a bit][7] on that side?		
205	NurseAN	[What?][7]	Looks at AN.	
206	AN	We will [take that XX][8]	Stands by the head of the bed.	
207	Radio-grapher2	[Yes. Will just see][8] how far down we need it.	Adjusts the position of the X-ray unit.	
208	NurseAN	Take out -		
209-212	EDnurse2 asks for information for documentation.			
213	AN	What is this man's name?	Removes the patient's I-gel airway	
214	NurseAN student	His name is NAME (patient).	Looks at AN.	NurseAN is looks at NurseAN student.

215	NurseAN	NAME (patient) NAME (patient)	Bends over the patient. Speaks loudly	
216	AN	X suction. Can you find a suction device for me?	Looks at EDnurse1.	
217	EDnurse1	Yes.	Goes to find suction device.	
218	Radio-grapher2	Then it's ready for chest X-ray.	Moves away from the patient's bed.	Phys1 moves away from the bed
219	AN	Then you need to hurry up.	Leans over the patient's head.	
220	Radio-grapher1	You must move your head away or you'll be included in the picture.	To AN	
221	Radio-grapher2	X-ray taken.	Goes back to the bed.	Phys1 goes up to the bed.
222	EDnurse2	X-ray taken.		
223	AN	NAME (patient) (6) ehh. No contact NAME (Phys1) I think we'll intubate.	Looks at Phys1, who is moving towards the X-ray image behind the patient's bed.	Phys1 turns and looks at AN nodding. NurseAN gets a bag-valve-mask from the wall behind the head end of the bed. The patient monitor alarm starts.
224	NurseAN	Intubate? [Do you want that?][1]	Puts the bag-valve-mask beside the patient's shoulder and walks over to the anaesthesia table.	
225	AN	[The question is if I should-][1]		
226	EDnurse1	85 in saturation.		
227	EDnurse2	85 in saturation.		

228	AN	Must have suction now!	Turns toward EDnurse1.	EDnurse1 is setting up the suction unit that is standing on the floor.
229	EDnurse1	Yes, but I've got no adaptor.	Connects the suction unit standing on the floor.	AN walks towards the patient monitor but turns back.
230	AN	I need it now! (8) [can you watch out for his arm][2]	Moves from the patient's side to behind the head end of the bed. Has to climb between cables hanging between the patient monitor and the patient.	EDnurse1 is standing next to AN. Suctions secretion from the patient's mouth with a suction catheter.
231	Phys1	[I think we must have a CT scan.][2]	Stands at the X-ray screen looking at Radiographer2.	PhysTh2 walks towards Phys1.
232	Radio-grapher 2	XX requisition.	Standing next to Phys1.	
233	EDnurse1	Yes.		
234	AN	Suction in the mouth.	Looks down at the patient.	
235	Phys1	It looks as- a bit like-	Looks at the screen showing the X-ray images	PhysTh2 stands next to Phys1 and look at the screen showing X-ray images.
236	PhysTh2	XX it looks [as though there's XX][3]	Looks at Phys1.	
237	AN	[Suxamethonium and fentanyl.][3]	Turns towards NurseAN when he is talking about medications.	
238	Phys1	[Yes, mhm][3] It might well be that too.		

239	NurseAN	NAME (NurseAN student) Insert a stylet in the tube here.	Looks at the NurseAN student who is standing by the anaesthesia machine.	
240	NurseAN student	Yes. A stylet?		
241	NurseAN	A stylet.		
242	Phys2	Is there something I should requisition?	Walks towards Phys1.	
243	AN	XX [turn up-][4]	Holds the bag-valve-mask to his ear then points towards the oxygen flowmeter.	EDnurse1 turns up the oxygen flowmeter.
244	Phys1	[Requisition a CT][4] chest (2) and a [CT lung and head.][5]	Facing Phys2.	

Standards for Reporting Qualitative Research (SRQR)*

http://www.equator-network.org/reporting-guidelines/srqr/

	Page no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	1
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	3
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	4
Purpose or research question - Purpose of the study and specific objectives or questions	5
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	7
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	7
Context - Setting/site and salient contextual factors; rationale**	6
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	7
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	6
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	6-7

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	7
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	7
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	7
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	7-8
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	7-8

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	8-9
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	10-16

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	16
Limitations - Trustworthiness and limitations of findings	18

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	19-20
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	19

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

Reference:
O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
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