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Leadership in crisis situations: merging the interdisciplinary silos

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Abstract

Purpose – Complex clinical situations, involving multiple medical specialists, create potential for tension or lack of clarity over leadership roles and may result in miscommunication, errors and poor patient outcomes. Even though copresence has been shown to overcome some differences among team members, the coordination literature provides little guidance on the relationship between coordination and leadership in highly specialized health settings. The purpose of this paper is to determine how different specialties involved in critical medical situations perceive the role of a leader and its contribution to effective crisis management, to better define leadership and improve interdisciplinary leadership and education.

Design/methodology/approach – A qualitative study was conducted featuring purposively sampled, semi-structured interviews with 27 physicians, from three different specialties involved in crisis resource management in pediatric centers across Canada: Pediatric Emergency Medicine, Otolaryngology and Anesthesia. A total of three researchers independently organized participant responses into categories. The categories were further refined into conceptual themes through iterative negotiation among the researchers.



Findings – Relatively “structured” (predictable) cases were amenable to concrete distributed leadership – the performance by micro-teams of specialized tasks with relative independence from each other. In contrast, relatively “unstructured” (unpredictable) cases required higher-level coordinative leadership – the overall management of the context and allocations of priorities by a designated individual.

Originality/value – Crisis medicine relies on designated leadership over highly differentiated personnel and unpredictable events. This challenges the notion of organic coordination and upholds the validity of a concept of leadership for crisis medicine that is not reducible to simple coordination. The intersection of predictability of cases with types of leadership can be incorporated into medical simulation training to develop non-technical skills crisis management and adaptive leaderships skills.

Keywords Training, Coordination, Emergency, Crisis resource management

Paper type Research paper

Introduction

Consider the way status epilepticus is managed in the emergency department (ED). This is a life-threatening condition in which several epileptic seizures occur in succession without recovery of consciousness. It is treated with a very well-known algorithm, which would be familiar to health-care practitioners within emergency settings. A relatively predictable collective response to this condition implies that everyone within a health-care team is working with a shared understanding of what the situation involves and what each other’s role is. This has also been called “cognitive coordination” (Foss and Lorenzen, 2009) or a “shared mental model (Haig *et al.*, 2006) that can be derived from prior experience”. However, add the fact that the child patient has been the victim of a trauma, and the whole situation may take an unexpected turn. The complication requires new health-care providers to join the emergency care team – such as a trauma surgeon and an intensivist – wanting perhaps to prioritize the trauma injuries over the status epilepticus. We can see that, as the case becomes more complicated, so does the need for overall coordination of the individual physicians – otherwise leaders in their specific, unique tasks in the intervention – to ensure a shared mental model and to optimize care and patient outcome. Who should be the overall leader in such situations, that is, the “first among equals”?

We define leadership as explicit guidance to ensure team coordination. Crisis situations in medicine are relatively prone to errors. In pediatric emergencies, communication breakdowns and deficient leadership are estimated to contribute to as many of 70 per cent of perinatal deaths and injuries (Hunziker *et al.*, 2011). Preventable errors in the way people work together in medical crisis situations are a regular occurrence (Teixeira *et al.*, 2007). Studies have found that between 22 and 38.6 per cent of trauma patients suffered a clinical error, and the same percentage has been at risk of a preventable error (Chua *et al.*, 2009; Pucher *et al.*, 2013; Sugrue *et al.*, 2008).

In the high-intensity environment of crisis management, research is needed in the relationship between coordination and leadership – what people need to work together effectively. In general, up to 80 per cent of clinical errors have been found to stem from failures of care coordination – that is, aligning tasks between individuals or teams (Østergaard, *et al.*, 2004; Woolf *et al.*, 2004). Most trauma-related deaths occur in the ED during the resuscitation phase (Gruen *et al.*, 2006). Thus, crisis situations in medicine, although relatively infrequent, pose a significant threat to patient safety. When these situations occur, patient outcome is critically dependent on the effective and timely intervention by a coordinated interprofessional team (including, among others, doctors, nurses and respiratory therapists) and an interdisciplinary team (physicians from different disciplines such as emergency medicine [EM], anesthesia and otolaryngology – head and neck surgery [OTL-HNS]) (Marsch *et al.*, 2004; Eppich *et al.*, 2008). Critical situations that

may arise in the ED (and also in the operating room) are dramatic examples of such a need to coordinate the actions of multiple physicians from multiple specialties. If the emergency physician in the paper's opening scenario insisted on continuing to prioritize management of the status epilepticus after the arrival of the surgeon and intensivist, the traumatic injuries would have been ignored despite the likely greater urgency with which the traumatic injuries needed to be addressed.

We draw on the theory of *coordination* in our engagement with leadership because we consider specifically the interplay between "bottom-up" and "top-down" ways of organizing tasks in situations of complexity – with high differentiation, urgency and consequence (Nugus *et al.*, 2010a). Coordination is the alignment of tasks among people who are mutually dependent (Gkeredakis, 2014). Those who wished to coordinate tasks have been required to work actively, through routines, and over time (Faraj and Xiao, 2006; Reagans *et al.*, 2016). Active cross-boundary practices are needed to make work "visible and legible" to each other, allowing task-alignment, even among specialized functions (Kellogg *et al.*, 2006). The evidence for an increase in what has been called "post-bureaucratic" work, in which team-based coordination processes are to replace hierarchical structures, is weak (Gittell, 2001). However, what makes medical crisis situations interesting is that – supervisors who are responsible for a small number of people who undertake the same broad tasks or project in the same time and place can be highly influential (Gittell, 2001). This is because supervisors with a limited span of formal control provide coaching and feedback with others in close interaction (Gittell, 2001). Coordination becomes more difficult across professional and organizational boundaries partly because the cognitive load of holding and exercising specialized knowledge is relatively overwhelming (Aggarwal and Wu, 2014; Brusoni, 2005). However, even across organizational units, knowledge-sharing becomes more effective when it takes the form of interpersonal interaction (Tsai, 2002).

Although being present with a small team in the same time and place can be beneficial for coordination (Gittell, 2001), there is reason to believe that close interaction is not sufficient to align priorities in the case of medical specialists, especially under crisis conditions. It is certainly yet to be tested. As such, intense interaction among medical specialists in different disciplines would offer new lessons about complex coordination in a context of high differentiation and intensity. When acting in inter-professional teams, doctors have been shown to be unable to adopt changed practices without extension negotiation with other medical colleagues (Ferlie *et al.*, 2005). This may be due, in part, to the shared values and practices among particular medical specialties being so strong that they have been able to deliberately enact "nonspread" of innovations across other disciplines and occupations (Ferlie *et al.*, 2005). The work conducted in this area to date has tended to concentrate on formal policy and institutional leadership (Lornudd *et al.*, 2016; Elton, 2016; Pihlainen *et al.*, 2015). Contexts in which *ad hoc* teams that are made up of several different interprofessional and interdisciplinary members may be an ideal setting under which to examine the permeability of disciplinary boundaries and may have the ability to effectively negotiate leadership, or fail to enact such leadership.

Intervention in medical crises promises an informative test bed of coordination under conditions of intense specialization among non-hierarchical actors. Medical crisis situations provide a balance of a high degree of specialization with copresence, which has been shown in other industries to facilitate coordination, as indicated above. Most trauma interventions occur in the ED and involve interdisciplinary teams. There is at least a shared interpretation of the goal of a trauma intervention: to save the life of the person under trauma (Faraj and Xiao, 2006). At a minimum, people in different roles to coordinate their activities require some degree of "cognitive coordination", that is, shared cognitive categories that constitute a

relatively shared understanding of the situation and each other's role (Foss and Lorenzen, 2009). In the case of medicine, for specialized care to work, such shared understanding would need to be greater than the differences among the team members (Srikanth *et al.*, 2016). Yet, specialized work, to some degree, relies on having different team members in different roles and with specialized knowledge or skills. To care for complex patients, physicians with different skills sets are required. By definition, interdisciplinary teams are made up of experts who are regarded as competent practitioners in particular domains.

The challenge for interdisciplinary medical teams – and the promise of such a study to advance understanding of health-care leadership in complex situations – lies in the assumption that all specialists are often socialized to consider themselves team leaders of other health professionals (Nembhard IM, 2006; Nugus *et al.*, 2010b). As assumed leaders, each member of an interdisciplinary team may also approach the medical management of the same situation very differently. Thus, when physicians of different specialties are called upon to collaborate in managing a crisis, they may not share a unified approach and may not communicate effectively. In fact, each may assume a leadership role, potentially creating a lack of clear leadership for the entire team (Daniels, 2008). This can create communication errors and delays in effective and safe patient care, all of which can ultimately lead to medical errors and poor patient outcomes (Bion *et al.*, 2010). Ultimately, what this may mean is that coordination may have limits in the context of *ad hoc* crisis teams.

For example, with the challenges of a difficult airway in an ED, who is the physician most likely to assume a leadership role? It could conceivably be either the EM physician for whom the environment and resources are most familiar, the otolaryngologist for whom anatomy is most familiar or the anesthesiologist who has the most experience with this procedure. Such a study is necessary to determine whether or how situated interaction among highly differentiated specialists is sufficient to enable coordination. Given the independence of medical disciplines, an investigation into their cross-boundary work will show, as two broad objectives, the extent to which or how overt leadership is needed and what such complex coordination means for the way leadership can be understood, in relation to coordination.

Leadership is perceived to be an important role, and Carne *et al.* (2012) have proposed three main functions of a leader: to allocate roles and establish the behavioral and performance expectations of team members, to establish and maintain the team's shared cognition (shared mental model) and to facilitate team effectiveness by monitoring the external and internal environment (Carne *et al.*, 2012). Through this third function, the leader may encounter situations where there may be a need for new leadership or transition of leadership. To understand what is required from the leader, we need to know how the detailed dynamics of leadership work in crisis situations to inform future training interventions. Lack of attention to cross-specialty and non-technical aspects of medical crisis intervention has made it an error-prone and risky undertaking (Pucher *et al.*, 2013; Sugrue *et al.*, 2008). We need to understand what is important to clinicians in optimizing team cohesiveness in a medical crisis situation and what leadership might look like in fulfilling a leader's aforementioned roles.

The concepts of transition of leadership and simultaneous leadership have been discussed in the simulation literature (Carne *et al.*, 2012). These refer, respectively, to the processes of changing leadership through an activity and the way different leaders undertake the task of coordinating others' activities simultaneously. They have been described as challenging to accomplish (Flin and Maran, 2004), but little conceptual guidance is available on how a transition through leadership or the integration of different

micro-teams, contributing to a broader collective goal, can occur (Manser *et al.*, 2009; Østergaard *et al.*, 2011).

Leadership and health organizational scholars have lamented the lack of, or urged further, research on the way leadership functions in the interaction of interdependent agents in non-hierarchical and relatively unpredictable (that is, complex) settings (Thompson *et al.*, 2016; Greenhalgh *et al.*, 2010; Oborn *et al.*, 2013). Research is needed to understand how individuals involved in *ad hoc* teams involved in crisis management describe the medical and team management within interdisciplinary teams as a window into understanding the negotiation of leadership and care coordination. Such research could show the extent to which, in a highly intense and specialized setting, post-bureaucratic scholars are accurate in predicting the rise of informal coordination practices at the expense of formal leadership. Such an investigation can achieve the objectives of guiding improvement in interdisciplinary leadership and education and sharpening our understanding of health leadership. The specific aim of this study is to ascertain how clinicians perceive the role of effective leadership in effective trauma interventions.

Methods

The perspectives people have, which inform the way people do their work, are rarely talked about explicitly while doing work, or these are evident in the outcome of work. Therefore, we asked clinicians directly about their work in crisis interventions, using interviews, to find out how leadership was understood in terms of crisis situations.

Study design, setting and population

We focused our attention on physicians who provide emergency medical care as a classic exemplar of medical crisis intervention among doctors in different specialties. As the premier gateway to the hospital, the ED is a focal point for complex interactions among various medical and surgical teams in the hospital (Nugus *et al.*, 2010a). Different countries have different models of who “owns” the ED, and who formally leads trauma interventions, which influences the ED’s relationship with the rest of the hospital (Nugus *et al.*, 2013). The copresence of different specialties during traumas, in particular, means that interdisciplinary differences are brought into the sharpest focus in the ED.

The McGill University Research Ethics Board approved this study. We conducted semi-structured individual interviews with 27 physicians, nine from each of three different specialties involved in crisis resource management of difficult airway situations in different pediatric centers across Canada: Pediatric Emergency Medicine (PEM), Otolaryngology (OTL) and Anesthesiology. Although interviews do not necessarily reflect behavior, we were interested in how individuals discussed issues of leadership in crisis situations. Interviews reflect meanings attributed to certain phenomena, which are consequential because they orient the way people act (Charmaz, 2000). Our methodological approach was “constructionist” in that we were interested in the meanings the participants would make of their experiences (Charmaz, 2000) in medical crisis situations. We later compared units of data within and across transcripts to render as plausible as possible an interpretation of the data that neither sought a “truth”, nor accepted participants’ constructions at face value (Crotty, 1998). Our sample was purposeful, rather than random, in that we targeted prospective participants precisely because of their role and, therefore, relevance to addressing the study’s objective (Mile and Huberman, 1994).

We sampled clinicians to achieve a balance in the number of physicians per specialty and practice settings. This was intended to ensure maximum sampling variation among the clinician groups most likely to undertake crisis interventions (Kitto *et al.*, 2008). We sampled

only attending physicians to maximize the experience held in working across medical and surgical disciplines in crisis. The specialties included in our study were specifically chosen because they cover both ED and operating room (OR) settings, deal with critical situations with varying frequency, and either work together regularly or sporadically. Eligible physicians were identified from contacts within three pediatric centers, but owing to limited availability of participants, eligibility was expanded to include seven pediatric centers. These prospective participants were invited to participate by email by members of the research team.

Data collection

Through a detailed review of the relevant literature, we developed an interview guide aimed at eliciting clinicians' perspectives on leadership in crisis situations, which was reviewed and vetted by an expert group (see [Appendix](#)). The team was well-balanced in terms of clinical and research and research expertise. The first author [HP] conducted interviews between September 2013 and May 2014. The interviewing author and three other team members are MDs. The final author and another author have PhDs and are not clinicians. Of the entire team, four are females and two are males. All team members had taken workshops in qualitative research methods. The final author has a background in Sociology and Adult Education and is an experienced qualitative researcher. There was close liaison and training within the research team for conducting, and analyzing the data from, the interviews.

The average length of each interview was 20 min. As physicians, participants were reluctant to spend more time but spoke succinctly and relatively quickly. The interviews with local participants were conducted in a closed room and that with inter-province participants via telephone or Skype. The interviewer was the only person present with each participant. The interviewer was not known to the participants, although the participants knew that the interviewer was a physician. The interviews were conducted in English and audio-recorded, with written consent. Initial questions were used to collect brief demographic data. To maximize the breadth of potential themes, without leading the participants to particular topics or perspectives, participants were then asked open-ended questions about what is a "good" leader. They were then asked about the differences between specialties and about who should be leading in a specific clinical vignette provided to participants ([Appendix](#)). Examples of "good" and "bad" crisis situations – and what made them so – were also obtained. These questions were decided collaboratively among the researchers. We asked participants to focus on what made the management of particular crisis situations effective, whether any transition in leadership occurred at any point, and, if so, to elaborate on the nature and impact of that transition.

Data analysis

The audio-recordings were transcribed using [Nonotes.com \(2015\)](#) call recording system, an e-commerce transcription and call recording service provider, the accuracy of which was verified independently. Analysis of interview transcripts was directed to comparing and contrasting, both within interviews and across interviews, and, in a systematic way, points made in each of the interviews. As prescribed by conventional thematic analysis, the analysis proceeded in a series of iterative cycles ([Silverman, 2013](#)). Three researchers initially coded the transcripts independently, in the absence of an a priori coding framework, to maximize potential themes produced. Each coder, thereby, had a list of categories into which the participants' responses were summarized. The coders gathered to discuss the themes. Each coder delivered most of the same categories, though frequently, there were synonymous terms of particular categories rather than categories given exactly the same

names. The remaining categories that were uniquely produced by individual coders were not contradictory of other categories, so they were comfortably incorporated into a single list of categories.

The interviews were saturated after approximately half of the participants were interviewed, whereby no new themes were emerging (Charmaz, 2006). However, the interviewer continued with the full sample to ensure that the research team could determine if there were any patterns in views across particular specialties. The findings were presented at two clinical conferences, at which attendees asked clarifying questions and broadly found the results to be resonant and plausible.

The two forms of leadership that we articulate in the findings derived from the types of qualities and activities that participants described when asked about what made previous crisis interventions “good” or “bad”. Although not labelling them as such, participants identified activities of individuals taking responsibility for aspects of the intervention (e.g. airway), which was described as proceeding in a manner of role difference but shared understanding. Some of the activities reflected a perception that explicit agreement was needed over a designated leader, ideally negotiated at the start of the intervention. Participants made it clear, before the term “leadership” was broached, that there were so many variables at stake that leadership had to be directive and formal. Elaboration on these points – derived mainly from the interviewer seeking examples of previous interventions – enabled us to distinguish patterns in types of leadership appropriate for cases that followed familiar patterns from those that were relatively unfamiliar.

Results

Of the 27 interviewed clinicians, 44 per cent ($n = 12$) were female and 60 per cent ($n = 16$) had been in practice for fewer than 10 years. Participants represented four Canadian provinces, with a majority coming from the province of Quebec, and there were nine participants from each of the focal specialties (PEM, Anesthesia, OTL – Head and Neck Surgery). Demographic characteristics of study participants are described in Table I. We did not observe systematic patterns in responses based on experience, specialty or gender.

By way of orientation, we briefly summarize the findings. When reflecting on what made crisis interventions effective or ineffective, interviewees referred to non-technical skills rather than technical skills, endorsing the general importance of focusing on non-technical skills. One such skill is team leadership – coordinating the activities and direction of the

Demographics	<i>n</i> (%)
<i>Gender, n (%)</i>	
Female	12 (44)
Male	15 (56)
<i>Years in practice, n (%)</i>	
Less than 10	16 (59)
10-20	9 (33)
More than 20	2 (7)
<i>Province, n (%)</i>	
Quebec	15 (56)
Ontario	10 (37)
Manitoba	1(4)
Nova Scotia	1(4)

Table I.
Characteristics of
participants

intervention. Implicit in the responses of participants across the interviews was the suggestion that formal leadership was centrally important for effective crisis interventions. Furthermore, leadership took two broad forms. In one of those forms, various individuals took responsibility for micro-teams consisting of, for example, a physician, physician assistant, nurse, respiratory therapist and a medical student in the conduct of different specialty-specific tasks (such as responsibility for maintenance of the airway) that were conducted relatively independently from other such micro-teams. The second form of leadership was formally managing the overall conduct of the intervention (giving general instructions such as for all to stop and review the situation). We call these two forms of leadership “distributed leadership” and “coordinative leadership”, respectively. Thus, distributed leadership can be considered as the individual responsibility for performance of concrete, specialized technical tasks by micro-teams, relatively independent of other micro-teams in the intervention. Different specialties represent unique leadership in their respective disciplines, reflected in their different tasks. Coordinative leadership, by contrast, is the overall management of the team effort, which included distribution of tasks and allocation of priorities for the team.

Relevant to each of the two types of leadership, we also identified two types of circumstances confronting critical interventional teams: “structured” and “unstructured” situations, existing on a continuum but relating to the degree of need for coordinative leadership. Structured situations are those characterized by a defined protocol such as status epilepticus or supraventricular tachycardia, referred to earlier. Distributed leadership was more amenable to structured, predictable situations. Unstructured situations, on the other hand, are those characterized by unpredictability, in which predefined protocols are less useful or must be interpreted such as conditions of multisystem organ failure or polytrauma. The more unstructured a situation was, the greater was the perceived need for overt coordinative leadership, to coordinate the efforts of the team. We focus on the intersection between the degree of formality of leadership needed and its relationship with coordination, on the one hand, and the degree of certainty or uncertainty offered by an individual case on the other hand. This allows us to conclude that leadership in crisis situations is the management of, and direct intervention based on, circumstances that shape the difference between the need for interdependent coordination, distributed leadership and coordinative leadership. We elaborate on these patterns below.

Distributed leadership: aligning mental models of specialized micro-teams

Participants assumed that other participants in shared crisis interventions had the specialized skill to take responsibility for a particular organ system or body part in the trauma, such as airway, localized trauma or circulation. We call this “distributed leadership”. The challenge was to combine those various specialized functions into a cohesive, interdependent effort. Prior clinical experience often contributed to structured situations for participants in crisis interventions. Participants in crisis interventions had built up a stock of expectations about: what people in particular roles or with particular levels of experience are supposed to or are able to do; what happens under certain contextual conditions (such as spatial arrangements and availability of particular objects); the consequences of experience on particular patients and interventions needed; and even individual personalities, according to which the other aforementioned expectations are moderated. Implicit – and shared algorithms – emerge from these. These are shared “mental models”, which are so embedded in the physicians’ collaborative work that they are rarely made explicit.

Aligning roles

Participants exhibited patterned expectations of particular roles in a crisis intervention – what could be done and what was usually done by people in particular roles or allocated particular tasks. Each crisis situation requires distinctive roles to be performed (such as management of the airway and management of circulation), which generally cuts across disciplinary roles (such as EM, OTL and anesthesiology, and even from physician to nurse). The capacity to work together was even framed as an implicit understanding of roles, available without necessarily negotiating them explicitly. One participant, unprompted, described this in the explicit terms of a shared mental model among physicians in different specialties:

We shared the same mental model of how to prepare for such cases and she understands very well what we have to do from an anesthesia stand point. I have worked with [OTL-HNS] surgeons for a long time. So, I have a good understanding of what their requirements or what their needs are. (Interview, anesthesiologist)

Sharing a mental model facilitates the team's understanding of each member's role. Using the example of simulation, participants suggested that clinicians were increasingly learning to adopt shared mental models:

I think now people are starting to share mental models (. . .). The expectations of people are much more predictable now as compared to what they were before. (Interview, anesthesiologist)

Alignment of expectations of level of experience

There was reported tension between specialized role and positional seniority, given that one's hierarchical position either as a resident or physician, for example, cuts across disciplinary boundaries. Many of the emergency physicians claimed that difficulties arise when the presenting specialist to a critical situation in the ED is a senior resident instead of an attending staff physician:

[You can find that][. . .] it is a resident coming down and not a staff (physician) which is always in my opinion a bit problematic because if you ask a fourth-year resident to come down and run a resuscitation where there are three emergency staff in the room – a staff anesthetist and a surgeon watching the – right away you have created an environment that is not ideal for them to take over as a leader. (Interview, PEM physician)

Another emergency physician asked:

Why is a fourth-year ICU resident in charge when we have more senior people standing around doing nothing? So, yes, I think experience matters; I think it is just a reality. (Interview, PEM physician)

Aligning expectations of personal and disciplinary attributes

Individuals oriented their interactions according to expectations of characteristics believed to be common to not only particular sub-specialties but also to personality idiosyncrasies of those with whom they were personally familiar. Individual characteristics of a particular physician were also deemed to be important in the exercise of leadership, such that individual personality and experience emerged as important variables in crisis management leadership. Personality was proposed not only as a function of an individual physician but also as a function of a particular specialty, although the value of this was often doubted:

I think that there are some stereotypes between different specialties, that people think all emergency medicine physicians are basically a bunch of cowboys and that surgeons are very gung ho and macho kind of stereotype. I think it is not actually very helpful and really not often very true and I think that you have different personality types and different leadership styles within specialties as much as between specialties. (Interview, anesthesiologist)

Unique features of the context of a particular event might also influence a physician's approach or reaction to the patient's condition:

I think there is a lot of different leaderships according to a person's personality – and also depending on the situation. So, in some situations, a surgeon, for example, might be very directive, versus an anesthesiologist in the same situation (who) could be maybe more collaborative or communicative. (Interview, anesthesiologist)

Therefore, there is resonance among physicians of particular characteristics that roughly cohere to particular specialties, although the strength of credibility of such stereotypes is a matter of contention. Within such comments we can identify that individual personality intersects with role, and that if two physicians believe they have the same role and are thus competing for leadership, personality may prevail.

Mere personal familiarity with the individual identifying as the leader of a particular intervention also played a role in trust, which in itself was perceived to lend credibility and facilitated leadership for this person. Knowing someone's individual personality and tendencies is also a form of predictable knowledge on which others oriented their actions. The perceived overlap between personality and experience was evident in the following account:

You have different egos and you have different levels of training. True, [you] need to have exposure to navigating those elements in addition to knowing the medicine and the principles of if you are going to, say, [achieve] "closed-loop" communication. (Interview, PEM physician)

Thus, clinicians act and interact on the basis of shared expectations (that is, relatively structured circumstances) and adjust their behavior according to their experience of the work context, patient conditions, disciplinary roles and levels of experience. When there is relative familiarity, i.e. structure, and, therefore, predictability, even including some adjustment based on personality differences or individual idiosyncrasies, participants in crisis intervention are free to focus on their unique task-based roles, such as anesthesiologists securing the airway.

Coordinative leadership: managing context and allocating priorities

Unstructured cases: the role of a leader. Conditions of relative uncertainty – that is, unfamiliarity – require one of the participants to step up from their task-based role-specific actions and manage the information exchange among the clinicians. This need can emerge from an unusual patient condition or an unexpected manifestation of particular symptoms or response to an intervention; an unknown participant who performs differently or sub-optimally from what would normally be expected of a particular discipline, level of experience or known individual who might be feeling unwell; or a change in the physical setting, such as a missing instrument requiring improvisation.

It is not only the unexpected decline in a patient's condition, for example, that delivers uncertainty. The commencement of a crisis intervention is, by definition, a period of profound uncertainty. Although participants might know individual colleagues and have clear and shared role expectations, they will never have experienced the exact same set of variables present in any given medical crisis. Commencement of the intervention, then,

requires higher level coordination before individuals can burrow into their own specialized technical tasks. The allocation of roles at the beginning of a particular case, and the role expectations of a particular specialist, was deemed to be important for clinicians to be able to work together to manage a crisis. A more abstract level of leadership, beyond technical tasks, was implied and captured aptly by an emergency physician who spontaneously spoke about leadership as:

[. . .] One defined leader for the team and [. . .] defining the role clearly for the other physicians of other specialties. (Interview, PEM physician)

Formally designating a “leader”. Many participants reflected the need for a formally designated leader to provide the team with knowledge of each member’s role designation and each member’s specific task delegation for a particular crisis situation. As one participant put it:

Everyone should know their roles before it happens, and the best way I think for that to happen is to have an agreed-upon system and then to practice [on that basis]. (Interview, PEM physician)

Transparency of role was seen to enable what has been called “situational awareness” (Gaba *et al.*, 1995) for the team as a whole, enabling spontaneous and restorative actions to occur if particular team members were dissatisfied with the progress of the intervention:

You need to analyze the situation: Are you the best person to lead the case? Sometimes, some people just need to be the leader or they are not comfortable. I think you need to analyze and see if at that moment in that situation [. . .] you are there for support or to give suggestion, or if you need to take the lead”. (Interview, OTL-HNS physician)

The leader’s role in a situation of high uncertainty is to make sure that tasks are effectively done in the appropriate order. This can be observed in many acute situations:

It was [. . .] a very subdued leadership in the sense that everybody naturally assumed the technique they were most familiar with. Because everybody knew what they had to do and how good they were at doing it; it just seemed natural to everyone choosing what to do and doing it. (Interview, anesthesiologist)

In the above situation, there was sufficient structure, or certainty, that high-level leadership, coordinating others’ activities, appeared not to be needed. An example of an unstructured case, by contrast, would be a multi-trauma patient arriving in the ED. There would be a high degree of unfamiliarity. Despite the frequency of multi-trauma patients, these patients can be extremely variable in their presentations, and these cases tend to require some overall direction by an individual, coordinating others’ tasks:

The fellow continued to remain as the overall leader of the case. The chest tubes were actually put in by myself and the ICU staff, and then other roles, like airway was done by the anesthesiology resident that was there, and other roles were sort of taken on by different residents as they were required. (Interview, PEM physician)

Thus, the need for a leader who will coordinate the task performances, and who will overall direct the team, the non-technical level becomes relevant where particular roles need to be assigned or confirmed.

You need to identify that you are accepting that leadership role, to best bring out the abilities of people who are working with you. So you optimize everyone at the table, optimize their abilities and their special skill set that might optimize patient outcome. And you need to have the awareness of that leadership role. (Interview, OTL physician)

Overall leadership is often static but can become more fluid:

Transitions of leadership [. . .] should occur after critical situations have subsided, never within it, or when one's expertise is surpassed. (Interview, PEM physician)

Thus, the leader role can shift, a process which ought to be clear to other team members.

Spatial context and the alignment of sub-specialty perspectives

Aligning sub-specialty perspectives is important for not only achieving uniformity. It is about achieving alignment of unique perspectives, each forming specialized parts of the idealized whole, which participants strive to share. The importance of space, for example, is featured regularly in the interviews and is intersected with roles. Indeed, the concept of space and its effect on leadership differed according to the interviewee's clinical specialty. Emergency physicians implied that because they work and would feel comfortable in their own environment (the ED), they would, ideally, be the leader in a crisis situation in the ED. As one said:

The emergency doctor should know his or her environment and team the best. (Interview, PEM physician)

This places the emergency physician in the leadership role at the beginning of any case within the ED. By contrast, anesthesiologists and OTL surgeons were likely to be called to different parts of the hospital. Both anesthesiologists and OTL physicians reported feeling most comfortable in the operating room despite the ability to be called to critical situations throughout the hospital. Many anesthesiologists and OTL surgeons voiced the need to rapidly analyze the situations to determine what type of leadership role they would take:

When we arrive, we introduce ourselves. We don't know who is in charge. Sometimes we will see it right away but sometimes we don't know; we don't know what [the patient's] problems are. [So] we don't know what [the leader] expects us to do. (Interview, anesthesiologist)

The expectations of that leadership role can also be rapidly evaluated in certain situations.

By the time I get there, [the other clinicians] are really stuck and they are very happy to give up control – in which case I walk straight to the head of the bed and do whatever I need to do. But when you don't know what is going on and you're unsure, then it is not going well. People start looking for other leaders to help them through a difficult situation. (Interview, OTL-HNS physician)

Thus, the unfamiliarity of the environment itself may compromise the team's chances of working optimally together – that is, optimally supporting what each one has to do. Emergency physicians also echoed this sentiment, one interviewee saying that yielding the leadership role to a physician unfamiliar with the environment may be a recipe for unclear and difficult leadership:

Why were they put in this situation, when we know in advance that it is not ideal for them to come down and be handed over care? [. . .] In other words, if a hockey player shows up for another team it is not going to go very well because they belong in [another] team. (Interview, PEM physician)

Discussion

This paper shows that formal leadership – what we have called “coordinative leadership” – is needed in situations of high complexity involving high specialization, urgency and consequence. The study also illuminated the environmental conditions that shape the

relationship between coordination and leadership under complex conditions – that is, when neither informal coordination nor distributed leadership is enough to maximize the outcome. Distributed leadership is the management of micro-teams that perform concrete technical tasks that generally align with the unique roles of particular specialties. Coordinative leadership, by contrast, is the overall management of the case and the allocation of priorities of the entire intervention.

In terms of navigating a transition of crisis team leader during a crisis intervention, and how different teams can function simultaneously, previous literature had been conceptual rather than empirical (Carne *et al.*, 2012). We can conclude that leadership transition must be made explicit by formal announcement and that leadership of simultaneously operating sub-teams can only work effectively if crisis situations are relatively structured. This means that cases are familiar enough to the team members for them to follow a relatively familiar pattern. Such familiarity, whether consciously or unconsciously realized, matches a shared “mental model” or “cognitive coordination” of how each should respond and how those responses are integrated (Gkeredakis, 2014). We define leadership in a crisis situation, then, as the navigation of and active intervention based on the conditions that distinguish interdependent coordination, distributed leadership among sub-teams, and coordinative leadership among the whole team.

Greater attention to the need for integrating teams of specialists and representatives of various organizations gave rise to the prospect that work was becoming post-bureaucratic. This means that workers are becoming increasingly interdependent and that formal supervisors are no longer, or less likely to be, needed (Gittell, 2001). When social interaction characterizes the way organizations are managed, knowledge sharing has been shown to be more effective than manifesting through formal hierarchy (Tsai, 2002). Coordinating activities with others is an ongoing, active accomplishment in which interdependent people make their work comprehensible to others (Faraj and Xiao, 2006; Reagans *et al.*, 2016; Kellogg *et al.*, 2006). Coordination, with less reliance on formal supervision, is more easily accomplished when a supervisor has a relatively limited span of people and is copresent with them, engaging in the moment (Gittell, 2001). Yet, there was reason to believe that such organic modes of work might not spell the decline of formal supervision in medicine, much less acute medical crises, in contrast with other industries. The identity boundaries around medicine and around particular medical sub-disciplines make it challenging for physicians in different sub-disciplines to work together. Information and innovation across those boundaries flow at doctors’ discretion (Ferlie *et al.*, 2017). Furthermore, doctors are socialized to be leaders of interprofessional teams (Nembhard IM, 2006, Nugus *et al.*, 2010b). This makes the negotiation of leadership in medical crises in the ED a particularly appropriate case study of the relationship between coordination and leadership under complex conditions, given the copresence of multiple individuals trained to “be the leader” within their own practice setting.

Work reported here shows that both distributed and coordinative leadership is required to manage complex patient cases – depending on the degree to which a case can be considered to be either “structured” or “unstructured”. A structured case includes a case in which defined roles, protocols or knowledge exist or shared mental algorithms, from prior experience, that take the form of specific and shared expectations to which individuals orient their actions and interactions. Unstructured cases, by contrast, involve unexpected deviations in one or more such expectations. (See Figure 1 below).

A case that takes an unexpected turn or deviates from predetermined medical management represents an unstructured context. The commencement of a crisis intervention is, by definition, an “as-yet-unstructured case”. The importance of each type of

leadership depends on how structured or unstructured each case is. Each case may have structured and unstructured components. The greater the unstructured component, the greater the need is for coordinative leadership; the greater the structured aspect, the greater the need for task-based leadership. These factors determine when coordinative leadership is needed to take over from distributed leadership.

Limitations

As a potential weakness, this study focuses on a relatively small number of clinicians. However, as a qualitative study, what is most important is that the sample range was appropriate, covering disciplines often implicated in medical crisis management. Furthermore, the topics addressed in interviews optimized the depth of exploration familiar as patterns of role and work in crisis situations generally, thereby allowing relative transferability of findings from a small number of participants. The discussion narrowly focused on topics of professional medical care, ensuring that the interviews drew on shared understandings of work conducted by clinicians in relatively replaceable roles across the country. Nevertheless, care needs to be taken with assuming its transferability across other sites, even though many training programs and university sites were represented in our participant sample. The findings are as transferable as the settings are similar. In any case, the study addresses aspects of interdisciplinary work that the literature has shown has resonance among clinicians working in crisis situations (Piquette *et al.*, 2009; Reddy *et al.*, 2009). Therefore, the findings, at the general level of the intersection of individual and context characteristics ought to be relevant in other specialized medical settings.

Observational research has often been justified by distinguishing what people say and do (Hammersley, 2006). However, we did not intend to find out from the interviewees what they would or would not do in a particular trauma situation, assuming to have taken their words as some sort of proxy, however imperfect, of their situated behavior. Given the purpose of the current study, interviews were the most appropriate data collection method. However, future work should focus on the observed behavioral patterns, rather than the individual reflections of leadership in interdisciplinary crisis contexts. Therefore, we recommend that, in the future, direct observational research would elaborate on transitions across leadership types and amongst clinicians from different specialties and occupations to inform improvements to clinical practice.

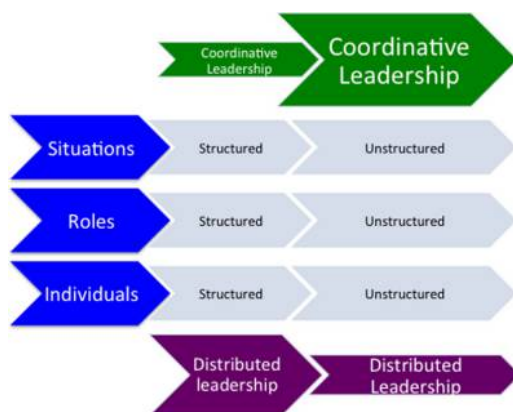


Figure 1.
Relative importance
of leadership types
due to the structured
or unstructured
nature of situations,
roles and individuals

Conclusion

This study has illuminated the conditions that give rise to, and the indicators of a need to, transition from relatively independent teams featuring “distributed leadership” to more directive “coordinative leadership”. This does not mean that traditional “top-down” leadership is necessarily desirable in all medical crisis situations. The primary research agenda from this study is to ascertain the conditions under which organic coordination – characterized by minimal supervisory interference and valorized by proponents of post-bureaucracy – can develop in a high-intensity interventional environment involving highly specialized “firsts among equals”. Research is also needed to compare these findings with other high-intensity and complex situations outside of health care such as disaster management. As suggested above, observational studies of team responses to changes in conditions of certainty are also needed to further our understanding of the “lived dynamics” of these *ad hoc* teams.

As implications for policy, practice and education, we have learned that key to the success of a crisis intervention team is the ability of a leader to adjust to the various spatial-contextual, patient-based, role-based, experience-based and individual influences evident in this study, and still provide a shared mental model for the care of critical patients. This study demonstrates the variety of individual and contextual leadership skills needed in crisis intervention, such as traumas in the ED. These overlap depending on the degree to which the situation is structured, or unstructured, as circumstances are, or become, unfamiliar. Crisis interventions, in particular, require urgent intervention in often *ad hoc* teams. This raises the stakes for appropriate leadership – and the prospect of uncertainty. Crisis intervention teams need coordinative leadership – beyond the performance of tasks that individuals are taught to contribute from their unique and specific disciplinary roles or allocated roles. These can provide a benchmark for performance measures, both individually and organizationally, and indicate specific skills to target in simulation exercises of crisis resource management.

Training and experience can, to some extent, render what would have been regarded as unstructured situations more structured. Traditional simulation is currently used extensively to teach non-technical skills in crisis and other interventions. Their training may ultimately be harmful if such education focuses only on task-driven, as opposed to systemic, aspects of leadership or the static role of a single overall medical leader. Nevertheless, the challenge remains that physicians are currently trained within their discipline. Specialization serves a positive function and places a role in securing technically optimal care. We would never advocate uniformity, but to optimize such specialization through complementarity. We argue that such complementarity can be advanced through increased formal interdisciplinary and interprofessional simulation training (Weller *et al.*, 2003; Yee *et al.*, 2005; Steadman *et al.*, 2006; Birch *et al.*, 2007). Policy-makers could incentivize the structured education and continual refinement of non-technical skills, as patient outcomes and safety depend strongly on these.

Although engagement in simulation is increasingly popular, education for non-technical skills is still largely sporadic and reliant on particularly committed individuals and sites. Such education should be systematized. More than education, however, systematic policy interventions are required to incentivize greater interdisciplinary and interprofessional case coordination and behaviors. Systemic incentives and educational interventions to develop these skills and practices must be valorized as central to clinical work, not just “added extras”, if we pride ourselves on improved technical intervention under conditions of uncertainty. If we know that non-technical skills are important, particularly in complex critical care, why are we leaving them to chance?

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“Interspecialty leadership in Crisis Situations”

Semi-structured interview schedule

Thank participant; introduce self again; brief project outline; brief outline of role of interviews; process: will ask set questions and may follow up; explain consent; seek permission to audio-record; explain that can stop recording at any time; explain can revoke consent at any time during interview or in the future; can choose not to answer particular question/s; will follow up results with them; give copy of information sheet and revocation of consent sheet again; electronic files and transcripts will be held confidentially and securely; they will not be able to be identified in the presentation of results; the interview will take approximately 20 minutes.

1. Demographic data:
 - a. Discipline: _____ b. Organization: _____
 - c. Length of time working in health care since graduation: _____
 - d. Length of time in present organization: _____
2. Please think about a crisis intervention where everyone worked really well together. Tell me what happened.

Prompts:

 - a. What made it effective?
 - b. How was the decision made of who would take the lead of patient care?
 - c. Was there one or multiple leaders? See question 6
 - d. How would u define what a leader is? What leadership is?
 - e. If multiple, did a transition of leadership occur? Or was there competition amongst leaders?
 - f. Who was/were the leader(s)? Was it a function of their role, circumstances or their individual personality?
 - g. If there was transition of leadership, what role, if any, did it play in working well together?
3. Please think about a crisis intervention where everyone worked really badly together. Tell me what happened.

Prompts:

 - a. What made it ineffective?
 - b. How was the decision made of who would take the lead of patient care?
 - c. Was there one or multiple leaders?
 - d. If multiple, did a transition of leadership occur? Or were there leaders competing amongst each other?
 - e. Who was/were the leader(s)? Was it a function of their role, circumstances or their individual personality?
 - f. What role did the qualities of the leader(s) play in working poorly together?
4. Please tell me about someone who you think is a role model in the management of crisis situations, either now or in the past? (You don't have to name them).
 - a. *Prompt:* Why?
5. What is a good leader in a crisis situation whether it be surgical or medical?

Prompts:

 - a. Why?
 - b. Can you please give me an example?
 - c. How important is it to have a good leader?
 - d. (May add this question if needed or if conversation moves this way: What difference does experience make?)
 - e. When might it be appropriate for a good leader to be a follower?
6. Who should lead in a crisis situation whether it be medical or surgical?

Prompts:

 - a. Why?
 - b. Under what circumstances should there be a change in leadership”?
 - c. If so, how should leadership change occur?
7. What are the differences you notice between different disciplines in working together in a crisis situation?
 - a. *Prompt:* eg. Emergency, surgery, anesthesia, ICU, ENT, neuro-surgery, neurology?
8. What skills do leaders in crisis situations within the field of medicine need?
9. How should leaders of crisis situations be trained?
10. Are there differences in how crisis situations are managed you'd like to share about other places you've worked or heard about?
11. Is there anything I should have asked and didn't?

Thank participant for their time and participation.