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Helping fluid teams work: A research agenda for effective team adaptation in healthcare

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ABSTRACT

Although membership changes within teams are a common practice, research into this phenomenon is relatively nascent (Summers et al.; Acad Manag J 55:314–338, 2012). The small literature base, however, does provide insight into skills required for effective adaptation. The purpose of this effort is to provide a brief research synopsis, leading to research hypotheses about medical team training. By generalizing previous scientific findings regarding skills required for effective membership adaptation in different kinds of teams, we posit mechanisms whereby teamwork training might also support adaptation among medical teams (Burke et al.; Qual & Saf Health Care 13:i96–i104, 2004 and Salas et al.; Theor Issues Ergon Sci 8:381–394, 2007). We provide an overview of the membership change literature. Drawing upon literature from both within and outside of the medical domain, we suggest a framework and research propositions to aid in research efforts designed to determine the best *content* for helping to create adaptable medical teams through team training efforts. For effective adaptation, we suggest ad hoc teams should be trained on generalizable teamwork skills, to share just "enough" and the "right" information, to engage in shared leadership, and to shift from explicit to implicit coordination. Our overarching goal was to present what is known from the general research literature on successful team adaptation to membership changes, and to propose a research agenda to evaluate whether findings generalize to member changes in medical teams.

KEYWORDS

Team training, Team adaptation, Membership fluidity, Membership change, Membership loss, Adaptive team performance

SYNTHESIZING LITERATURE ON TEAM MEMBERSHIP CHANGE: A BRIEF SYNOPSIS

Interactions among team members play a fundamental role in behavioral medicine. As such, the study of team composition–particularly membership changes that frequently occur in professional work teams–is necessary. Referred to as membership fluidity [1] or open medical teams, team membership change occurs for many reasons: new opportunities, low performance,

Implications

Practice: Medical teams may benefit from teamwork training that focuses on generalizable skills, information sharing, shared leadership, and implicit coordination to successfully adapt to non-routine events.

Research: Research is needed to evaluate whether teamwork training improves the adaptation of medical teams.

Policy: Hospital administrators should dedicate resources to evaluate whether teamwork training improves the adaptability of their medical teams.

economic conditions forcing layoffs, and–as is frequently the case in behavioral medicine–task requirements/workload. Consider an emergency room on any given night. A team of doctors and nurses is assigned to one patient. However, a more critical patient arrives and requires the expertise of one particular team member, who is then reassigned to that patient. Depending on the number of patients in the hospital at that time, there may not be replacement personnel available. During such transitions, it is imperative that the effects of these membership losses/exchanges (e.g., shifting of tasks among members) be handled effectively to minimize patient safety risks.

The purpose of this effort is to provide a brief synopsis of existing adaptation literature with regard to membership change. Although membership change is common practice, research into this phenomenon is relatively nascent [2] and generally exists only with regard to ad hoc student teams in various settings. This literature base, however, does provide insight as (1) there is empirically derived, scientific evidence to draw upon and (2) we suggest that some characteristics of these ad hoc teams are relevant to medical teams. To provide examples of these characteristics, the teams utilized in the previously mentioned experiments had varying levels of familiarity among teammates (i.e., some members had known other members previously and worked with them, while others had never worked together). Additionally, these teams had varying levels of task skill among members. Although this variation is not as great as can be found

in medical teams (i.e., a seasoned surgeon with a medical resident), the variation in skill level provides additional evidence that these same findings *may* generalize to other settings with similar skill variation among teammates. Therefore, we begin with an overview of the literature, providing a glimpse into what is known regarding membership adaptation. We then suggest research propositions regarding training content, derived from the literature synthesis. The overarching goals are to demonstrate the importance of membership adaptation to the medical community and spur future research based on the degree to which these findings may be relevant to medical teams.

WHY ADAPTATION?

In dynamic operational environments characteristic of medical professions, performance outcomes (e.g., patient safety) largely depend on the ability of teams to quickly alter actions in response to rapidly changing conditions [3]. Alonso and colleagues [4], drawing upon previous research by Salas et al. [5], argue for a number of core components to successful teamwork within medical domains (e.g., mutual performance monitoring, backup behaviors, and adaptability). They suggest improving these key constructs will significantly benefit the effectiveness of medical teams. Adaptability, in particular, is highly valued due to the nature of task demands—demands that require flexibility and versatility [6], which are frequently encountered by medical teams.

Team adaptation is defined as "a change in team performance, in response to a salient cue or cue stream, that leads to a functional outcome for the entire team" [7]. Organizational demands across work domains, and especially in the medical realm, require rapid reconfiguration of teams. This results in what has been labeled "open groups" [8] or more recently, "membership fluidity" [1]. Membership fluidity describes the dynamic flow of members in and out of teams, resulting in a change to the team composition [1, 8–11]. This process can describe (1) integration of a new member into an existing team, (2) a change in membership where an existing member is lost and a new member joins, or (3) a loss of an existing member without replacement. The loss or exchange of a member is considered a cue requiring adaptive behavior to maintain effective performance. In all teams, membership fluidity is considered particularly problematic in reducing teamwork as members have both a diminished sense of (1) actually belonging to a team and (2) belief in the ability of all members on that "team" to effectively accomplish the job [12].

MEMBERSHIP CHANGE LITERATURE

Traditionally, there have been two approaches to studying membership adaptation. One line has focused on identification of constructs relevant for selection of team members. For example, LePine [13, 14] found that cognitive ability, learning goal orientation, achievement, and openness to experience predicted adaptive performance. DeRue and colleagues [15] considered various structural approaches to downsizing a team (i.e., membership loss) and the personality factors that can mitigate negative effects of such disruption on performance. Results indicated that emotional stability and extraversion are key compositional variables aiding teams in overcoming the loss of a leader, integrating a leader into the team (i.e., removal of hierarchy), or losing a member while maintaining hierarchy.

Yet, selecting the composition of a team based on these characteristics is often impractical—or even impossible—in real-world settings as teams are often comprised of employees who are available due to work schedules, for example. Therefore, a second research stream has focused on validation of interventions designed to mitigate negative effects that traditionally accompany task or membership changes. For example, Lewis and colleagues [16] demonstrated that teams who were trained together on a task had significantly better transactive memory systems (TMS; i.e., knowing where expertise lies within a team—or more simply, who knows what) than teams comprised of members who were trained apart. However, teams comprised of two members trained together and one member trained apart had similar levels of TMS to teams trained completely together. Thus, a new member did not negatively influence development of TMS. In another example, Summers [17] manipulated the amount of information that departing members were allowed to share and found that teams engaging in higher levels of information sharing experienced less disruption in coordination. Furthermore, if information sharing was high, it did not matter which team member left the team. However, if information sharing was low, the more critical the departing member, the greater the negative influence that loss had on coordination.

Figure 1 demonstrates these findings in relation to adaptive behavior. The research outlined above suggests that these individual differences (e.g., cognitive ability and personality), as well as specific knowledge, skills, and attitudes (e.g., what information to share), improve the adaptive behavior of teams.

When considering the impact of membership fluidity on performance, there have been two schools of thought: the first argues for the benefits of membership change, in certain conditions. The second suggests that stable groups are preferable.

First school: Change benefits teams

Membership change, such as through job rotation, can increase the available knowledge stock [18]. Changes can also fuel reflection on the team's processes [19, 20]. By capitalizing on these benefits,
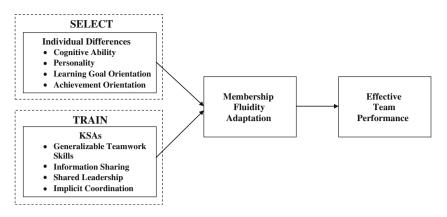
Fig. 1 | Framework depicting antecedents of effective membership fluidity adaptation

teams may increase their flexibility and perform more effectively [21–23].

However, the majority of research supporting the first school of thought (i.e., change benefits teams) has considered the impact of membership change within *creative tasks*. Newcomers who recently joined the team as a result of membership change have been found to increase the number of ideas generated, the variance of these ideas, and the creativity of "oldtimers" (i.e., those members who remain in a team) [24]. Similar results were found by Baer and colleagues [25] in collaborative or highly competitive teams who experienced membership change, as both types outperformed those teams with stable membership in an idea generation task. De La Hera and Rodriguez [26] also found that teams who experienced membership change generated higher quality alternatives in creative problem-solving tasks than teams with stable membership. Furthermore, the greater the magnitude of membership changes, the better. Although stable membership teams *perceived* themselves to be more creative, teams with membership change actually were more creative in terms of the number of ideas generated, the creativity of those ideas, and the divergent thoughts manifested from those initial ideas [27]. In integrating this research, the overarching theme is that membership change can potentially be beneficial when teams are working on creative tasks.

Second school: Change harms teams
On the other hand, when members leave, they take both tacit and explicit knowledge with them [28], which has the negative effect of eliminating team access to that individually held knowledge [29]. Additionally, after membership change, attention is temporarily diverted from the task because teams are in a state of flux (i.e., dynamic, unstable patterns of interaction), which can result in process loss if not managed appropriately [2, 17]. Furthermore, familiarity that stems from membership stability (i.e., no change in membership) has been linked to greater cohesion, higher levels of coordination, lower levels of anxiety, increased willingness to express disagreement, and better performance [e.g., 30–33] as com-

pared to those teams with less familiarity. Such benefits of member familiarity have been demonstrated in field settings as well. For example, Smith-Jentsch and colleagues [34] showed that air traffic control teams who were more familiar with one another both requested and accepted more backup than teams comprised of members who were less familiar. Coupled with the findings from lab studies, this literature suggests that team stability is preferable to membership change in most tasks. Given the nature of tasks required within medical teams, it seems likely that the findings related to the second school of thought would apply such that membership fluidity would negatively influence medical team performance.

MEMBERSHIP ADAPTATION TRAINING PROPOSITIONS
Based on the findings from the existing literature, it is clear that adaptation is a critical skill for team performance in ad hoc teams that experience membership change. Furthermore, research has identified several key factors that enable effective adaptation. Some are best suited for selection, whereas others can be trained (see Fig. 1). Yet, it is often impractical to select specific people for teams in dynamic work conditions that characterize medical settings. As we seek to provide the medical community with a research agenda to identify the degree to which the identified evidence-based content translates to effective adaptive behavior in medical teams, drawing from both the team adaptation and team training literature, we provide several propositions regarding areas of research that can be pursued to generate evidence for effective adaptive teams in the medical environment. We emphasize the need for research on these particular propositions within the medical community *prior to* implementation, as developmental programs to determine the precise relevance to the variety of teams providing medical care.

Proposition 1: Train medical teams on effective, generalizable teamwork skills
Woolley [35] found that training teams to focus on processes instead of desired outcomes did not help

in dealing with membership change. However, her process focus was task-based. Research suggests that more generic *team*-based processes can aid adaptive performance (see [36] for a comprehensive review of teamwork competencies). These generic competencies have been labeled as *task-contingent* (i.e., applicable to specific tasks regardless of team member configuration) or *transportable* (i.e., applicable to any task with any team configuration) [37]. Furthermore, Salas and colleagues [36, 38] argue that core coordinating mechanisms such as shared mental models (SMMs)–"common or overlapping cognitive representations of task requirements, procedures and role responsibilities" enable adaptation. Teams can be trained to develop task SMMs, which are then generalizable to any team configuration (i.e., pilot teams who frequently rotate, but consistently perform the same tasks can be trained on the appropriate tasks required to fly a plane regardless of who comprises the flight crew). As another example, teamwork skills such as backup behavior are generalizable to any task or team configuration. Illustrating the importance of these competencies to effective teamwork, team coordination training, also known as CRM–a foundation for the development of the medical training program TeamSTEPPS, incorporates training on many of these transportable skills [39, 40]. Given that empirical work has linked them to effective adaptation in ad hoc teams [e.g., 35], researchers should examine the generalizability of such skills to effective adaptation within medical teams.

Proposition 2: Train medical teams to effectively share "just enough" of the right kind of information

Researchers have considered communication within teams who experienced task changes [e.g., 41, 42] and found that more effective communication increases adaptation. Communication naturally involves information sharing. Sharing information regarding both the task and the team can facilitate development of SMMs [38] and TMS. Indeed, research on pre-briefing and debriefing techniques organized around a model of teamwork have demonstrated that teams develop greater SMMs on teamwork through such structured discussions [43]. Yet, information sharing must focus on key teamwork issues as taskwork naturally arise when discussing teamwork, but teamwork issues do not naturally arise in discussions focused on taskwork [43]. Furthermore, team training within medical domains emphasizes the importance of information sharing. Work that began with Gaba and colleagues [44, 45] emphasizes the importance of sharing information. Indeed, a lack of information sharing has been cited as a major contributing factor to medical mishaps [46]. However, teams cannot "constantly communicate" and still perform effectively. A meta-analyses examining the relationship between information sharing and team performance found that information sharing was more positively related to team performance when the information shared was unique and related directly to performance outcomes [47], which suggests that time spent sharing redundant or nonrelevant information is not helpful to teams.

Proposition 3: Train teams to rotate task leadership based on expertise

Literature on team adaptation suggests that teams performed better when they lost a leader and were then forced to reconfigure, as compared to teams who experienced loss of different member, or integration of the leader into the team, thus creating a flat team structure without a designated leader [15]. This suggests that teams without designated leaders are more active in reconfiguration efforts as compared to teams with a more formally designated leader, who tend to leave those decisions to one person (the leader). The relatively recent concept of rotating leadership within teams [48] suggests that team performance can be improved when fluid teams distribute leadership among members rather than designate a single leader. A common division of leadership for rotation purposes falls around areas of expertise. This type of rotational leadership lends itself to medical teams–particularly acute care teams during initial diagnosis and treatment of severely injured or ill patients–as helping patients with a number of injuries/illnesses naturally involves a variety of expertise until patients are stable [12]. Thus, the very type of "leadership" that is exhibited naturally in acute care medical teams (i.e., one person taking charge when required by the task based on his/her expertise) should enable teams to adapt more effectively to membership changes as compared to teams who have one leader who remains with the team regardless of other membership changes. In other words, if several members of the team can take control at any moment based on patient vitals, team performance will not suffer as much if any of those key personnel must leave before the patient is stabilized. This is partially explained through TMS, as teams who exhibit shared leadership do so because they understand who is capable of performing what actions based on expertise. It is important to note that this does require some member familiarity. Thus, it would not be appropriate for teams who have no familiarity, but rather those teams who experience membership loss or exchange and have some degree of understanding regarding expertise, perhaps based on role assignment.

Proposition 4: Train teams to shift from explicit to implicit coordination

Coordination within teams or "the process of orchestrating the sequence and timing of interdependent actions" [49] involves exchanging information and adjusting actions [50] to appropriately align member actions for effective goal achievement. Given the "interdependent" aspect of this definition, the more interdependent the team tasks, the greater

reliance teams must place on coordination for optimal performance. Thus, coordination must be a fluid process, as the most effective way to coordinate in any situation depends on a variety of factors. As such, any recommendation regarding coordination should be context specific [51]. However, research has already demonstrated that training teams to shift from explicit (active and overt information-seeking strategies) to implicit (drawing upon a shared understanding and thus reducing overt communication) coordination aids adaptive performance when teams are faced with a critical (i.e., non-routine) event [52]. Drawing upon this research, Burtscher and colleagues [51] determined that anesthesia teams who successfully adapted (i.e., performed better on a simulation involving a critical event) did so by increasing the amount of time they engaged in information management–a specific type of coordination activity. This did not entail sharing *more* information, but rather more effectively utilizing the information that was shared. The shift toward more implicit coordination activities allowed the anesthesia teams to focus more specifically on relevant information, which enabled effective adaptation. In other words, teams who reduced information exchange because of greater shared understanding were able to focus on only discussing information that was not shared among the team (i.e., unique member knowledge), which reduced unnecessary information exchange and enabled better performance. To determine the degree to which these findings may be generalizable to other types of medical teams, researchers should consider observing medical teams to identify how they function, which could inform decisions regarding the particular coordination strategies that are most beneficial to medical teams.

CONCLUSIONS

As noted above, adaptation literature with regard to membership change/loss is relatively new. Therefore, empirical evidence is only now emerging. Although these findings have generally focused on laboratory studies or field studies outside of the medical domain, the findings may have relevance to medical teams as they experience more membership fluidity than many other teams working in different organizational contexts. If teamwork skills do prove to be demonstrably associated with team adaptability within the medical domain, medical educators may wish to consider making teamwork skills a required competence.

The main goal of any medical team is to save lives. Given the volatile condition of many patients, adaptation is a critical teamwork skill. By drawing upon existing adaptation and training literatures, we have provided a brief synopsis and preliminary propositions regarding training content. Our hope is that this effort not only highlights the need for adaptation to improve medical team performance but also ignites discussion. We note that these propositions are intended to guide research to determine the degree to which these findings may be relevant to various medical teams. Thus, we suggested specific training content as a first step in designing a systematic research agenda for medical team training on adaptation–particularly with regard to membership fluidity. The literature has provided specific evidence regarding skills that lead to adaptive behavior. This content must now be tested in medical teams. As noted by Burtscher and colleagues [51], the ability to adapt is one of the most critical skills for medical professionals. Research is needed to evaluate whether teamwork training enhances adaptability for medical teams, as it does for other types of teams.

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