Learning Across Hierarchies and Boundaries: Partner Exposure and Hierarchy in Cross-Discipline Temporary Teams

(Authors' names blinded for peer review)

In many workplaces, temporary teams comprised of cross-discipline team members convene and coordinate complex work, despite team members having not worked together before. Most related research has found consistent performance benefits when members of temporary teams work together multiple times (*team familiarity*). Recent work in this area broke new conceptual ground by instead exploring the learning and performance benefits that team members gain by being exposed to many new partners. However, that new work examined *partner exposure* within solo-discipline teams. In this paper, we aim to extend this research area by developing and testing theory about partner exposure in temporary cross-discipline teams where members are working across professional and discipline boundaries. We use visit-level data from a hospital ED and leverage the *ad hoc* assignment of attendings, nurses, and residents to teams and the round-robin assignment of patients to these teams as our identification strategy. We find a significant positive performance impact of residents' exposure to more nurses and a significant negative impact of residents' exposure to more attendings. Both of these effects are lessened on patient cases with more structured workflows. In teams that do not include a resident, we find a significant negative performance effect of nurses' exposure to more attendings. The magnitudes of these effects do not differ based on whether the experiences were accumulated more recently or longer ago. Our results suggest that interaction with cross-discipline partners is an important but often unrecognized part of disciplinary training and team composition.

Key words: temporary teams, cross-discipline teams, partner exposure, team familiarity, health care

---

1. Introduction

In recent years, many industries have come to rely on temporary teams to accomplish complex, high-value work (Edmondson and Nembhard 2009, Huckman et al. 2009, Kerrissey et al. 2020, Mortensen and Haas 2018). This trend has been attributed to several factors, including new internet communication technologies that facilitate the assembly of temporary teams, as well as new macro-employment models where people pursue career paths that span projects, organizations, and industries (Benkler 2017, Cappelli 1999, Klein et al. 2006). These temporary teams are often composed of members who may have not worked together before, and who are assembled on demand for short-term engagements that require them to coordinate tightly-coupled and complex work. Examples of temporary teams used in different industry settings include innovation project teams (Dugan and Gabriel 2013), crowdsourced "flash teams" and "flash organizations" (Retelny et al. 2014, Valentine et al. 2017), "tour of duty" start-up teams (Hoffman et al. 2013), "fluid" project teams (Staats and Upton 2011), and *ad hoc* virtual teams (Crisp and Jarvenpaa 2013). Temporary teams are also now common in professional service industries including health care, consulting, and law (Gardner and Valentine 2015, Weinberg et al. 2011). These industry trends prompt the need for research about the effectiveness of temporary teams that operate with extremely fluctuating membership (Hackman and Katz 2010).

A substantial research literature explores the ways in which various team characteristics contribute to effective teamwork and improved team performance. This research examines topics spanning from collective intelligence (Riedl and Woolley 2017, Woolley et al. 2010, 2015), conflict (Jehn 1995, de Wit et al. 2012), network structure (Balkundi and Harrison 2006, Cummings and Cross 2003, Reagans et al. 2004, Sackett and Cummings 2018), and psychological safety (Edmondson 1999, Siemsen et al. 2009), among others. One of the most consistent and replicated results in this literature is that the amount of team members' prior shared experiences—sometimes called team familiarity—is associated with the team's performance (Espinosa et al. 2007, Katz and Allen 1982, Ramachandran et al. 2018, Reagans et al. 2005, Staats 2012). This result is particularly relevant for temporary teams, whose members are likely to have varying levels of familiarity or shared experience (Cattani et al. 2013, Huckman et al. 2009, Huckman and Staats 2011).

Recently, some studies broke new conceptual ground in this research area. These studies examined the implications of staffing teams to optimize team familiarity on other potentially useful properties of teams, such as the availability of team members (Salehi et al. 2017) or the opportunity for team members to learn from new partners (Akşin et al. 2020). Relevant for our paper, Akşin et al. (2020) developed and tested new theory about team members' exposure to new partners over time as temporary teams are convened, work together on a new task, and disband. Their results showed that such new partner exposure indeed benefits performance, and that this positive relationship differs by the level of task standardization, team member experience, and workload. However, their paper developed and tested theory about partner exposure in the context of solo-discipline teams, where the focal team members were learning from exposure to peers in their own profession and who carry out the same set of tasks as themselves.

In this paper, we argue that this theory of partner exposure should now be extended to theorize and test the effects of partner exposure in cross-discipline temporary teams. Unlike solo-discipline teams comprised of peers, these team members work across both professional hierarchies and across disciplinary boundaries. Both professional hierarchies and cross-discipline boundaries shape the nature of teaming interactions in ways that influence productivity and learning. Team members who represent the same discipline or profession are working within the same boundaries of expertise; they are learning to make the same decisions and do the same tasks as each of their subsequent partners. Yet sometimes they are working across a professional hierarchy, which may limit some of the ongoing interactions that support productivity and learning. For trainees, the benefits of partner exposure to authority figures in the same discipline will likely depend on how this authority structure shapes interactions.

In contrast to team members from the same discipline, team members who are working across disciplines have different areas of expertise and responsibilities. They are learning to react to and adjust to another professions' decisions and tasks, rather than being exposed to a member of their own profession carrying out the decisions and tasks that they themselves will do. Yet some cross-discipline partners may also be more interdependent and interactive because of team authority structures, such that the nature of their ongoing interactions may support productivity and learning. For trainees, the benefits of exposure to cross-discipline team members depends on both how the disciplinary boundary and authority structure shape interactions. To explore these ideas, we develop a conceptual framework that draws on research on cross-discipline boundaries, team hierarchy, and task interdependence. Because this is a nascent research area, we develop and test competing hypotheses (Edmondson and McManus 2007).

We analyze these effects by leveraging the archival data in the electronic health records (EHR) of a hospital emergency department (ED). In many hospital EDs, temporary teams of attendings, nurses, and residents are formed *ad hoc* every shift, with no particular staffing policy. We leverage this team assignment and the round-robin patient assignment to these teams to cleanly identify the effects of partner exposure and team familiarity on cross-discipline team performance. We focus on time to disposition as the main measure of team performance in the ED. We use these data and this empirical setting to answer the following research questions: What are the effects of team familiarity and partner exposure on the performance of cross-discipline temporary teams? Specifically, do these effects vary by role, and do they vary depending on how long ago these experiences were accumulated? In addition, are these effects moderated by structured workflows?

We obtain the following results. First, consistent with prior literature, we show that team familiarity significantly improves team performance. However, our results depart from Akşin et al. (2020), which showed benefits of partner exposure within peer solo-discipline teams. We find a significant positive impact on performance of resident-trainees' partner exposure to more cross-discipline partners (nurses) and a significant negative impact of their partner exposure to same-discipline authorities (attendings). Both the positive (vis-à-vis nurses) and negative (vis-à-vis attendings) effect of residents' partner exposure are lessened on cases with more structured workflows. In teams that do not include a resident, we find a significant negative impact on performance of nurses' partner exposure to more attendings. The magnitudes of these effects do not differ based on whether the experiences were accumulated recently or longer ago. Our results suggest that interaction with cross-discipline partners is an important but often unrecognized part of disciplinary training and team composition.

2. Related Literature and Hypothesis Development

Many contemporary work settings are structured around temporary teams that come together for one or a few tasks before disbanding. Typically, team members are drawn from some larger workforce, such as an incident command staff (Bigley and Roberts 2001), a larger industry such as film or construction (Bechky 2006, Goodman and Goodman 1976), or a clinical department or staff (Akşin et al. 2020, Faraj and Xiao 2006, Klein et al. 2006). Many researchers have explored the conditions under which temporary teams are able to effectively accomplish their complex, often mission-critical work. This research shows that temporary teams as a work structure offer particular challenges and benefits, especially related to how the teams are staffed or composed (Edmondson and Nembhard 2009, Twyman and Contractor 2019). People working in this kind of workforce tend to experience low team familiarity and high exposure to new teaming partners. Within this stream of research, many empirical studies have demonstrated the performance effects of team familiarity (e.g., Avgerinos and Gokpinar 2017, Espinosa et al. 2007, Huckman et al. 2009, Huckman and Staats 2011). Yet, to date few empirical studies have cleanly identified the performance effects of partner exposure—even though several relevant theoretical frameworks have recognized the possible learning benefits from exposure to more teaming partners (e.g., Edmondson and Nembhard 2009, Myers 2018, O'Leary et al. 2011). Partner exposure is defined as the number of distinct partners that a focal team member has worked with during a given period of time. In this section, we review the well-established literature on team familiarity, and then draw together several research streams to develop ideas related to partner exposure in cross-discipline temporary teams.

2.1. Team Familiarity and Performance

Team familiarity is defined as the amount of shared experience that team members have accumulated in working together on a focal task or project (Espinosa et al. 2007, Huckman et al. 2009). This structural property of teams emerges from prior team staffing patterns, and is particularly relevant to temporary teams, which are teams that are typically short-lived and characterized by highly fluid membership. A well-documented empirical result from the prior literature is that team familiarity has a significant impact on team performance—i.e., how well a team performs new work depends on how much work experience members have accumulated together in the past. For example, in the context of software development teams, Huckman et al. (2009) finds that an increase in team familiarity leads to a reduction in defects and an improvement in schedule adherence. Espinosa et al. (2007) also use the context of software teams to illustrate that when it is challenging to coordinate the team (e.g., due to size or geographic dispersion), team familiarity is even more helpful in improving performance. In the context of the film industry, Cattani et al. (2013) illustrates that team familiarity can mitigate the negative effects of having too many stars on the same team. The only negative effects of team familiarity demonstrated to date include hampering creative performance (Ramachandran et al. 2018), and over many years reducing search outside of the team (Katz and Allen 1982). Some of this prior literature has examined team familiarity in the context of relatively stable teams. In contrast, we focus on temporary teams, in which team members frequently and quickly come together for a discrete task and then disband and reassemble with a different set of team members for the next task. This is relevant to how most health care settings operate. Specifically in this setting, prior work has shown team familiarity to be associated with shorter surgical operative time (Avgerinos and Gokpinar 2017, Reagans et al. 2005, Xu et al. 2013), shorter lengths of stay (Patterson et al. 2015, Valentine and Edmondson 2015), and lower health care costs (Agha et al. 2018).

Consistent with this extensive prior literature, we expect team familiarity to positively impact team performance in our context of emergency department (ED) physician-nurse teams. Physicians and nurses who have had more experience working together in the past are likely to have more shared experiences that enable them to quickly synchronize their understanding of and responses to changing situations (Mathieu et al. 2000, Yuan et al. 2018), resonant mental models of their respective skills and weaknesses (Lewis 2004, Ren and Argote 2011, Zhang et al. 2007), common language for talking about problems and solutions (Thompson and Fine 1999), as well as trust and psychological safety to facilitate knowledge sharing (Edmondson 1999, Siemsen et al. 2009). These relational qualities enable team members to coordinate faster, without sacrificing quality care. Consistent with this prior research, we hypothesize the following:

H1: Team familiarity is positively associated with team performance.

2.2. Partner Exposure and Performance

Relative to the prior research on the effects of team familiarity on performance, the empirical literature on the effects of partner exposure on performance is much less developed. Nevertheless, partner exposure is also an important structural property of temporary teams that arises from staffing patterns, and one that managers may need to trade off against team familiarity. Take, for example, an extreme case, in which a manager chooses to always keep one team together. In this scenario, these team members will have a high level of team familiarity but a low level of partner exposure, because they will not have been worked with other partners, who could have been a source of learning. Familiarity and partner exposure are related but not strongly correlated. For example, a physician-nurse dyad may be new to working with each other, so have zero familiarity with each other, but the nurse may have also worked with many other physicians and the physician may have high familiarity scores with one or two other nurses. These simple examples illustrate that to fully understand the performance implications of how temporary teams are staffed, the effects of partner exposure should be considered alongside team familiarity.

To our knowledge, Akşin et al. (2020) is the only study to date that empirically measures the performance effects of partner exposure together with team familiarity in temporary teams. The authors study ambulance transport teams, each of which is comprised of two paramedics, to examine how partner exposure and team familiarity affect efficient team performance. The two paramedics were relative peers—neither was in formal training or required supervision. Their study finds that both partner exposure and team familiarity positively impact the efficient performance of the transport teams, and that the benefits of partner exposure outweigh that of the benefits of team familiarity in this context. As such, they recommend that managers in this setting should prioritize maximizing partner exposure when staffing the transport teams. This study importantly broke new conceptual ground in the research conversation on temporary teams by considering the performance effects of partner exposure. Yet, its scope was limited to developing and testing new theory in the context of solo-discipline teams. Many temporary teams convene members from across different disciplines. Many teams also include trainees within a discipline (e.g., medical residents) who are in training, require supervision, and lack full decision-making authority. This new area of study on partner exposure needs to now be extended to also consider the performance effects in cross-discipline temporary teams.

To develop these new ideas, we need to consider the implications of cross-discipline team structures: members interact across professional hierarchies and across disciplinary boundaries. The literature to date supports competing hypotheses about how partner exposure across professional hierarchies and disciplinary boundaries might shape performance. We can synthesize these ideas by first considering how peer team members learn from each other in solo-discipline teams. In solo-discipline teams, team members belong to the same 'community of practice'. Community of practice is a conceptual label used in the research literature on workplace learning to refer a "group that shares a [sometimes professional] concern and learns how to do it better as they interact regularly" (Lave and Wenger 1991, Wenger 1999). In organizations, communities of practice often develop within and overlap with occupations or professions (Brown and Duguid 2001, Wenger and Snyder 2000). A key idea advanced by this literature is that workplace learning tends to be situated and social rather than formal, didactic, and abstract, meaning that people learn as they interact with each other as they carry out their actual work in the relevant situations. Lave and Wenger (1991), founding theorists in this area, argued that learning, understanding, and interpretation involve a great deal that is not "explicit or explicable" so must be "developed and framed in a communal context" (Lave 1988, p.633). A classic example comes from Orr (1996), who studied how technicians learned on the job. His study showed that learning by reading manuals or documentation was rarely relevant or helpful. Instead, technicians learned from each other as they interacted on the job, developing informal, 'non-canonical', but highly situated and relevant understandings of each problem they encountered. He explained that "solving problems in situ required constructing a coherent account of [the problem] out of the incoherence of the data and documentation" (p.169). To do this, the technicians embarked on what Orr (1996) referred to as a long story-telling procedure of problems each had experienced before that might have relevance to interpreting the current problem. He claimed that learning involved the technicians interacting around "narration," "collaboration," and "social construction". Later studies built on these ideas and similarly demonstrated that learning is social, interactive, contextual, often involves narration or storytelling to interpret and explain ideas, and unfolds within communities of practice (e.g., Beane 2019, Brown and Duguid 1991, 2001, Duguid 2005, Wenger 2000).

When considered in light of this research literature, the Akşin et al. (2020) results make sense. The ambulance transport teams were peer partners in the same community of practice. They shared a common problem space, a shared set of tasks, and had access to a shared set of stories and practices that could be used to interpret and understand the unexpected and ambiguous scenes they encountered. Each new partner had a different set of experiences from which the other could learn. The more exposure that any paramedic gained to new partners, the more varied practices they observed being applied in practice. In addition, they had a mature enough understanding of their field that they could then generalize these practices and choose among or synthesize the best practices at their next scene. This effect of partner exposure was a significant boost to performance, above and beyond simply accumulating additional experience on the job. Among peers within communities of practice, we expect that new partner exposure is likely to be commonly advantageous.

In contrast, cross-discipline teams have a more complicated role structure. Some team members are not peers; trainees on the team are working within the context of a professional hierarchy. Some team members are not working within the same community of practice, but rather working across disciplinary boundaries. These team structures shape the nature of interactions. First, we consider the implications of the professional hierarchy on the effects of partner exposure. The professional hierarchy determines the team authority structure, wherein team members have differential decision-making authority (Wageman and Fisher 2014). One team member tends to be the *de facto* team leader while other team members, including trainees, "have authority only for executing the tasks" (Hackman 2002). Such team authority structures are ubiquitous in contexts such as surgical teams, airline cockpit crews, and emergency rooms. The team member with the decision-making authority has full autonomy to exercise their professional judgement as they see fit; we know from extensive research that this professional autonomy results in significant practice variation (Corallo et al. 2014, Davis et al. 2000, Grytten and Sørensen 2003). The implication of this authority structure might support the finding in Akşin et al. (2020). Trainees might benefit from working with and being exposed to the varied decisions of many different team leaders within their professional discipline. Zaheer and Soda (2009) argue that a "heterogeneity of new ideas, processes, and routines" from past experiences can be a valuable source of individual and team learning (p.3).

However, social hierarchy in groups can also have an inhibiting effect on the kinds of interactions that support learning. Many studies show that within a group, the mere presence of social hierarchy inhibits low-status actors' ability to engage in the critical cognitive states and behaviors needed for experimenting and learning new ideas (Brooks 23, Foldy et al. 2009, Keltner et al. 2003). Temporary teams with this authority structure tend to have particularly defined social hierarchies. In cardiac surgery teams, for example, physician decision-making is generally "hierarchical, demanding, and direct" (Edmondson et al. 2001a, p.704). The team leader in this authority structure can view the team as "support systems for them as individuals" (Wageman and Fisher 2014, p.4). Edmondson et al. (2001b, p.128) quote a cardiac surgeon saying, "Once I get the team set up, I never look up [from the operating field]...it is they who have to make sure that everything is flowing". This kind of tight unilateral control of the decisions that set other people's work in process is common in the medical profession (Nembhard and Edmondson 2006). The team leader holds the authority for decision-making about the teams' plans and courses of action, and the other members execute on those decisions and plans. Trainees in the ED, for example, were described to us by several informants as "servants" of the attendings. This lack of ownership is another reason that hierarchy can have an inhibiting effect on learning (Alexander et al. 2005, Dougherty 1992, Greer et al. 2018, Greer and Chu 2020, Lemieux-Charles and McGuire 2006). The authority structure limits autonomy, which means that trainees as decision-takers may not easily generalize their exposure to varied practices to quick coordination of future cases. The literature thus offers these differing effects of trainee partner exposure. We summarize the above arguments by stating the competing hypotheses:

H2a/b: Same-discipline partner exposure is positively/negatively associated with team performance for trainees in cross-discipline temporary teams.

A second team structure that shapes the nature of team interactions in cross-discipline teams is the disciplinary boundary. This team structure may also influence the extent to which different team members gain performance benefits from exposure to many new partners. Again, the relevant literature offers mixed arguments. On the one hand, trainees on the team may struggle to learn from exposure to cross-discipline partners. Cross-discipline team members are likely to understand and interpret the same work situation differently: they pay attention to different information as salient to their own tasks at hand, they are invested in different practices and identities around what they do to address different problems, and they have a different language and culture for describing their different interpretations. Each discipline develops and works within their own 'interpretive thought worlds' (Dougherty 1992). These in-group shared mental models help the within-discipline members coordinate with each other because they share a similar interpretation about salient information as they encounter uncertain events (Austin 2003, Mathieu et al. 2000). But the shared meaning systems that are so helpful within a discipline also complicate understanding across disciplines: different groups tend to understand the intricacies and details of their own practices, but gloss over the complexities underlying other groups' practices (Alderfer 1980, Bresman and Zellmer-Bruhn 2013, Dougherty 1992). Specific to medical teams, residents and nurses have been shown to have different perceptions of many practices including "documentation practices, how reports on patients were provided and received during patient handoffs, daily schedules, unit routines, and methods of communicating with one another" (Benike and Clark 2013). The differences in how different occupations interpret similar situations or events are quite substantial; Bechky (2003) describes how two occupational communities had to interact and negotiate to 'share meanings' of their understandings of the same boundary object. These 'silos' within disciplines develop early in professional training and are often reinforced by professional cultures (Bartunek 2011). For example, resident trainees and nurses are both to some degree decision-takers because of the team authority structure, but they are also working across the medical hierarchy where the residents are likely to perceive themselves as having more authority and responsibility than nurses (Baggs and Schmitt 1997, Muller-Juge et al. 2013). For these reasons, it may be difficult for trainees to learn from exposure to many cross-discipline teaming partners.

On the other hand, cross-discipline interactions may also be a source of learning for trainees and improve their productivity on later tasks. One reason that trainees might learn from cross-discipline partners in ways that make them more efficient relates in part to the team authority structure and the nature of interdependence and interaction in temporary teams. The situated learning literature summarized above reveals how interactive and iterative most workplace learning is (Duguid 2005, Lave and Wenger 1991, Wenger 2000). Trainees, being so early in their learning process, will thus rely heavily on ongoing narration, interpretation, and clarification to make sense of new situations and problems. This kind of learning will likely involve ongoing, informal iterative questions and answers. Their questions might be fairly basic compared to what an advanced member of their own profession might consider to be relevant to their professional realm. Thus, for trainees, some of their productivity and learning might come from cross-discipline partners who are right there with them at the moment of their uncertainty and can informally narrate and interpret the scene. Specific to ED teams, a time-and-motion study showed that attendings move about the ED less than residents and nurses; residents and nurses were more likely to be going to the patient bedside and interacting there (Hollingsworth et al. 1998). The residents will clearly learn some things during the formalized professional interactions with attendings, such as formal rounding. But resident trainees may also learn through ongoing iterative interactions with nurses at the bedside or in the hallways as they are moving around to carry out the overall plan of care. Studies of the actual workflow in medical teams have characterized the highly interactive nature of the resident-nurse relationship, for example with nurses making suggestions, reflecting and verifying the residents' thinking, and sometimes even taking the lead in cases where the resident seemed to be struggling to do so (Baggs and Schmitt 1997, Lingard et al. 2004, Muller-Juge et al. 2013, Piquette et al. 2009). Related studies have shown that nurses sometimes saw it as their role to help, direct, or manage medical trainees even when outside of the attendings' awareness (Adler-Milstein et al. 2011, Weller et al. 2008). Nurses can also help residents learn and practice with hands-on skills such as "peripheral IV, NG tubes, Foley catheters, ECG lead placements" that may take ongoing clarification, narration, and practice, and which an attending may not directly supervise (Abourbih et al. 2015). In general, cross-discipline team members who are highly interdependent and interactive, especially at the scene of the work such as in the patient room, may be a source of learning for each other. For trainees who are early in their professional development, exposure to more cross-discipline partners may provide them with many new partners who can narrate, interpret, and interact at the scene of the work. Summarizing the competing arguments in the literature laid out above, we lay out the following hypotheses:

H3a/b: Cross-discipline partner exposure is positively/negatively associated with team performance for trainees.

Finally, some dyads within cross-discipline teams, such as attendings and nurses in the ED setting, interact across both a discipline boundary and the team hierarchy structure. Taking this specific example, the attendings make decisions about the plan of care (e.g., making diagnoses, creating treatment plans, ordering lab tests or radiological images, ordering treatments) while the nurses execute these plans and decisions (e.g., obtaining patient samples for the clinical tests, administering medications and intravenous infusions, preparing patients and their families for their treatment and admittance or discharge). The arguments presented above about hierarchy and disciplinary boundaries can thus be extended to partner exposure within these dyads as well. Each team member may benefit from exposure to each other's varied ways of practicing. Nurses may observe the several different ways that attendings approach different cases and better anticipate future decisions given this exposure. Alternatively, the authority structure and disciplinary boundary may complicate nurses' ability to generalize lessons from the variation they encounter across attendings to produce quicker coordination on later cases. One study quoted a nurse explaining that a physician partner was "unsure of my skill" which led to "less information exchange" that would have supported learning from the work together and possible performance improvement on later cases (Weller et al. 2008, p.385). These partners may develop personal attributions about each other's varying practice styles rather than necessarily learning generalized best ways to handle future cases. Following the diverging arguments laid out above, we summarize the following competing hypotheses:

H4a/b: Partner exposure is positively/negatively associated with team performance for cross-discipline (i.e., non-trainee) team members.

Many studies in the research literature on team familiarity also explore whether and how different task structures moderate the well-established relationship between team familiarity and performance. As one example, Espinosa et al. (2007) find that familiarity was less helpful for teams confronting complex tasks. In conversation with this research, Akşin et al. (2020) also examine the moderating effect of task structure on the performance benefits of partner exposure. They argue that the effects of partner exposure may similarly be contingent on the "characteristics of the underlying task process and the type of knowledge required to execute it" (p.4). They find empirical support for this argument in the context of the ambulance transport teams. Greater partner exposure directly improves performance at the patient pick-up scene, where tasks are less-structured, but only benefits performance past a certain threshold at patient-hospital hand-offs, which involve more-structured tasks. To continue to build on these ideas, we also analyze how task structures moderate the performance benefits of partner exposure in cross-discipline teams. We similarly expect that cases with more structured workflows also help structure interactions and scaffold learning for trainees and cross-discipline members as they encounter varying practices among team authorities. Some of the knowledge needed to complete complex tasks is tacit and ambiguous, which means it is best shared through ongoing, iterative interactions. Other aspects of knowledge are more easily codified, for example checklists or protocols encoded into workflows that shape the coordination between different disciplines on a team (Pronovost and Vohr 2010). Taking our setting, recent empirical research shows that standardized checklists and protocols in the electronic medical record helps reduce practice variation and improve the quality of care (Weiser et al. 2010, Wolff et al. 2004). Thus, if trainees and nurses are indeed benefiting from exposure to many attendings' different and varying practices, this effect would likely be lessened on patient cases with more structured workflows. The workflows would be helping to structure and focus the needed interactions and conversations so they are less variable and less subject to attending idiosyncratic practice styles. On the other hand, if trainees and nurses are not learning from exposure to attendings' varied practice styles in ways that they can generalize to more efficient coordination on future cases, then the structured workflows might alternatively help lessen the negative effects of exposure to varying practice. We summarize these competing arguments with the following hypotheses:

H5a/b: The relationship between partner exposure and team performance is/is not attenuated on cases with more structured workflows.

2.3. Recency of shared experiences in team familiarity and partner exposure

In understanding the effect of staffing patterns on temporary team performance, it is also important to consider whether the recency of the shared experience matters (Ancona et al. 2001, Harrison et al. 2003), a factor that to our knowledge has not yet been considered in the research literature. In fact, very little attention has been paid in prior literature to issues of time and recency when authors are describing how they compute familiarity or partner exposure and test performance effects. Because this idea is new for this research literature, our purpose is to provide discussion of relevant literature and report our models with explicit modeling of the lookback windows, but not explicitly develop or test hypotheses. Nevertheless, we argue that explicit discussion or evidence of the lookback windows used to calculate these team staffing variables is likely useful because differential effects based on the recency of shared experience are plausible.

On the one hand, a shared work experience between two team members that occurred a year ago may have little or no effect on performance whereas one that occurred a month ago might have a stronger impact on performance. This differential relationship over time may be because the team members' shared mental models, shared language, and synchronized responses may be disrupted by different factors over longer periods of time (Anderson and Lewis 2014, Froehle and White 2014), including experiences with other teams (Kane et al. 2005), changes to the tasks or context (Leonard-Barton 1992), or simply the passing of time whereby experiences become less salient and retrievable (Ramdas et al. 2018). As team members encounter these various disruptions, they may see fewer benefits to performance from their shared experience together. If this were the case, managers should employ a short lookback window to measure team familiarity. If they were to instead use a long lookback window, they would over-credit the shared experiences that were accumulated longer ago and, thus, overestimate the stock of team familiarity from which team members stand to benefit. On the other hand, it may be the case that the aforementioned disruptions do not alter the benefits to performance from a shared work experience that occurred a long time ago. In the context of temporary teams, it is possible that the rapid pace of learning, and the gains to performance thereof, outpaces the rate of forgetting. This may be the case if the performance gains from higher levels of team familiarity stem primarily from intangible know-how rather than from concrete know-what (Paiva et al. 2008). In this case, managers may be better off employing a reasonably long lookback window to measure team familiarity, as team familiarity that was accumulated longer ago may still meaningfully contribute to the stock of overall team familiarity from which team members stand to benefit.

In the research to date on the effects of team familiarity, this temporal aspect has largely been ignored. In addition, much of the prior literature does not explicitly define a lookback window. Instead, researchers have typically calculated team familiarity by counting the number of cases on which team members have worked together since the beginning of the dataset being used for the study (Avgerinos and Gokpinar 2017, Espinosa et al. 2007, Reagans et al. 2005, Xu et al. 2013). This approach often results in lookback windows that vary in length by each observation, where observations near the beginning of the dataset have a shorter lookback window and observations near the end of the dataset have a longer lookback window (Espinosa et al. 2007). In contrast, some other studies do use a consistent lookback window across all observations by constraining the lookback window to a fixed length of time. For example, Huckman et al. (2009) uses a 2-year lookback window, Huckman and Staats (2011) uses a 3-year lookback window, Cattani et al. (2013) uses a 4-year lookback window, and Ramachandran et al. (2018) uses a 10-year lookback window, respectively, for all observations. Nevertheless, all of these works effectively assume that the impact of team familiarity is cumulatively additive rather than potentially diminishing over time, in which shared experiences accumulated longer ago have less of an effect on team performance.

As mentioned above, the research literature on partner exposure is relatively nascent compared with the team familiarity literature. Like much of the previous work on team familiarity, Akşin et al. (2020) calculate the measures of both team familiarity and partner exposure by assuming cumulative additivity and by using a lookback window that varies in length across observations (i.e., it extends to the beginning of the study's dataset rather than spanning a fixed period of time). Similar to the reasons discussed above, it is important to examine the differential effects of this temporal dimension on the relationship between partner exposure and team performance. As another experience-related team characteristic, partner exposure may also be subject to forgetting effects (Anderson and Lewis 2014, Froehle and White 2014, Ramdas et al. 2018). Our models address these temporal and recency issues by first defining team familiarity and partner exposure measures using a pre-specified lookback window and then comparing our estimation results across a variety of lookback windows to examine whether these effects vary as a function of the length of the lookback window.

3. Empirical Setting: Temporary Teams in Hospital Emergency Departments

Many EDs have been facing an increase in patient volumes and higher levels of patient complexity without a corresponding increase in staffing levels (US Government Accountability Office 2009, Pitts et al. 2012). This has resulted in longer wait times and higher rates of patients leaving without being seen (US Government Accountability Office 2009), both of which are linked to worse patient outcomes in the form of higher rates of admission to the hospital and higher mortality rates, among others (Bernstein et al. 2009, Singer et al. 2011). To ensure access to emergency care with reasonable wait times, ED administrators have been looking for ways to improve patient throughput using existing resources without sacrificing the quality of care.

Recent reviews of the literature in health care management have highlighted that "operational characteristics play an important role in influencing patient outcomes and warrant just as much attention as patient-level clinical characteristics" (Kc et al. 2020). A multitude of different operational levers have been studied in recent years, such as appointment scheduling (Gupta and Denton 2008, Liu et al. 2010, White et al. 2011, Zacharias and Pinedo 2014), bed utilization in hospitals (Allon et al. 2013, Berry Jaeker and Tucker 2017, Kc and Terwiesch 2009, Kuntz et al. 2015, Roth et al. 2019), and the time of treatment (Anderson et al. 2014, Batt et al. 2019, Deo and Jain 2019, Kc 2019). In the setting of the ED specifically, others have documented the impact of emphasis framing in clinical information systems (Laker et al. 2018), multitasking (Kc 2014), operational flexibility (Laker et al. 2014, Ward et al. 2015), patient streaming and queueing (Saghafian et al. 2012, 2014, Song et al. 2015), peer influence (Song et al. 2018, Yuan et al. 2018), and staff quality and training (Kuntz and Sülz 2013, Morey et al. 2002). Yet, there exists an important and pervasive aspect of ED operations that has received little attention: how to staff physician-nurse teams, and the performance implications thereof. In this paper, we examine how the staffing of ED teams can be improved as a way to increase patient throughput.

To conduct our analyses, we use data from a hospital ED, which we anonymize as Metro ED. Metro ED is part of a high-volume, academic hospital in a large metropolitan area of the United States. As is typical of most EDs, temporary teams comprised of physicians and nurses deliver care to patients at Metro ED.

3.1. Physician-Nurse Teams at Metro ED

Metro ED organizes temporary teams of clinical providers by assigning physicians and nurses to work together as a team for the duration of their shifts. Start times of shifts are staggered across providers in order to ensure that at least one provider stays on the team who knows about the patient. In some cases when the patient's stay spans across a nursing shift change, the patient is handed off from the outgoing nurse to the incoming nurse, with the latter becoming the second nurse on the patient's record. Patients are rarely handed off across attending physicians' shift changes; when this does happen, the outgoing attending physician is responsible for completing a care plan for the patient and continues to assume responsibility for the patient's care. Resident physicians can also be assigned to care for patients alongside attending physicians and nurses, but this is a function of the residency program's schedule and is exogenous to the patient's condition. Hence, all teams have at least one attending physician and one nurse; some teams also have a resident physician as part of the team.[1]

3.2. Staffing and Patient Assignment at Metro ED

A feature of the staffing process at Metro ED that is important for our analysis is that the attending physician manager and the nurse manager each staff the ED separately (with attendings and nurses, respectively), with no attempt to preferentially pair specific attendings with specific nurses. This staffing process seeks to accommodate individual preferences for the type and number of shifts (e.g., if a nurse wants to work three 12-hour shifts or five 8-hour shifts in a particular week), but the process of staffing each attending-nurse team is by random assignment. In other words, there is no attempt to pair specific attendings with specific nurses in creating the teams. The assignment of resident physicians onto these teams is also exogenously determined and is random. This random assignment of attendings, nurses, and residents onto patient care teams is critical for our analysis, because it ensures that variation in team familiarity and partner exposure is exogenous, rather than based on team member preferences or capabilities.

[1] In section 6.2, we consider alternate sample definitions in which we consider only the visits that did not include a resident physician, only the visits that included a resident physician, and only the visits that did not include a second nurse as part of the care delivery team.

In addition, patients are exogenously assigned to the physician-nurse teams. This is the result of a department policy of using round-robin assignment for fairness reasons. In Figure A.1 of the Online Supplement, we use the data to illustrate that the average Emergency Severity Index (ESI) level is tightly concentrated around 3 for all attendings, nurses, and residents, which suggests that Metro ED was adhering to the round-robin assignment policy in assigning patients to patient care teams. Several papers have explored the performance implications of round-robin patient assignment (Chan 2016, Song et al. 2015, Valentine 2018). In this paper, we leverage this round-robin assignment to cleanly identify variation in performance that is exogenous and not based on differential task assignment.

4. Data

We collected data for every adult patient who received care at Metro ED from January 2008 to December 2011. For each ED visit, the data include the patient-level information including age, gender, a 5-level ESI (level 1 is the most urgent and level 5 is the least urgent) (Gilboy et al. 2011), discharge disposition, physician identifier, nurse identifier(s), resident identifier and whether the patient returned to the ED within 48 hours after discharge. The data also include several time stamps related to patient flow through the ED: arrival (time of patient arriving at the ED), nurse start (nurse first signing up for the patient), physician start (physician first signing up for the patient), disposition order, and departure (patient leaving the ED).

4.1. Sample Selection

Table B.1 of the Online Supplement describes our sample selection process. In order to utilize a consistent lookback window across all observations when constructing our variables of interest (team familiarity and partner exposure), we exclude from the analysis sample those visits that occurred in the first 12 months of our 3-year data collection period. We also exclude visits by pediatric patients and those with a missing value for age, gender, attending physician identifier, or nurse identifier. We further limit our analysis sample to patients seen by attending physicians and nurses who treated at least 50 cases in the 3-year data collection period. Using discharge disposition information, we also exclude patients who died in the ED, were transferred to another hospital, or left without being seen by a care provider. We exclude patients whose ESI level is 1 (most urgent); these patients comprise less than 1 percent of our sample. Finally, we exclude patients whose time to disposition (difference between disposition order time stamp and patient arrival time stamp; see section 4.2 for details) is shorter than the 1st percentile value (28 minutes) or longer than the 99th percentile value (652 minutes) to remove outliers in the time to disposition.

The resulting final sample consists of 111,491 ED visits, with 71 unique attending physicians and 100 unique nurses who worked in 4,572 unique physician-nurse teams in our 2-year study period; of these, 76,377 involved a resident physician as well. During the 2-year study period, each attending physician worked with 64 nurses (s.d.=26) and 65 residents (s.d.=37) on 1,570 cases (s.d.=1,413), on average. Each nurse worked with 46 attendings (s.d.=15) and 71 residents (s.d.=33) on 1,115 cases (s.d.=916), on average. Each resident physician worked with 24 attendings (s.d.=19) and 37 nurses (s.d.=29) on 396 cases (s.d.=540), on average.

4.2. Variables

4.2.1. Measure of Team Performance Our main measure of team performance is time to disposition in the ED. This is a measure that has been used frequently as a proxy for provider productivity in ED settings (Batt et al. 2019, Pourmand et al. 2013, Saghafian et al. 2014, Song et al. 2015). Discussions with several ED managers and clinicians also point to this as a first-order productivity measure of interest. In contrast to the total time in the ED, which is defined as the time from patient arrival to departure from the ED, time to disposition focuses specifically on the time from a patient's arrival to the ED to the time a disposition order was signed (which indicates that a patient is ready to be discharged or admitted), thus excluding any time spent boarding in the ED or in an inpatient unit.[2]

The first panel of Table 1 shows summary statistics for this measure. Patients' time to disposition was 197.59 minutes or 3.3 hours, on average.

4.2.2. Measures of Team Familiarity and Partner Exposure The key variables of interest are team familiarity and partner exposure, respectively. For each observation, we define team familiarity to be the number of prior cases two providers worked on together within a defined lookback window. The lookback windows we employ range from 1 month to 12 months, which were determined based on 20 interviews that we conducted with

[2] In section 6.1, we consider time in the ED, time from first provider to disposition, and time from disposition to departure as alternate measures of performance.

Table 1 Summary statistics of performance measures and variables of interest

Variable	Mean	Std. Dev.	Min	Median	Max
Time to disposition (minutes)	197.59	120.09	28	170	652
Team familiarity between ATT and NUR (1 month)	3.05	4.60	0	1	38
Team familiarity between ATT and NUR (12 months)	28.06	25.64	0	23	203
Team familiarity between ATT and RES (1 month)†	2.71	5.01	0	0	51
Team familiarity between ATT and RES (12 months)†	18.58	18.24	0	14	138
Team familiarity between NUR and RES (1 month)†	1.88	3.05	0	0	26
Team familiarity between NUR and RES (12 months)†	13.02	12.96	0	10	94
ATT's partner exposure to NURs (1 month)	26.40	9.81	0	28	52
ATT's partner exposure to NURs (12 months)	71.34	14.39	0	75	90
ATT's partner exposure to RESs (1 month)	15.68	6.31	0	16	36
ATT's partner exposure to RESs (12 months)	63.80	16.44	0	68	89
NUR's partner exposure to ATTs (1 month)	18.19	6.74	0	19	39
NUR's partner exposure to ATTs (12 months)	43.93	8.83	0	46	59
NUR's partner exposure to RESs (1 month)	17.20	7.00	0	18	36
NUR's partner exposure to RESs (12 months)	61.42	17.11	0	67	89
RES's partner exposure to ATTs (1 month)†	13.73	7.50	0	14	34
RES's partner exposure to ATTs (12 months)†	37.36	11.44	0	41	54
RES's partner exposure to NURs (1 month)†	21.20	10.57	0	22	53
RES's partner exposure to NURs (12 months)†	58.47	17.73	0	65	83
Age (years)	49.77	19.20	18	48	108
ATT current workload (cases)	8.67	4.48	1	8	34
NUR current workload (cases)	3.28	1.80	1	3	15
RES current workload (cases)†	3.82	1.99	1	4	17
ATT experience (cases)	2884.16	1579.80	0	2829	7368
NUR experience (cases)	1614.02	967.92	0	1526	4542
RES experience (cases)†	939.31	625.06	0	915	2565
ED census (cases)	25.71	9.40	1	25	64
Time since ATT shift start (hours)	3.97	2.81	0	3.83	23.78
Categorical variables	***N***	**%**			
Female	64,602	57.94			
RES present	76,377	68.51			
Second NUR present	40,476	36.30			
ESI level					
2	15,538	13.94			
3	66,702	59.83			
4	25,800	23.14			
5	3,451	3.10			
Arrival day-of-week					
Sunday	13,956	12.52			
Monday	17,539	15.73			
Tuesday	16,950	15.20			
Wednesday	16,289	14.61			
Thursday	16,043	14.39			
Friday	16,151	14.49			
Saturday	14,563	13.06			

Notes. $N = 111,491$. ATT=Attending. NUR=Nurse. RES=Resident. Team familiarity is measured as the number of prior cases two care providers worked on together in the specified lookback window (e.g., 1 month or 12 months). Partner exposure is measured as the number of prior partners the focal care provider has worked with in the specified lookback window (e.g., 1 month or 12 months). Variables not shown for brevity include (ATT current workload)^2, (NUR current workload)^2, (RES current workload)^2, arrival hour-of-day, arrival year-month, attending fixed effects, nurse fixed effects, and resident fixed effects.

† $N = 76,377$ because this measure only pertains to cases that involve a resident.

physician and nurse managers at 8 EDs.[3] Note, these measures of team familiarity capture the number of times a given dyad has worked together, and therefore is not dependent on a focal role.

Unlike team familiarity, partner exposure is dependent on a focal role; i.e., it captures the number of partners of the other discipline with whom a given provider has worked prior to the focal observation. As such, an attending's partner exposure to nurses is captured as the number of distinct nurses a given attending has worked with within the given lookback window, whereas a nurse's partner exposure to attendings is captured as the number of distinct attendings a given nurse has worked with within the given lookback window. As we do with team familiarity, we employ a range of lookback windows from 1 month to 12 months.

In calculating team familiarity and partner exposure measures, we count a case towards each of the measures only if the case was completed at least 12 hours prior to the focal patient's arrival. We impose this restriction in order to exclude experiences that were accumulated within the same shift, since physicians and nurses are assigned to work together as a team for the duration of a shift. For example, a case would count towards the measure of team familiarity accumulated over the past 1 month only if the two providers worked on the case together within the past 1 month and if they had completed the case at least 12 hours prior to the time the focal patient arrived in the ED.

In Table 1, we provide summary statistics of each of the team familiarity and partner exposure measures over select lookback windows (1 month and 12 months). As we would expect, both the team familiarity measure and each of the partner exposure measures increase as the lookback window becomes longer.

Table 2 presents correlation values between the team performance measures and each of the variables of interest. We find there is a negative correlation between team familiarity and time to disposition, whereas there are a mix of positive and negative correlations between the partner exposure measures and time to disposition. In addition, the correlation between team familiarity and each of the partner exposure measures is positive but low.

[3] Based on our interviews, we determined that the shortest lookback window ought to be at least a few weeks in order to ensure sufficient variation in the team-related measures of interest because many physicians and nurses may work either a few days per week or a few weeks per month. We also decided to have 12 months be the longest lookback window because many ED scheduling systems retain scheduling information for only one year.

Table 2 Correlation values among variables included in empirical specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
(1) Time to disposition (minutes)	1.00																															
(2) Team familiarity between ATT and NUR (1 month)	-0.03	1.00																														
(3) Team familiarity between ATT and NUR (12 months)	-0.05	0.44	1.00																													
(4) Team familiarity between ATT and RES (1 month)†	-0.01	0.12	0.10	1.00																												
(5) Team familiarity between ATT and RES (12 months)†	-0.03	0.15	0.25	0.39	1.00																											
(6) Team familiarity between NUR and RES (1 month)†	0.00	0.11	0.09	0.15	0.05	1.00																										
(7) Team familiarity between NUR and RES (12 months)†	-0.02	0.12	0.30	0.06	0.26	0.36	1.00																									
(8) ATT's partner exposure to NURs (1 month)	-0.02	0.26	0.23	0.22	0.22	0.01	0.00	1.00																								
(9) ATT's partner exposure to NURs (12 months)	-0.04	0.09	0.26	0.09	0.27	0.00	-0.02	0.48	1.00																							
(10) ATT's partner exposure to RESs (1 month)	-0.03	0.27	0.23	0.21	0.22	0.01	0.00	0.91	0.45	1.00																						
(11) ATT's partner exposure to RESs (12 months)	-0.04	0.08	0.28	0.07	0.24	-0.01	-0.04	0.48	0.92	0.47	1.00																					
(12) NUR's partner exposure to ATTs (1 month)	0.04	0.26	0.24	0.02	0.05	0.23	0.25	0.00	-0.04	0.00	-0.04	1.00																				
(13) NUR's partner exposure to ATTs (12 months)	0.02	0.12	0.40	0.01	0.01	0.09	0.35	0.01	-0.07	0.00	-0.04	0.45	1.00																			
(14) NUR's partner exposure to RESs (1 month)	0.04	0.25	0.25	0.02	0.04	0.22	0.24	0.01	-0.03	0.01	-0.02	0.90	0.45	1.00																		
(15) NUR's partner exposure to RESs (12 months)	0.02	0.09	0.39	0.00	0.00	0.06	0.29	0.00	-0.03	0.00	0.00	0.41	0.89	0.46	1.00																	
(16) RES's partner exposure to ATTs (1 month)†	0.02	0.00	-0.01	0.27	0.05	0.31	0.04	0.00	-0.01	0.00	-0.02	0.04	0.04	0.05	0.05	1.00																
(17) RES's partner exposure to ATTs (12 months)†	-0.01	0.04	0.05	0.11	0.43	0.10	0.41	-0.01	-0.01	-0.01	-0.04	0.08	0.05	0.09	0.04	0.28	1.00															
(18) RES's partner exposure to NURs (1 month)†	0.01	0.00	0.00	0.30	0.07	0.33	0.05	0.01	0.00	0.01	0.00	0.04	0.04	0.05	0.05	0.92	0.28	1.00														
(19) RES's partner exposure to NURs (12 months)†	-0.03	0.04	0.04	0.11	0.46	0.10	0.42	-0.03	0.03	-0.02	-0.03	0.07	0.01	0.08	0.01	0.22	0.94	0.25	1.00													
(20) Age (years)	0.11	-0.03	-0.05	0.00	-0.02	-0.01	-0.03	0.00	0.01	0.00	0.02	-0.01	-0.01	-0.02	0.00	0.00	-0.02	0.01	-0.02	1.00												
(21) Female	0.02	-0.02	-0.02	0.00	-0.01	0.00	-0.01	0.00	0.01	0.00	0.02	-0.02	-0.01	-0.03	-0.01	-0.01	-0.02	0.00	-0.02	0.00	1.00											
(22) ESI level	-0.17	0.03	0.05	0.00	0.01	0.00	0.01	0.00	-0.02	0.00	-0.03	0.01	0.01	0.01	0.00	-0.02	-0.02	-0.02	-0.01	-0.18	0.01	1.00										
(23) RES present	0.06	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.08	0.05	0.09	0.06	0.00	0.00	0.00	0.00	0.04	0.00	-0.10	1.00									
(24) Second NUR present	0.24	-0.02	-0.08	0.00	-0.02	-0.02	-0.09	0.02	-0.02	0.00	0.01	-0.04	-0.12	-0.05	-0.13	-0.01	-0.04	0.00	-0.06	0.10	0.00	-0.10	0.02	1.00								
(25) ATT current workload (cases)	0.05	0.02	0.04	0.01	0.02	0.02	0.04	-0.02	-0.04	-0.04	-0.06	0.03	0.04	0.03	0.02	0.03	0.02	0.02	0.01	-0.06	-0.04	0.02	0.01	0.02	1.00							
(26) NUR current workload (cases)	-0.02	0.06	0.08	0.00	0.02	0.04	0.08	-0.03	-0.04	-0.03	-0.06	0.13	0.09	0.13	0.07	0.01	0.05	0.00	0.04	-0.09	-0.01	0.07	-0.03	0.00	0.27	1.00						
(27) RES current workload (cases)†	0.06	0.05	0.07	0.05	0.12	0.05	0.11	-0.02	-0.06	-0.04	-0.08	0.05	0.04	0.05	0.03	0.06	0.18	0.07	0.17	-0.04	-0.01	-0.02	.	0.03	0.43	0.31	1.00					
(28) ATT experience (cases)	-0.03	0.15	0.43	0.11	0.30	0.00	0.02	0.40	0.53	0.36	0.66	0.02	0.08	0.02	0.08	0.00	0.00	0.02	-0.05	-0.01	0.00	0.00	-0.01	0.07	0.04	-0.02	0.00	1.00				
(29) NUR experience (cases)	0.01	0.08	0.39	0.00	0.00	0.06	0.33	0.03	-0.06	0.00	-0.01	0.26	0.67	0.25	0.65	0.02	0.02	0.02	-0.03	-0.02	-0.01	0.01	0.02	-0.07	0.05	0.06	0.04	0.22	1.00			
(30) RES experience (cases)†	-0.02	0.04	0.06	0.03	0.41	0.03	0.42	0.00	-0.04	-0.02	-0.05	0.09	0.09	0.09	0.05	0.07	0.72	0.06	0.71	-0.03	-0.03	0.00	.	-0.02	0.03	0.05	0.15	0.07	0.11	1.00		
(31) ED census (cases)	0.12	-0.02	-0.02	-0.04	-0.08	0.00	-0.02	0.01	-0.02	-0.01	-0.01	-0.04	0.01	-0.03	0.03	-0.02	-0.09	-0.03	-0.11	0.02	0.05	-0.08	-0.07	0.08	0.37	0.30	0.31	0.01	0.04	-0.05	1.00	
(32) Time since ATT shift start (hours)	0.00	0.00	-0.01	0.01	0.01	0.02	0.03	0.00	0.00	0.01	0.00	0.04	0.03	0.05	0.03	0.03	0.02	0.02	0.01	-0.04	-0.02	-0.02	0.08	0.01	0.51	0.04	0.15	0.00	0.01	0.01	0.15	1.00

Notes. $N = 111,491$. ATT=Attending. NUR=Nurse. RES=Resident. Team familiarity is measured as the number of prior cases two care providers worked on together in the specified lookback window (e.g., 1 month or 12 months). Partner exposure is measured as the number of prior partners the focal care provider has worked with in the specified lookback window (e.g., 1 month or 12 months). Variables not shown for brevity include (ATT current workload)^2, (NUR current workload)^2, (RES current workload)^2, arrival hour-of-day, arrival year-month, attending fixed effects, nurse fixed effects, and resident fixed effects. All correlation coefficients whose absolute magnitude is less than or equal to 0.01 are statistically significant at the $p < 0.05$ level.

† $N = 76,377$ because this measure only pertains to cases that involve a resident.

4.2.3. Control Variables Our data allow us to control for several patient-, provider- and ED-level covariates that can potentially affect our performance measures. To adjust for heterogeneity across patient types, we control for patient age, gender, and ESI level. We also control for seasonality by including dummies for patient arrival hour, day-of-week, and month. Because prior studies have shown that workload can affect worker performance (Kc and Terwiesch 2009, Tan and Netessine 2014), we control for the number of cases that each of the assigned providers are concurrently working on (i.e., attending current workload, nurse current workload, and resident current workload), as well as their squared terms. We also control for the number of cases currently in the ED (i.e., ED census) as a proxy for ED congestion. To account for the within-shift variation in service rates (Batt et al. 2019, Deo and Jain 2019), we control for the time since the start of the attending physician's shift. We also control for attending, nurse, and resident fixed effects as well as the presence of a second nurse on the case. Finally, we control for the number of prior cases that each of the providers (attending, nurse, and resident, respectively) have worked on since the beginning of the study period as a proxy for experience. For brevity, we refer to these measures as attending experience, nurse experience, and resident experience, respectively. Table 1 provides summary statistics of the control variables, and Table 2 shows their correlations.

5. Effects of Team Familiarity and Partner Exposure

5.1. Estimation Model

We start by testing Hypotheses 1-4 to address our research questions. Namely, what are the effects of team familiarity and partner exposure on the performance of cross-discipline temporary teams? Do these effects vary by role, and do they vary depending on how long ago these experiences were accumulated? For our analyses, we leverage the exogenous variation in team and task assignment that comes from the random assignment of providers to teams and the round-robin assignment of patients to these teams. For each of the 12 lookback windows we consider, we estimate the effects of team familiarity and partner exposure on time to disposition in a single model. Specifically, we estimate the following log-linear model at the encounter level for each lookback window l:

$$\begin{aligned}\log(TimetoDispo_i) = {} & \gamma_0 + \gamma_{1,l} TF_{Att_i,Nur_i,l} + \gamma_{2,l} TF_{Att_i,Res_i,l} + \gamma_{3,l} TF_{Nur_i,Res_i,l} \\ & + \gamma_{4,l} PE_{Att_i,Nur,l} + \gamma_{5,l} PE_{Att_i,Res,l} + \gamma_{6,l} PE_{Nur_i,Att,l} \\ & + \gamma_{7,l} PE_{Nur_i,Res,l} + \gamma_{8,l} PE_{Res_i,Att,l} + \gamma_{9,l} PE_{Res_i,Nur,l} \\ & + \delta \mathbf{X}_i + \alpha_{Att_i} + \nu_{Nur_i} + \rho_{Res_i} + \varepsilon_i.\end{aligned} \tag{1}$$

Here, $\log(TimetoDispo_i)$ represents the logged number of minutes from patient arrival to disposition for patient encounter i. We log transform the dependent variable to account for the right-skewed distribution of the time to disposition variable. $TF_{Att_i,Nur_i,l}$ denotes the number of prior cases that Att_i and Nur_i worked on together during the lookback window l preceding encounter i, i.e., their level of team familiarity (TF). Similarly, $TF_{Att_i,Res_i,l}$ captures the team familiarity between the attending and the resident, and $TF_{Nur_i,Res_i,l}$ captures the team familiarity between the nurse and the resident. $PE_{j_i,k,l}$ measures the partner exposure (PE) by capturing the number of distinct providers of type k that provider j_i worked with during the lookback window l preceding encounter i. For example, $PE_{Att_i,Nur,l}$ denotes the number of distinct nurses that Att_i worked with during the lookback window l preceding encounter i, i.e., the attending's partner exposure to nurses. For cases that did not involve a resident, we set the team familiarity and partner exposure-related measures to 0. $\mathbf{X}_i$ is a vector of control variables described in section 4.2.3. α_{Att_i} are attending fixed effects where Att_i is the attending physician for patient encounter i. Similarly, ν_{Nur_i} are nurse fixed effects where Nur_i is the nurse for patient encounter i, and ρ_{Res_i} are resident fixed effects where Res_i is the resident physician for patient encounter i. Collectively, α_{Att_i}, ν_{Nur_i}, ρ_{Res_i} allow us to control for time-invariant aspects of attendings, nurses, and residents, respectively. Thus, our model assesses within-attending, within-nurse, and within-resident variance in measuring performance. ε_i captures standard errors clustered by provider teams. The main coefficients of interest are $\gamma_{1,l}$ through $\gamma_{9,l}$, which capture the effects of team familiarity and partner exposure on time to disposition.[4]

5.2. Main Results

Table 3 presents the results of estimating Equation 1 on our full analysis sample over 12 lookback windows ranging from 1 month to 12 months (see Table B.2 of the Online Supplement for full results tables with coefficients for control variables).

Table 3 Effects of team familiarity and partner exposure on logged time to disposition

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0026***	-0.0020***	-0.0017***	-0.0016***	-0.0016***	-0.0015***	-0.0013***	-0.0013***	-0.0012***	-0.0011***	-0.0011***	-0.0010***
	(0.0005)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Team familiarity between ATT and RES	0.0002	-0.0000	0.0000	-0.0000	-0.0000	-0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	-0.0002	-0.0003	-0.0003	-0.0003	-0.0003	-0.0002	-0.0000	-0.0002	-0.0001	-0.0002	-0.0002	-0.0002
	(0.0008)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
ATT's partner exposure to NURs	0.0007	-0.0006	-0.0006	-0.0004	-0.0012*	-0.0007	-0.0012*	-0.0012*	-0.0012*	-0.0012*	-0.0015**	-0.0014**
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
ATT's partner exposure to RESs	-0.0001	0.0015*	0.0009	0.0006	0.0015**	0.0008	0.0012*	0.0013*	0.0011+	0.0010+	0.0012*	0.0011+
	(0.0008)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)
NUR's partner exposure to ATTs	0.0004	0.0008	0.0008	0.0008	0.0006	0.0013+	0.0021**	0.0025***	0.0022**	0.0019**	0.0017*	0.0016*
	(0.0007)	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
NUR's partner exposure to RESs	0.0011	0.0010+	0.0012*	0.0014**	0.0017***	0.0012*	0.0008	0.0006	0.0009*	0.0011*	0.0013**	0.0012**
	(0.0007)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
RES's partner exposure to ATTs	0.0032***	0.0030***	0.0034***	0.0038***	0.0030***	0.0031***	0.0023**	0.0018*	0.0021**	0.0024**	0.0018*	0.0017*
	(0.0009)	(0.0008)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0009)
RES's partner exposure to NURs	-0.0021***	-0.0026***	-0.0027***	-0.0034***	-0.0032***	-0.0033***	-0.0028***	-0.0028***	-0.0030***	-0.0033***	-0.0031***	-0.0031***
	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Test of equality of coefficients												
ATT's partner exposure to NURs vs RESs	0.4801	0.0409	0.1560	0.3458	0.0088	0.1637	0.0200	0.0171	0.0351	0.0371	0.0081	0.0154
NUR's partner exposure to ATTs vs RESs	0.6312	0.8520	0.7290	0.5883	0.3514	0.8932	0.2346	0.0923	0.2481	0.4563	0.6907	0.6869
RES's partner exposure to ATTs vs NURs	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0001	0.0000	0.0002	0.0004
N	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491
R^2	0.1852	0.1854	0.1855	0.1858	0.1860	0.1861	0.1861	0.1863	0.1864	0.1865	0.1866	0.1866

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

We begin by examining the results on team familiarity. We find that higher levels of team familiarity between attendings and nurses are strongly associated with improved

[4] We check for multicollinearity by calculating variance inflation factors (VIF). When using a 1-month lookback window, the mean VIF in our empirical model is 2.45, which falls below the conventional threshold of 10 (Hair et al. 1998). We obtain similar results when using lookback windows ranging from 2 months to 12 months. This suggests that multicollinearity is not a concern in our model (Wooldridge 2012).

performance—more specifically a shorter time to disposition. This is evidenced by the fact that the coefficient on team familiarity between attendings and nurses (γ_1, l in Equation 1) in Table 3 is negative and statistically significant across all 12 specifications using lookback windows ranging from 1 month to 12 months. For example, in column (1) of Table 3, we find that a 1-unit increase in team familiarity accumulated over the past 1 month is associated with a 0.26 percent decrease in time to disposition ($p < 0.001$). In other words, patients under the care of an attending-nurse team that has worked on 1 additional case together over the past month experience a 0.26 percent decrease in the time to disposition on the focal case. As such, for attending-nurse dyads, we find strong evidence in support of Hypothesis 1 that team familiarity is positively associated with faster speed. However, for dyads involving resident trainees (attending-resident and nurse-resident), we do not find statistically significant effects associated with higher levels of team familiarity.

Next, we turn to the results on partner exposure, highlighting the dyads that yield results that are consistent across the 12 lookback windows. First, we find that higher levels of residents' partner exposure to attendings has a negative impact on performance. We see evidence of this from the positive and statistically significant coefficient on residents' partner exposure to attendings ($\gamma_{8,l}$ in Equation 1). When employing a 1-month lookback window, we see that patients under the care of a resident who has previously worked with 1 more attending in the past month experiences a 0.32 percent increase in time to disposition ($p < 0.001$). In other words, partner exposure as experienced by residents vis-à-vis attendings is associated with slower speeds. This offers support for Hypothesis 2b, which stated that same-discipline partner exposure is negatively associated with team performance for trainees in cross-discipline temporary teams.

In contrast, we find that higher levels of residents' partner exposure to nurses has a positive impact on performance. In this case, we find a negative and statistically significant coefficient on residents' partner exposure to nurses ($\gamma_{9,l}$ in Equation 1), which are consistent across all 12 lookback windows. Using a 1-month lookback window as an example once more, we see that patients under the care of a resident who has previously worked with 1 more nurse in the past month experiences a 0.21 percent decrease in time to disposition ($p < 0.001$). This time, partner exposure as experienced by residents vis-à-vis nurses is associated with faster speeds. Thus, we find that Hypothesis 3a is supported; cross-discipline partner exposure is positively associated with team performance for trainees. A post-estimation test of equality shows that this positive effect of residents' partner exposure to nurses is statistically significantly different from the negative effect of residents' partner exposure to attendings ($p < 0.001$ across all 12 lookback windows).

With regards to cross-discipline partner exposure that only involves non-trainee members (i.e., attendings and nurses), we find effects that are less stable in statistical significance across the 12 lookback windows. When it comes to the effect of attendings' partner exposure to nurses, we find evidence that is suggestive of a slight improvement in performance when employing lookback windows spanning at least 7 months ($p < 0.05$). In other words, when considering relatively long lookback windows, patients under the care of an attending who has previously worked with more distinct nurses seem to experience a slight reduction in their time to disposition. This offers partial support for Hypothesis 4a when it comes to attendings' partner exposure. We find the opposite with regards to the effect of nurses' partner exposure to attendings. Again, only when using lookback windows spanning at least 7 months, we find that patients under the care of a nurse who has previously worked with more distinct attendings experience an increase in their time to disposition ($p < 0.05$). This finding offers partial support for Hypothesis 4b when it comes to nurses' partner exposure. In section 6.1, we re-examine these hypotheses using a sample of cases where patient care teams included only an attending physician and a nurse and did not involve a resident.

5.3. Moderation Effects

Next, we test Hypothesis 5 to address the question of whether the effects of partner exposure on performance are moderated by the presence of structured workflows. To proxy for cases with more structured workflows, we construct a new indicator variable that identifies whether a case involved at least one laboratory test or radiology test; in our sample, 64% of cases involved at least one laboratory test or radiology test. This is a suitable proxy measure in the ED setting because cases that involve these diagnostic tests tend to follow a pre-defined structure and set of processes based on the test results. For our analyses, we interact the indicator variable for the presence of a laboratory or radiology test with each of the measures of partner exposure. For completeness, we also interact it with each of the measures of team familiarity.

We report the results of our estimation of these moderation effects in Table 4. Our findings show that the negative effect of residents' partner exposure to attendings is attenuated for cases that involved a laboratory test or a radiology test. This can be seen from the negative and significant coefficients on the term interacting residents' partner exposure attendings with the indicator for laboratory or radiology tests. We also find that the positive effect of residents' partner exposure to nurses is attenuated for these cases, which can be seen from the generally positive and significant coefficients on the term interacting residents' partner exposure to nurses with the indicator for laboratory or radiology tests. With each of these findings, we find support for Hypothesis 5a: the relationship between partner exposure and team performance is attenuated on cases with more structured workflows.

Table 4 Moderation effects of team familiarity and partner exposure on logged time to disposition

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0012^{+}	-0.0005	-0.0003	-0.0004	-0.0005^{+}	-0.0005*	-0.0005*	-0.0005*	-0.0005**	-0.0006**	-0.0006**	-0.0005**
	(0.0007)	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between ATT and RES	-0.0010	-0.0017***	-0.0013**	-0.0012**	-0.0011**	-0.0012***	-0.0009**	-0.0007*	-0.0007**	-0.0005*	-0.0005*	-0.0005*
	(0.0007)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	0.0002	0.0007	0.0001	0.0003	0.0003	0.0001	0.0004	0.0003	0.0005	0.0002	0.0001	0.0001
	(0.0012)	(0.0008)	(0.0007)	(0.0006)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0003)
ATT's partner exposure to NURs	0.0011	0.0003	0.0000	0.0006	-0.0001	0.0005	-0.0006	-0.0008	-0.0010	-0.0008	-0.0010	-0.0013*
	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
ATT's partner exposure to RESs	-0.0012	-0.0000	-0.0001	-0.0008	0.0001	-0.0007	0.0004	0.0007	0.0007	0.0005	0.0006	0.0007
	(0.0011)	(0.0009)	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0006)
NUR's partner exposure to ATTs	0.0009	0.0005	0.0012	0.0011	0.0009	0.0010	0.0018*	0.0020*	0.0019*	0.0021*	0.0019*	0.0018*
	(0.0010)	(0.0009)	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0008)
NUR's partner exposure to RESs	0.0015	0.0017*	0.0013*	0.0015*	0.0017**	0.0016**	0.0012*	0.0011*	0.0012*	0.0012*	0.0013**	0.0012**
	(0.0010)	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
RES's partner exposure to ATTs	0.0044***	0.0042***	0.0047***	0.0053***	0.0052***	0.0064***	0.0060***	0.0065***	0.0072***	0.0076***	0.0067***	0.0070***
	(0.0012)	(0.0011)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
RES's partner exposure to NURs	-0.0001	-0.0009	-0.0013^{+}	-0.0023**	-0.0028***	-0.0036***	-0.0036***	-0.0043***	-0.0049***	-0.0052***	-0.0048***	-0.0051***
	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Lab or rad test	0.6318***	0.6504***	0.6665***	0.6748***	0.6802***	0.6855***	0.6741***	0.6638***	0.6605***	0.6697***	0.6745***	0.6620***
	(0.0142)	(0.0183)	(0.0213)	(0.0231)	(0.0243)	(0.0255)	(0.0264)	(0.0272)	(0.0279)	(0.0285)	(0.0288)	(0.0290)
Team familiarity between ATT and NUR × Lab or rad test	-0.0009	-0.0012*	-0.0012**	-0.0012**	-0.0010**	-0.0009**	-0.0007**	-0.0007**	-0.0005*	-0.0004*	-0.0004*	-0.0004*
	(0.0008)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between ATT and RES × Lab or rad test	0.0014^{+}	0.0023***	0.0018***	0.0015***	0.0013**	0.0013***	0.0010**	0.0008*	0.0008**	0.0006*	0.0006*	0.0006*
	(0.0008)	(0.0006)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Team familiarity between NUR and RES × Lab or rad test	-0.0008	-0.0015	-0.0006	-0.0011	-0.0010^{+}	-0.0006	-0.0008	-0.0007	-0.0009*	-0.0007	-0.0005	-0.0004
	(0.0014)	(0.0010)	(0.0008)	(0.0007)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
ATT's partner exposure to NURs × Lab or rad test	-0.0012	-0.0014*	-0.0011	-0.0017*	-0.0016*	-0.0018**	-0.0010	-0.0007	-0.0005	-0.0005	-0.0003	0.0001
	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0006)
ATT's partner exposure to RESs × Lab or rad test	0.0021	0.0021*	0.0016^{+}	0.0022**	0.0019*	0.0021**	0.0014*	0.0011^{+}	0.0008	0.0008	0.0006	0.0003
	(0.0013)	(0.0009)	(0.0009)	(0.0008)	(0.0008)	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0005)
NUR's partner exposure to ATTs × Lab or rad test	-0.0002	0.0007	-0.0006	-0.0002	-0.0004	-0.0001	-0.0004	-0.0002	-0.0003	-0.0008	-0.0011	-0.0012
	(0.0012)	(0.0010)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
NUR's partner exposure to RESs × Lab or rad test	-0.0014	-0.0017*	-0.0005	-0.0008	-0.0006	-0.0008	-0.0006	-0.0006	-0.0006	-0.0004	-0.0002	-0.0001
	(0.0011)	(0.0008)	(0.0007)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)
RES's partner exposure to ATTs × Lab or rad test	-0.0028*	-0.0025*	-0.0026*	-0.0024*	-0.0030**	-0.0047***	-0.0052***	-0.0065***	-0.0070***	-0.0073***	-0.0068***	-0.0073***
	(0.0014)	(0.0012)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0010)	(0.0010)
RES's partner exposure to NURs × Lab or rad test	-0.0024*	-0.0020*	-0.0016*	-0.0014^{+}	-0.0008	0.0005	0.0010	0.0020**	0.0024***	0.0026***	0.0023**	0.0026***
	(0.0009)	(0.0008)	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
N	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491
R^2	0.3263	0.3270	0.3272	0.3276	0.3278	0.3279	0.3278	0.3280	0.3282	0.3282	0.3282	0.3283

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

6. Additional Analyses and Robustness Checks

We conduct several additional analyses to assess the robustness of our findings and the sensitivity of our main results.

6.1. Alternate Sample Definitions

We consider alternate ways of defining the analysis sample. First, we consider a subsample of cases where patient care teams included only an attending physician and a nurse and did not involve a resident. As discussed in section 3.1, while all patient care teams must include an attending physician and a nurse, about 69% of the cases also include a resident physician, as a function of the residency program's schedule. To see whether there are meaningful differences in the results when we consider all cases versus excluding those that did not include a resident physician, we estimate the following log-linear model on this subsample:

$$\log(TimetoDispo_i) = \beta_0 + \beta_{1,l} TF_{Att_i,Nur_i,l} + \beta_{2,l} PE_{Att_i,Nur,l} + \beta_{3,l} PE_{Nur_i,Att,l} + \delta \mathbf{X}_i + \alpha_{Att_i} + \nu_{Nur_i} + \rho_{Res_i} + \varepsilon_i. \tag{2}$$

These results are reported in Table 5. We find the team familiarity results are highly robust to the main results, in both the magnitude and statistical significance of the coefficients across each of the 12 lookback windows. We find no significant effects when it comes to attendings' partner exposure to nurses. However, we find strong negative effects of nurses' partner exposure to attendings, which lends further support for Hypothesis 4b.

Table 5 **Effects of team familiarity and partner exposure on logged time to disposition – cases without residents**

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0029***	-0.0021***	-0.0015**	-0.0013**	-0.0012**	-0.0012***	-0.0012***	-0.0010***	-0.0010***	-0.0008**	-0.0008**	-0.0007**
	(0.0009)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)
ATT's partner exposure to NURs	0.0002	0.0001	-0.0005	-0.0002	-0.0002	-0.0001	-0.0003	-0.0004	-0.0005	-0.0005	-0.0006	-0.0008
	(0.0005)	(0.0005)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
NUR's partner exposure to ATTs	0.0013	0.0024**	0.0028***	0.0027***	0.0028***	0.0031***	0.0032***	0.0034***	0.0037***	0.0037***	0.0035***	0.0035***
	(0.0008)	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)
Test of equality of coefficients												
ATT's vs NURs's partner exposure	0.2484	0.0156	0.0004	0.0019	0.0011	0.0007	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
N	35114	35114	35114	35114	35114	35114	35114	35114	35114	35114	35114	35114
R^2	0.2055	0.2057	0.2057	0.2057	0.2057	0.2059	0.2060	0.2060	0.2061	0.2061	0.2060	0.2060

Notes. ATT=Attending. NUR=Nurse. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, attending experience, nurse experience, ED census, attending fixed effects, and nurse fixed effects. Standard errors (in parentheses) are clustered by attending-nurse teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

For completeness, we also consider a subsample of cases where patient care teams included members of all three roles, i.e., one attending, one nurse, and one resident. These results, reported in Table 6, are highly consistent with the main results reported in Table 3.

Table 6 Effects of team familiarity and partner exposure on logged time to disposition – cases with residents

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0024***	-0.0019***	-0.0017***	-0.0017***	-0.0017***	-0.0015***	-0.0014***	-0.0014***	-0.0013***	-0.0012***	-0.0012***	-0.0012***
	(0.0005)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Team familiarity between ATT and RES	-0.0002	-0.0003	-0.0002	-0.0003	-0.0003	-0.0004+	-0.0003	-0.0002	-0.0002	-0.0002	-0.0001	-0.0002
	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	0.0001	0.0000	0.0001	0.0001	-0.0000	0.0001	0.0002	0.0000	0.0001	0.0000	-0.0000	-0.0000
	(0.0008)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)
ATT's partner exposure to NURs	0.0011+	-0.0005	-0.0004	-0.0001	-0.0012*	-0.0009	-0.0013*	-0.0012*	-0.0009	-0.0011+	-0.0013*	-0.0013*
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
ATT's partner exposure to RESs	-0.0003	0.0014*	0.0009	0.0003	0.0015*	0.0010	0.0014*	0.0015*	0.0009	0.0009	0.0011	0.0011+
	(0.0009)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0006)
NUR's partner exposure to ATTs	0.0009	0.0008	0.0008	0.0010	0.0007	0.0013	0.0023**	0.0025**	0.0020*	0.0016+	0.0013	0.0015+
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
NUR's partner exposure to RESs	0.0004	0.0007	0.0008	0.0009	0.0014*	0.0010+	0.0005	0.0005	0.0009+	0.0012*	0.0014**	0.0012*
	(0.0008)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
RES's partner exposure to ATTs	0.0034***	0.0032***	0.0038***	0.0042***	0.0032***	0.0034***	0.0024**	0.0018*	0.0021*	0.0024**	0.0018*	0.0015+
	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
RES's partner exposure to NURs	-0.0022***	-0.0026***	-0.0029***	-0.0035***	-0.0032***	-0.0033***	-0.0027***	-0.0025***	-0.0028***	-0.0031***	-0.0029***	-0.0028***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Test of equality of coefficients												
ATT's partner exposure to NURs vs RESs	0.3065	0.1233	0.2916	0.7162	0.0229	0.0994	0.0260	0.0281	0.1393	0.1124	0.0514	0.0443
NUR's partner exposure to ATTs vs RESs	0.7474	0.9362	0.9909	0.9567	0.5905	0.8246	0.1809	0.1374	0.3935	0.7683	0.9191	0.7940
RES's partner exposure to ATTs vs NURs	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0017	0.0005	0.0001	0.0014	0.0033
N	76377	76377	76377	76377	76377	76377	76377	76377	76377	76377	76377	76377
R^2	0.1822	0.1824	0.1826	0.1829	0.1831	0.1833	0.1832	0.1834	0.1835	0.1837	0.1838	0.1839

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Next, we consider an alternate sample where we relax some of our exclusion criteria. Specifically, we include in our sample visits whose time to disposition is shorter than the 1^{st} percentile value or longer than the 99^{th} percentile value (Table B.3). We also include visits of patients whose ESI level is 1 (Table B.4). We find our main results to be robust to these expanded samples.

We also consider imposing additional exclusion criteria as opposed to relaxing them, whereby we exclude cases that included a second nurse to whom the case was handed off (Table B.5). Again, our main results are highly robust to these additional sample exclusions.

6.2. Alternate Measures of Performance

We examine whether our results are sensitive to different ways of measuring performance in the context of the ED. To do this, we use two alternate measures that are also commonly used: logged time in the ED and logged time from first provider to disposition. For each of these dependent variables, we estimate a log-linear model at the encounter level for each lookback window l that retains the same form on the right-hand side as Equation 1.

We begin by assessing the effects of team familiarity and partner variety on logged time in the ED. This measure is different from logged time to disposition in that it includes discharge processing times and boarding times. These portions of time are typically beyond the control of the ED providers, but nevertheless have a significant impact on ED operations. When using time to disposition as the speed-related team performance measure, we find our main results to be robust to the use of this alternate measure in terms of magnitude, directionality, and statistical significance (see Table B.6).

In Table B.7, we repeat the estimation for logged time from first provider to disposition. This captures the time elapsed between when the first provider (either an attending, a nurse, or a resident) started interacting with the patient's EHR and the time when the disposition order was signed. With this model as well, we find our main results to be highly robust in terms of magnitude, sign, and statistical significance.

Finally, we estimate the effects on just a small portion of the total time that patients spend in the ED—specifically, the time from disposition to departure among patients who were discharged to home from the ED. While this duration, which captures the discharge process, is not necessarily representative of the entire time the patient spent receiving care, it could be indicative of the extent to which the physician and nurse are coordinating effectively with each other. Our findings, shown in Table B.8, show that attending-nurse pairs who have higher levels of team familiarity are able to complete this discharge process faster ($p < 0.01$). This suggests that teams with higher levels of familiarity are better at communicating with each other. However, and as we would expect, partner exposure does not seem to meaningfully impact the speed of this discharge process.

7. Discussion and Conclusions

In this paper, we synthesized competing hypotheses exploring how team composition influences team performance, focusing on team familiarity and partner exposure in temporary cross-discipline teams. We assess the competing hypotheses by leveraging the *ad hoc* team assignment and round-robin patient assignment at a hospital ED to cleanly identify the performance effects of these team composition variables. Most of the research in this area has focused on and found performance benefits of team familiarity in temporary teams. A recent study found performance benefits of partner exposure in solo-discipline teams. Our results contribute new empirical evidence demonstrating differential performance effects of partner exposure in cross-discipline temporary teams. We find that there is a significant positive impact of the residents' (i.e., trainees') exposure to more nurses, who are their cross-discipline partners. In contrast, we find a significant negative impact of both residents' and nurses' exposure to more attendings. These effects are mitigated for patient cases with more structured workflows. We also find that these effects do not differ substantially based on whether the experiences were accumulated recently versus longer ago. These results make several contributions to the literature on the performance of temporary and cross-discipline teams, and lay out opportunities for future research.

First, these results contribute new insight into the composition of temporary and cross-discipline teams. We synthesize the research literature to describe how members of cross-discipline teams engage in teaming interactions across professional hierarchies and disciplinary boundaries, and to consider how these structures shape both productivity and learning. For all members within these teams, the *ad hoc* composition of the temporary teams meant that they were exposed to many new team members over the course of weeks, months, and years of working in the Metro ED. As the Akşin et al. (2020) result demonstrates, this kind of new partner exposure offers team members the opportunity to observe many different ways of working. Attendings have considerable practice variation (Corallo et al. 2014, Davis et al. 2000, Grytten and Sørensen 2003), and as the team authorities, their practice styles and preferences shape the work of the rest the team. Thus, as we summarize above, there is a case to be made that both residents and nurses could learn from exposure to many different attendings. In Akşin et al. (2020), exposure to the varied practices of same-discipline partners was the source of performance benefits as team members learned from each other and were able to generalize those learnings to quicker coordination on later patient cases. However, our results did not bear out this set of arguments for cross-discipline teams, which suggests that learning across the professional hierarchy or learning across the disciplinary boundary was not as easily a matter of exposure to practice variation.

Instead, our results show negative performance impacts of partner exposure to more attendings for both residents and nurses, and that these effects are lessened on patient cases with more structured workflows. This pattern of results suggests that the team authority structure contributes to the lack of learning and performance benefits from partner exposure to attendings. Neither nurses nor residents seem to be gaining generalized performance benefits as they work with additional attending partners.

With this study, we cannot perfectly rule out the possibility that each new attending is taking the time to explain and narrate to both residents and nurses, and that this additional discussion explains the negative efficiencies of attending exposure. This alternative explanation does not align with prior characterizations of teams with this authority structure, where the attendings bear responsibility for a set of life-and-death decisions and need to be authoritative and direct. It also does not align with any of our observations and interviews. The attendings were more likely to engage residents in the formalized treatment plans during rounds or at the computers, but not necessarily through on-going iterative narration and explanation. Additionally, the moderating effect of more structured workflows also supports this interpretation of the results. This is because the cases that involve laboratory or radiology tests tend to have clear if-then protocols based on the test results, which lessens the need for residents to rely on other providers for guidance on next steps.

We do find positive performance impacts for one dyad on these cross-discipline temporary teams. Resident-trainees gained performance benefits from partner exposure to nurses, who are their cross-discipline partners. The relevant literature that suggests we might expect this kind of learning focuses on the iterative interactions that are structured by the resident-nurse interdependence and the team authority structure. These studies suggest that despite the well-defined disciplinary silos that medical and nursing students are trained and socialized in, these two roles end up interdependent and interactive because they are the team members actively carrying out the plan of care. They are walking to and from the patient bedside carrying out the orders, and are more likely to engage on the routine aspects of care delivery; because the residents are so early in their professional learning, these seemingly routine interactions wherein details are narrated and interpreted might be particularly useful for the residents. Different nurses might have different ways of explaining or narrating or interpreting different patient cases and orders. Our results bore out this set of arguments: exposure to more nurses does significantly impact residents' performance on later cases in a positive way. Taken together, these results demonstrate that the effects of partner exposure on team performance are setting specific and role specific. For some team members, partner exposure tends to hinder rather than bolster team performance. In addition, even though it may not be emphasized in staffing procedures or formal training policies, trainees on the cross-discipline teams may benefit from exposure to more cross-discipline partners.

Our results also advance this literature on team composition in temporary teams by explicitly modeling and assessing the recency effects of these variables. To our knowledge, this work is the first to explicitly consider whether these effects are contingent on how long ago the shared experience or new partner exposure was gained. Our results show that the effects do not meaningfully vary depending on how long ago these experiences were accumulated. In cases when there are differences in effects across lookback windows, the lack of statistical significance applies to findings when employing shorter lookback windows as opposed to longer ones, which points to limited variation and statistical power inherent to shorter lookback windows rather than a forgetting effect. As such, our findings indicate that there is not a measurable forgetting effect; in other words, the effects of team familiarity and partner variety on team performance do not meaningfully depend on how recently the experiences were accumulated (at least over a period of the past 12 months). This suggests that experiences accumulated longer ago should contribute to the stock of overall team familiarity and partner variety just as much as experiences that were accumulated more recently. As such, managers should employ a reasonably long lookback window in measuring these experience-related team characteristics, so that they can more fully capture the true stock of team familiarity and partner variety.

In terms of the research literature, prior work seldom discusses whether and how the lookback window was defined in measuring various experience-related team characteristics, such as team familiarity and partner exposure. In fact, much of the existing literature to date uses a rolling lookback window that is effectively shorter for observations occurring closer to the beginning of the data set and longer for observations occurring later in the data set. In future work, we recommend that researchers use pre-determined and consistent lookback windows across all observations when measuring these types of team characteristics, and consider reporting the sensitivity of their results to the lookback specification. Our paper provides a template for doing so.

As with many field-based studies, a limitation of this work is that our investigation was limited to a single organization. Future work should explore the extent to which these findings hold in other EDs. It is possible that this ED has a particularly demanding medical culture compared to other EDs. We expect that the larger organizational and professional cultures that shape expectations about how attendings interact with nurses and residents might be a salient contextual moderator of these results (e.g., Alexander et al. 2005, Shortell et al. 1991). At the same time, medical care and hospitals are a particularly institutionalized setting, so the underlying dynamics may not vary considerably between EDs themselves. Our results suggest that the team authority structure shapes the value of partner exposure, and these dynamics may generalize to other hierarchical and institutionalized settings. It is useful to recognize that those properties of the medical setting, and particularly the ED setting, are often attributed to the demands of the work: fast-paced, dynamic, sometimes life-and-death decisions with varied workflow and changing staff (e.g., Klein et al. 2006). Less hierarchical and less institutionalized settings might change results; thus, in developing future theory on partner exposure, future work should also explore these dynamics in a variety of other service settings, such as in in new product development teams (e.g., Edmondson and Nembhard 2009). We were also constrained by some limitations in data availability, such as more detailed information about patient conditions and data on specialists who may also be involved in the patient's care. In addition, like many studies that use archival data to estimate impacts, we do not directly measure the conceptual mechanisms we develop in the argument. That said, these limitations should not bias our estimations, given the round-robin assignment of patients to teams. This feature of the organizational setting provides a clean identification strategy to isolate performance effects.

In many industries, a growing number of organizations—within and beyond health care settings—are utilizing temporary teams that are comprised of cross-discipline team members. These teams are essential to the execution of the complex service operations that these firms carry out daily. Our results provide managers with evidence on the staffing levers they might use to compose temporary teams. Team composition can be a relatively straightforward managerial tool for improving team performance (Beckman et al. 2007, Bell 2007, Mathieu et al. 2014, Ruef 2002, Twyman and Contractor 2019). Furthermore, given the many automated scheduling systems available for use, some of which are home-grown and relatively easy to program, our recommendation that organizations empirically assess the performance impacts of staffing decisions is a feasible one to implement.

References

Abourbih D, Armstrong S, Nixon K, Ackery AD (2015) Communication between nurses and physicians: Strategies to surviving in the emergency department trenches. *Emergency medicine Australasia: EMA* 27(1):80–82, ISSN 1742-6723, URL http://dx.doi.org/10.1111/1742-6723.12339.

Adler-Milstein J, Neal K, Howell MD (2011) Residents' and nurses' perceptions of team function in the medical intensive care unit. *Journal of Critical Care* 26(1):104.e7–104.e15, ISSN 08839441, URL http://dx.doi.org/10.1016/j.jcrc.2010.04.003.

Agha L, Ericson KM, Geissler K, Rebitzer J (2018) Team Formation and Performance: Evidence from Healthcare Referral Networks, URL http://dx.doi.org/10.3386/w24338.

Akşin Z, Deo S, Jónasson JO, Ramdas K (2020) Learning from Many: Partner Exposure and Team Familiarity in Fluid Teams. *Management Science* mnsc.2019.3576, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.2019.3576.

Alderfer CP (1980) Consulting to underbounded systems. *Advances in experiential social processes* 2:267–295.

Alexander JA, Lichtenstein R, Jinnett K, Wells R, Zazzali J, Liu D (2005) Cross-Functional Team Processes and Patient Functional Improvement: Cross-Functional Teams. *Health Services Research* 40(5p1):1335–1355, ISSN 00179124, 14756773, URL http://dx.doi.org/10.1111/j.1475-6773.2005.00418.x.

Allon G, Deo S, Lin W (2013) The Impact of Size and Occupancy of Hospital on the Extent of Ambulance Diversion: Theory and Evidence. *Operations Research* 61(3):544–562, ISSN 0030-364X, 1526-5463, URL http://dx.doi.org/10.1287/opre.2013.1176.

Ancona DG, Okhuysen GA, Perlow LA (2001) Taking Time to Integrate Temporal Research. *Academy of Management Review* 26(4):512–529, URL http://dx.doi.org/10.2307/3560239.

Anderson D, Gao GG, Golden B (2014) Life Is All about Timing: An Examination of Differences in Treatment Quality for Trauma Patients Based on Hospital Arrival Time. *Production and Operations Management* 23(12):2178–2190, URL http://dx.doi.org/10.1111/poms.12236.

Anderson EG, Lewis K (2014) A Dynamic Model of Individual and Collective Learning Amid Disruption. *Organization Science* 25(2):356–376, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.2013.0854.

Austin JR (2003) Transactive memory in organizational groups: The effects of content, consensus, specialization, and accuracy on group performance. *Journal of Applied Psychology* 88(5):866–878, ISSN 0021-9010, URL http://dx.doi.org/10.1037/0021-9010.88.5.866.

Avgerinos E, Gokpinar B (2017) Team Familiarity and Productivity in Cardiac Surgery Operations: The Effect of Dispersion, Bottlenecks, and Task Complexity. *Manufacturing & Service Operations Management* 19(1):19–35, ISSN 1523-4614, URL http://dx.doi.org/10.1287/msom.2016.0597.

Baggs JG, Schmitt MH (1997) Nurses' and resident physicians' perceptions of the process of collaboration in an MICU. *Research in Nursing & Health* 20(1):71–80, ISSN 0160-6891, URL http://dx.doi.org/10.1002/(sici)1098-240x(199702)20:1<71::aid-nur8>3.0.co;2-r.

Balkundi P, Harrison DA (2006) Ties, Leaders, And Time In Teams: Strong Inference About Network Structure's Effects On Team Viability And Performance. *Academy of Management Journal* 49(1):49–68, ISSN 0001-4273, 1948-0989, URL http://dx.doi.org/10.5465/amj.2006.20785500.

Bartunek JM (2011) Intergroup relationships and quality improvement in healthcare. *BMJ Quality & Safety* 20(Suppl 1):i62–i66, ISSN 2044-5415, 2044-5423, URL http://dx.doi.org/10.1136/bmjqs.2010.046169.

Batt RJ, Kc DS, Staats BR, Patterson BW (2019) The Effects of Discrete Work Shifts on a Nonterminating Service System. *Production and Operations Management* 28(6):1528–1544, ISSN 1059-1478, 1937-5956, URL http://dx.doi.org/10.1111/poms.12999.

Beane M (2019) Shadow Learning: Building Robotic Surgical Skill When Approved Means Fail. *Administrative Science Quarterly* 64(1):87–123, ISSN 0001-8392, 1930-3815, URL http://dx.doi.org/10.1177/0001839217751692.

Bechky BA (2003) Sharing Meaning Across Occupational Communities: The Transformation of Understanding on a Production Floor. *Organization Science* 14(3):312–330, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.14.3.312.15162.

Bechky BA (2006) Gaffers, Gofers, and Grips: Role-Based Coordination in Temporary Organizations. *Organization Science* 17(1):3–21, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.1050.0149.

Beckman CM, Burton MD, O'Reilly C (2007) Early teams: The impact of team demography on VC financing and going public. *Journal of Business Venturing* 22(2):147–173, ISSN 08839026, URL http://dx.doi.org/10.1016/j.jbusvent.2006.02.001.

Bell ST (2007) Deep-level composition variables as predictors of team performance: A meta-analysis. *Journal of Applied Psychology* 92(3):595–615, ISSN 1939-1854, 0021-9010, URL http://dx.doi.org/10.1037/0021-9010.92.3.595.

Benike LA, Clark JE (2013) Bridging the Professional Divide Between Nurses and Medical Residents. *Harvard Business Review* ISSN 0017-8012.

Benkler Y (2017) Peer production, the commons, and the future of the firm. *Strategic Organization* 15(2):264–274, ISSN 1476-1270, URL http://dx.doi.org/10.1177/1476127016652606.

Bernstein SL, Aronsky D, Duseja R, Epstein S, Handel D, Hwang U, McCarthy M, John McConnell K, Pines JM, Rathlev N, Schafermeyer R, Zwemer F, Schull M, Asplin BR, Society for Academic Emergency Medicine, Emergency Department Crowding Task Force (2009) The Effect of Emergency Department Crowding on Clinically Oriented Outcomes. *Academic Emergency Medicine* 16(1):1–10, ISSN 10696563, 15532712, URL http://dx.doi.org/10.1111/j.1553-2712.2008.00295.x.

Berry Jaeker JA, Tucker AL (2017) Past the Point of Speeding Up: The Negative Effects of Workload Saturation on Efficiency and Patient Severity. *Management Science* 63(4):1042–1062, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.2015.2387.

Bigley GA, Roberts KH (2001) The Incident Command System: High-Reliability Organizing for Complex and Volatile Task Environments. *Academy of Management Journal* 44(6):1281–1299, URL http://dx.doi.org/10.5465/3069401.

Bresman H, Zellmer-Bruhn M (2013) The Structural Context of Team Learning: Effects of Organizational and Team Structure on Internal and External Learning. *Organization Science* 24(4):1120–1139, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.1120.0783.

Brooks AK (23) Power and the production of knowledge: Collective team learning in work organizations. *Human Resource Development Quarterly* 5(3):213–235, ISSN 10448004, 15321096, URL http://dx.doi.org/10.1002/hrdq.3920050303.

Brown JS, Duguid P (1991) Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovation. *Organization Science* 2(1):40–57, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.2.1.40.

Brown JS, Duguid P (2001) Knowledge and Organization: A Social-Practice Perspective. *Organization Science* 12(2):198–213, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.12.2.198.10116.

Cappelli P (1999) Career jobs are dead. *California Management Review* 42(1):146–167.

Cattani G, Ferriani S, Mariani MM, Mengoli S (2013) Tackling the "Galacticos" effect: Team familiarity and the performance of star-studded projects. *Industrial and Corporate Change* 22(6):1629–1662, ISSN 0960-6491, URL http://dx.doi.org/10.1093/icc/dtt001.

Chan DC (2016) Teamwork and Moral Hazard: Evidence from the Emergency Department. *Journal of Political Economy* 124(3):734–770, ISSN 0022-3808, URL http://dx.doi.org/10.1086/685910.

Corallo AN, Croxford R, Goodman DC, Bryan EL, Srivastava D, Stukel TA (2014) A systematic review of medical practice variation in OECD countries. *Health Policy* 114(1):5–14, ISSN 01688510, URL http://dx.doi.org/10.1016/j.healthpol.2013.08.002.

Crisp CB, Jarvenpaa SL (2013) Swift Trust in Global Virtual Teams. *Journal of Personnel Psychology* 12(1):45–56, URL http://dx.doi.org/10.1027/1866-5888/a000075.

Cummings JN, Cross R (2003) Structural properties of work groups and their consequences for performance. *Social Networks* 25(3):197–210, ISSN 03788733, URL http://dx.doi.org/10.1016/S0378-8733(02)00049-7.

Davis P, Gribben B, Scott A, Lay-Yee R (2000) The "supply hypothesis" and medical practice variation in primary care: Testing economic and clinical models of inter-practitioner variation. *Social Science & Medicine* 50(3):407–418, ISSN 02779536, URL http://dx.doi.org/10.1016/S0277-9536(99)00299-3.

de Wit FRC, Greer LL, Jehn KA (2012) The paradox of intragroup conflict: A meta-analysis. *Journal of Applied Psychology* 97(2):360–390, ISSN 1939-1854, 0021-9010, URL http://dx.doi.org/10.1037/a0024844.

Deo S, Jain A (2019) Slow First, Fast Later: Temporal Speed-Up in Service Episodes of Finite Duration. *Production and Operations Management* 28(5):1061–1081, ISSN 1059-1478, 1937-5956, URL http://dx.doi.org/10.1111/poms.12972.

Dougherty D (1992) Interpretive Barriers to Successful Product Innovation in Large Firms. *Organization Science* 3(2):179–202, URL http://dx.doi.org/10.1287/orsc.3.2.179.

Dugan RE, Gabriel KJ (2013) "Special Forces" Innovation: How DARPA Attacks Problems. *Harvard Business Review* 91(10):74–84, ISSN 0017-8012.

Duguid P (2005) "The Art of Knowing": Social and Tacit Dimensions of Knowledge and the Limits of the Community of Practice. *The Information Society* 21(2):109–118, ISSN 0197-2243, 1087-6537, URL http://dx.doi.org/10.1080/01972240590925311.

Edmondson A (1999) Psychological Safety and Learning Behavior in Work Teams. *Administrative Science Quarterly* 44(2):350–383, ISSN 0001-8392, URL http://dx.doi.org/10.2307/2666999.

Edmondson AC, Bohmer RM, Pisano GP (2001a) Disrupted Routines: Team Learning and New Technology Implementation in Hospitals. *Administrative Science Quarterly* 46(4):685–716, ISSN 00018392, URL http://dx.doi.org/10.2307/3094828.

Edmondson AC, Bohmer RM, Pisano GP (2001b) Speeding Up Team learning. *Harvard Business Review* 79(9):125–132.

Edmondson AC, McManus SE (2007) Methodological fit in management field research. *Academy of Management Review* 32(4):1246–1264, ISSN 0363-7425, 1930-3807, URL http://dx.doi.org/10.5465/amr.2007.26586086.

Edmondson AC, Nembhard IM (2009) Product Development and Learning in Project Teams: The Challenges Are the Benefits. *Journal of Product Innovation Management* 26(2):123–138, URL http://dx.doi.org/10.1111/j.1540-5885.2009.00341.x.

Espinosa JA, Slaughter SA, Kraut RE, Herbsleb JD (2007) Familiarity, Complexity, and Team Performance in Geographically Distributed Software Development. *Organization Science* 18(4):613–630, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.1070.0297.

Faraj S, Xiao Y (2006) Coordination in Fast-Response Organizations. *Management Science* 52(8):1155–1169, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.1060.0526.

Foldy EG, Rivard P, Buckley TR (2009) Power, Safety, and Learning in Racially Diverse Groups. *Academy of Management Learning & Education* 8(1):25–41, ISSN 1537-260X, 1944-9585, URL http://dx.doi.org/10.5465/amle.2009.37012177.

Froehle CM, White DL (2014) Interruption and Forgetting in Knowledge-Intensive Service Environments. *Production and Operations Management* 23(4):704–722, ISSN 10591478, URL http://dx.doi.org/10.1111/poms.12089.

Gardner HK, Valentine M (2015) Collaboration among Highly Autonomous Professionals: Costs, Benefits, and Future Research Directions. *Advances in Group Processes*, 209–242 (Emerald Group Publishing Limited), ISBN 0882-6145, URL http://dx.doi.org/10.1108/S0882-614520150000032008.

Gilboy N, Tanabe T, Travers D, Rosenau A (2011) *Emergency Severity Index (ESI): A Triage Tool for Emergency Department Care, Version 4, Implementation Handbook* (Rockville, MD: Agency for Healthcare Research and Quality).

Goodman RA, Goodman LP (1976) Some Management Issues in Temporary Systems: A Study of Professional Development and Manpower-The Theater Case. *Administrative Science Quarterly* 21(3):494, ISSN 00018392, URL http://dx.doi.org/10.2307/2391857.

Greer LL, Chu C (2020) Power struggles: When and why the benefits of power for individuals paradoxically harm groups. *Current Opinion in Psychology* 33:162–166, ISSN 2352250X, URL http://dx.doi.org/10.1016/j.copsyc.2019.07.040.

Greer LL, de Jong BA, Schouten ME, Dannals JE (2018) Why and when hierarchy impacts team effectiveness: A meta-analytic integration. *Journal of Applied Psychology* 103(6):591–613, ISSN 1939-1854, 0021-9010, URL http://dx.doi.org/10.1037/apl0000291.

Grytten J, Sørensen R (2003) Practice variation and physician-specific effects. *Journal of Health Economics* 22(3):403–418, ISSN 01676296, URL http://dx.doi.org/10.1016/S0167-6296(02)00105-4.

Gupta D, Denton B (2008) Appointment scheduling in health care: Challenges and opportunities. *IIE Transactions* 40(9):800–819, URL http://dx.doi.org/10.1080/07408170802165880.

Hackman JR (2002) *Leading Teams: Setting the Stage for Great Performances* (Boston, MA: Harvard Business Press), ISBN 1-57851-333-2.

Hackman JR, Katz N (2010) Group Behavior and Performance. Fiske ST, Gilbert DT, Lindzey G, eds., *Handbook of Social Psychology*, socpsy002032 (Hoboken, NJ, USA: John Wiley & Sons, Inc.), ISBN 978-0-470-56111-9, URL http://dx.doi.org/10.1002/9780470561119.socpsy002032.

Hair JF, Anderson RE, Tatham RL, Black WC (1998) *Multivariate Data Analysis* (Upper Saddle River, NJ: Prentice Hall), fifth edition, ISBN 978-0-13-813263-7.

Harrison DA, Mohammed S, Mcgrath JE, Florey AT, Vanderstoep SW (2003) Time matters in team performance: Effects of member familiarity, entrainment and task discontinuity on speed and quality. *Personnel Psychology* 56(3):633–669, ISSN 0031-5826, 1744-6570, URL http://dx.doi.org/10.1111/j.1744-6570.2003.tb00753.x.

Hoffman R, Casnocha B, Yeh C (2013) Tours of duty: The new employer-employee contract. *Harvard Business Review* 91(6):48–58, ISSN 0017-8012.

Hollingsworth JC, Chisholm CD, Giles BK, Cordell WH, Nelson DR (1998) How do physicians and nurses spend their time in the emergency department? *Annals of Emergency Medicine* 31(1):87–91, ISSN 0196-0644, URL http://dx.doi.org/10.1016/s0196-0644(98)70287-2.

Huckman RS, Staats BR (2011) Fluid Tasks and Fluid Teams: The Impact of Diversity in Experience and Team Familiarity on Team Performance. *Manufacturing & Service Operations Management* 13(3):310–328, ISSN 1523-4614, 1526-5498, URL http://dx.doi.org/10.1287/msom.1100.0321.

Huckman RS, Staats BR, Upton DM (2009) Team Familiarity, Role Experience, and Performance: Evidence from Indian Software Services. *Management Science* 55(1):85–100, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.1080.0921.

Jehn KA (1995) A Multimethod Examination of the Benefits and Detriments of Intragroup Conflict. *Administrative Science Quarterly* 40(2):256–282, ISSN 00018392, URL http://dx.doi.org/10.2307/2393638.

Kane AA, Argote L, Levine JM (2005) Knowledge transfer between groups via personnel rotation: Effects of social identity and knowledge quality. *Organizational Behavior and Human Decision Processes* 96(1):56–71.

Katz R, Allen TJ (1982) Investigating the Not Invented Here (NIH) syndrome: A look at the performance, tenure, and communication patterns of 50 R & D Project Groups. *R&D Management* 12(1):7–20, ISSN 0033-6807, 1467-9310, URL http://dx.doi.org/10.1111/j.1467-9310.1982.tb00478.x.

Kc DS (2014) Does Multitasking Improve Performance? Evidence from the Emergency Department. *Manufacturing & Service Operations Management* 16(2):168–183, ISSN 1523-4614, 1526-5498, URL http://dx.doi.org/10.1287/msom.2013.0464.

Kc DS (2019) Heuristic Thinking in Patient Care. *Management Science* 66:2291–2799, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.2019.3332.

Kc DS, Scholtes S, Terwiesch C (2020) Empirical Research in Healthcare Operations: Past Research, Present Understanding, and Future Opportunities. *Manufacturing & Service Operations Management* 22(1):73–83, ISSN 1523-4614, 1526-5498, URL http://dx.doi.org/10.1287/msom.2019.0826.

Kc DS, Terwiesch C (2009) Impact of Workload on Service Time and Patient Safety: An Econometric Analysis of Hospital Operations. *Management Science* 55(9):1486–1498, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.1090.1037.

Keltner D, Gruenfeld DH, Anderson C (2003) Power, approach, and inhibition. *Psychological Review* 110(2):265–284, ISSN 1939-1471, 0033-295X, URL http://dx.doi.org/10.1037/0033-295X.110.2.265.

Kerrissey MJ, Satterstrom P, Edmondson AC (2020) Into the fray: Adaptive approaches to studying novel teamwork forms. *Organizational Psychology Review* 10(2):62–86, ISSN 2041-3866, 2041-3874, URL http://dx.doi.org/10.1177/2041386620912833.

Klein KJ, Ziegert JC, Knight AP, Xiao Y (2006) Dynamic Delegation: Shared, Hierarchical, and Deindividualized Leadership in Extreme Action Teams. *Administrative Science Quarterly* 51(4):590–621, ISSN 0001-8392, URL http://dx.doi.org/10.2189/asqu.51.4.590.

Kuntz L, Mennicken R, Scholtes S (2015) Stress on the Ward: Evidence of Safety Tipping Points in Hospitals. *Management Science* 61(4):754–771, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.2014.1917.

Kuntz L, Sülz S (2013) Treatment speed and high load in the Emergency Department—does staff quality matter? *Health Care Management Science* 16(4):366–376, ISSN 1386-9620, 1572-9389, URL http://dx.doi.org/10.1007/s10729-013-9233-3.

Laker LF, Froehle CM, Lindsell CJ, Ward MJ (2014) The Flex Track: Flexible Partitioning Between Low- and High-Acuity Areas of an Emergency Department. *Annals of Emergency Medicine* 64(6):591–603, ISSN 01960644, URL http://dx.doi.org/10.1016/j.annemergmed.2014.05.031.

Laker LF, Froehle CM, Windeler JB, Lindsell CJ (2018) Quality and Efficiency of the Clinical Decision-Making Process: Information Overload and Emphasis Framing. *Production and Operations Management* 27(12):2213–2225, ISSN 10591478, URL http://dx.doi.org/10.1111/poms.12777.

Lave J (1988) *Cognition in Practice : Mind, Mathematics, and Culture in Everyday Life* (Cambridge; New York: Cambridge University Press), ISBN 0-521-35015-8 978-0-521-35015-0 0-521-35734-9 978-0-521-35734-0 0-511-60926-4 978-0-511-60926-8.

Lave J, Wenger E (1991) *Situated Learning: Legitimate Peripheral Participation* (Cambridge University Press), ISBN 978-1-139-64300-9.

Lemieux-Charles L, McGuire WL (2006) What Do We Know about Health Care Team Effectiveness? A Review of the Literature. *Medical Care Research and Review* 63(3):263–300, ISSN 1077-5587, 1552-6801, URL http://dx.doi.org/10.1177/1077558706287003.

Leonard-Barton D (1992) Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal* 13(S1):111–125, URL http://dx.doi.org/10.1002/smj.4250131009.

Lewis K (2004) Knowledge and Performance in Knowledge-Worker Teams: A Longitudinal Study of Transactive Memory Systems. *Management Science* 50(11):1519–1533, URL http://dx.doi.org/10.1287/mnsc.1040.0257.

Lingard L, Espin S, Evans C, Hawryluck L (2004) The rules of the game: Interprofessional collaboration on the intensive care unit team. *Critical Care* 8(6):R403, ISSN 13648535, URL http://dx.doi.org/10.1186/cc2958.

Liu N, Ziya S, Kulkarni VG (2010) Dynamic Scheduling of Outpatient Appointments Under Patient No-Shows and Cancellations. *Manufacturing & Service Operations Management* 12(2):347–364, URL http://dx.doi.org/10.1287/msom.1090.0272.

Mathieu JE, Heffner TS, Goodwin GF, Salas E, Cannon-Bowers JA (2000) The influence of shared mental models on team process and performance. *Journal of Applied Psychology* 85(2):273–283, URL http://dx.doi.org/10.1037/0021-9010.85.2.273.

Mathieu JE, Tannenbaum SI, Donsbach JS, Alliger GM (2014) A Review and Integration of Team Composition Models: Moving Toward a Dynamic and Temporal Framework. *Journal of Management* 40(1):130–160, ISSN 0149-2063, 1557-1211, URL http://dx.doi.org/10.1177/0149206313503014.

Morey JC, Simon R, Jay GD, Wears RL, Salisbury M, Dukes KA, Berns SD (2002) Error Reduction and Performance Improvement in the Emergency Department through Formal Teamwork Training: Evaluation Results of the MedTeams Project. *Health Services Research* 37(6):1553–1581, ISSN 0017-9124, 1475-6773, URL http://dx.doi.org/10.1111/1475-6773.01104.

Mortensen M, Haas MR (2018) Rethinking Teams: From Bounded Membership to Dynamic Participation. *Organization Science* 29(2):341–355, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.2017.1198.

Muller-Juge V, Cullati S, Blondon KS, Hudelson P, Maître F, Vu NV, Savoldelli GL, Nendaz MR (2013) Interprofessional Collaboration on an Internal Medicine Ward: Role Perceptions and Expectations among Nurses and Residents. *PLoS ONE* 8(2):e57570, ISSN 1932-6203, URL http://dx.doi.org/10.1371/journal.pone.0057570.

Myers CG (2018) Coactive Vicarious Learning: Toward a Relational Theory of Vicarious Learning in Organizations. *Academy of Management Review* 43(4):610–634, ISSN 0363-7425, 1930-3807, URL http://dx.doi.org/10.5465/amr.2016.0202.

Nembhard IM, Edmondson AC (2006) Making it safe: The effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams. *Journal of Organizational Behavior* 27(7):941–966, ISSN 0894-3796, 1099-1379, URL http://dx.doi.org/10.1002/job.413.

O'Leary MB, Mortensen M, Woolley AW (2011) Multiple Team Membership: A Theoretical Model of its Effects on Productivity and Learning for Individuals and Teams. *Academy of Management Review* 36(3):461–478, ISSN 0363-7425, URL http://dx.doi.org/10.5465/AMR.2011.61031807.

Orr JE (1996) *Talking about Machines: An Ethnography of a Modern Job* (Ithaca, N.Y.: ILR Press), ISBN 0-8014-3297-9 978-0-8014-3297-2 0-8014-8390-5 978-0-8014-8390-5.

Paiva EL, Roth AV, Fensterseifer JE (2008) Organizational knowledge and the manufacturing strategy process: A resource-based view analysis. *Journal of Operations Management* 26(1):115–132, ISSN 02726963, URL http://dx.doi.org/10.1016/j.jom.2007.05.003.

Patterson PD, Pfeiffer AJ, Lave JR, Weaver MD, Abebe K, Krackhardt D, Arnold RM, Yealy DM (2015) How familiar are clinician teammates in the emergency department? *Emergency Medicine Journal* 32(4):258–262, ISSN 1472-0205, 1472-0213, URL http://dx.doi.org/10.1136/emermed-2013-203199.

Piquette D, Reeves S, Leblanc VR (2009) Interprofessional intensive care unit team interactions and medical crises: A qualitative study. *Journal of Interprofessional Care* 23(3):273–285, ISSN 1356-1820, 1469-9567, URL http://dx.doi.org/10.1080/13561820802697818.

Pitts SR, Pines JM, Handrigan MT, Kellermann AL (2012) National Trends in Emergency Department Occupancy, 2001 to 2008: Effect of Inpatient Admissions Versus Emergency Department Practice Intensity. *Annals of Emergency Medicine* 60(6):679–686.e3, ISSN 01960644, URL http://dx.doi.org/10.1016/j.annemergmed.2012.05.014.

Pourmand A, Lucas R, Pines J, Shokoohi H, Yadav K (2013) Bedside Teaching on Time to Disposition Improves Length of Stay for Critically-ill Emergency Departments Patients. *Western Journal of Emergency Medicine* 14(2):137–140, ISSN 1936900X, 19369018, URL http://dx.doi.org/10.5811/westjem.2012.10.12243.

Pronovost PJ, Vohr E (2010) *Safe Patients, Smart Hospitals: How One Doctor's Checklist Can Help Us Change Health Care from the Inside Out* (New York, NY: Hudson Street Press).

Ramachandran K, Tereyagoglu N, Unal M (2018) Help or Hindrance? The Role of Familiarity in Collaborative Product Development.

Ramdas K, Saleh K, Stern S, Liu H (2018) Variety and Experience: Learning and Forgetting in the Use of Surgical Devices. *Management Science* 64(6):2590–2608, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.2016.2721.

Reagans R, Argote L, Brooks D (2005) Individual Experience and Experience Working Together: Predicting Learning Rates from Knowing Who Knows What and Knowing How to Work Together. *Management Science* 51(6):869–881, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.1050.0366.

Reagans R, Zuckerman E, McEvily B (2004) How to Make the Team: Social Networks vs. Demography as Criteria for Designing Effective Teams. *Administrative Science Quarterly* 49(1):101–133.

Ren Y, Argote L (2011) Transactive Memory Systems 1985–2010: An Integrative Framework of Key Dimensions, Antecedents, and Consequences. *Academy of Management Annals* 5(1):189–229, URL http://dx.doi.org/10.5465/19416520.2011.590300.

Retelny D, Robaszkiewicz S, To A, Lasecki WS, Patel J, Rahmati N, Doshi T, Valentine M, Bernstein MS (2014) Expert crowdsourcing with flash teams. *Proceedings of the 27th Annual ACM Symposium on User Interface Software and Technology - UIST '14*, 75–85 (New York, New York, USA: ACM Press), ISBN 978-1-4503-3069-5, URL http://dx.doi.org/10.1145/2642918.2647409.

Riedl C, Woolley AW (2017) Teams vs. Crowds: A Field Test of the Relative Contribution of Incentives, Member Ability, and Emergent Collaboration to Crowd-Based Problem Solving Performance. *Academy of Management Discoveries* 3(4):382–403, URL http://dx.doi.org/10.5465/amd.2015.0097.

Roth A, Tucker AL, Venkataraman S, Chilingerian J (2019) Being on the Productivity Frontier: Identifying "Triple Aim Performance" Hospitals. *Production and Operations Management* 28(9):2165–2183, ISSN 1059-1478, 1937-5956, URL http://dx.doi.org/10.1111/poms.13019.

Ruef M (2002) A structural event approach to the analysis of group composition. *Social Networks* 24(2):135–160, ISSN 03788733, URL http://dx.doi.org/10.1016/S0378-8733(01)00054-5.

Sackett E, Cummings JN (2018) When team members perceive task interdependence differently: Exploring centrality asymmetry and team success. *Group Dynamics* 22(1):16–31, URL http://dx.doi.org/10.1037/gdn0000079.

Saghafian S, Hopp WJ, Van Oyen MP, Desmond JS, Kronick SL (2012) Patient Streaming as a Mechanism for Improving Responsiveness in Emergency Departments. *Operations Research* 60(5):1080–1097, ISSN 0030-364X, 1526-5463, URL http://dx.doi.org/10.1287/opre.1120.1096.

Saghafian S, Hopp WJ, Van Oyen MP, Desmond JS, Kronick SL (2014) Complexity-Augmented Triage: A Tool for Improving Patient Safety and Operational Efficiency. *Manufacturing & Service Operations Management* 16(3):329–345, ISSN 1523-4614, 1526-5498, URL http://dx.doi.org/10.1287/msom.2014.0487.

Salehi N, McCabe A, Valentine M, Bernstein M (2017) Huddler: Convening Stable and Familiar Crowd Teams Despite Unpredictable Availability. *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, 1700–1713 (ACM), ISBN 978-1-4503-4335-0, URL http://dx.doi.org/10.1145/2998181.2998300.

Shortell SM, Rousseau DM, Gillies RR, Devers KJ, Simons TL (1991) Organizational Assessment in Intensive Care Units (ICUs): Construct Development, Reliability, and Validity of the ICU Nurse-Physician Questionnaire. *Medical Care* 29(8):709–726.

Siemsen E, Roth AV, Balasubramanian S, Anand G (2009) The Influence of Psychological Safety and Confidence in Knowledge on Employee Knowledge Sharing. *Manufacturing & Service Operations Management* 11(3):429–447, ISSN 1523-4614, 1526-5498, URL http://dx.doi.org/10.1287/msom.1080.0233.

Singer AJ, Thode Jr HC, Viccellio P, Pines JM (2011) The Association Between Length of Emergency Department Boarding and Mortality. *Academic Emergency Medicine* 18(12):1324–1329, ISSN 10696563, URL http://dx.doi.org/10.1111/j.1553-2712.2011.01236.x.

Song H, Tucker AL, Murrell KL (2015) The Diseconomies of Queue Pooling: An Empirical Investigation of Emergency Department Length of Stay. *Management Science* 61(12):3032–3053, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.2014.2118.

Song H, Tucker AL, Murrell KL, Vinson DR (2018) Closing the Productivity Gap: Improving Worker Productivity Through Public Relative Performance Feedback and Validation of Best Practices. *Management Science* 64(6):2628–2649, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.2017.2745.

Staats BR (2012) Unpacking team familiarity: The effects of geographic location and hierarchical role. *Production and Operations Management* 21(3):619–635, ISSN 10591478, URL http://dx.doi.org/10.1111/j.1937-5956.2011.01254.x.

Staats BR, Upton DM (2011) Lean Knowledge Work. *Harvard Business Review* 89(10):100–110, ISSN 0017-8012.

Tan TF, Netessine S (2014) When Does the Devil Make Work? An Empirical Study of the Impact of Workload on Worker Productivity. *Management Science* 60(6):1574–1593, ISSN 0025-1909, 1526-5501, URL http://dx.doi.org/10.1287/mnsc.2014.1950.

Thompson L, Fine GA (1999) Socially Shared Cognition, Affect, and Behavior: A Review and Integration. *Personality and Social Psychology Review* 3(4):278–302, URL http://dx.doi.org/10.1207/s15327957pspr0304_1.

Twyman M, Contractor N (2019) Team Assembly. Hall KL, Vogel AL, Croyle RT, eds., *Strategies for Team Science Success*, 217–240 (Cham: Springer International Publishing), ISBN 978-3-030-20990-2 978-3-030-20992-6, URL http://dx.doi.org/10.1007/978-3-030-20992-6_17.

US Government Accountability Office (2009) Hospital emergency departments: Crowding continues to occur, and some patients wait longer than recommended time frames. Technical report.

Valentine M (2018) When Equity Seems Unfair: The Role of Justice Enforceability in Temporary Team Coordination. *Academy of Management Journal* 61(6):2081–2105, URL http://dx.doi.org/10.5465/amj.2016.1101.

Valentine MA, Edmondson AC (2015) Team Scaffolds: How Mesolevel Structures Enable Role-Based Coordination in Temporary Groups. *Organization Science* 26(2):405–422, ISSN 1047-7039, 1526-5455, URL http://dx.doi.org/10.1287/orsc.2014.0947.

Valentine MA, Retelny D, To A, Rahmati N, Doshi T, Bernstein MS (2017) Flash Organizations: Crowdsourcing Complex Work by Structuring Crowds As Organizations. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, 3523–3537 (ACM), ISBN 1-4503-4655-3.

Wageman R, Fisher C (2014) Who's in Charge Here? The Team Leadership Implications of Authority Structure. Day DV, ed., *The Oxford Handbook of Leadership and Organizations* (Oxford University Press), ISBN 978-0-19-975561-5, URL http://dx.doi.org/10.1093/oxfordhb/9780199755615.013.022.

Ward MJ, Ferrand YB, Laker LF, Froehle CM, Vogus TJ, Dittus RS, Kripalani S, Pines JM (2015) The Nature and Necessity of Operational Flexibility in the Emergency Department. *Annals of Emergency Medicine* 65(2):156–161, ISSN 01960644, URL http://dx.doi.org/10.1016/j.annemergmed.2014.08.014.

Weinberg DB, Cooney-Miner D, Perloff JN, Babington L, Avgar AC (2011) Building Collaborative Capacity Promoting Interdisciplinary Teamwork in the Absence of Formal Teams. *Medical Care* 49(8):716–723, ISSN 0025-7079, URL http://dx.doi.org/10.1097/MLR.0b013e318215da3f.

Weiser TG, Haynes AB, Lashoher A, Dziekan G, Boorman DJ, Berry WR, Gawande AA (2010) Perspectives in quality: Designing the WHO Surgical Safety Checklist. *International Journal for Quality in Health Care* 22(5):365–370, ISSN 1353-4505, 1464-3677, URL http://dx.doi.org/10.1093/intqhc/mzq039.

Weller JM, Janssen AL, Merry AF, Robinson B (2008) Interdisciplinary team interactions: A qualitative study of perceptions of team function in simulated anaesthesia crises. *Medical Education* 42(4):382–388, ISSN 0308-0110, 1365-2923, URL http://dx.doi.org/10.1111/j.1365-2923.2007.02971.x.

Wenger E (1999) *Communities of Practice: Learning, Meaning, and Identity* (Cambridge University Press), ISBN 978-0-521-66363-2.

Wenger E (2000) Communities of Practice and Social Learning Systems. *Organization* 7(2):225–246, ISSN 1350-5084, 1461-7323, URL http://dx.doi.org/10.1177/135050840072002.

Wenger EC, Snyder WM (2000) Communities of practice: The organizational frontier. *Harvard Business Review* 78(1):139–146.

White DL, Froehle CM, Klassen KJ (2011) The Effect of Integrated Scheduling and Capacity Policies on Clinical Efficiency: Integrated Scheduling and Capacity Policies. *Production and Operations Management* 20(3):442–455, ISSN 10591478, URL http://dx.doi.org/10.1111/j.1937-5956.2011.01220.x.

Wolff AM, Taylor SA, McCabe JF (2004) Using checklists and reminders in clinical pathways to improve hospital inpatient care. *Medical Journal of Australia* 181(8):428–31.

Wooldridge JM (2012) *Introductory Econometrics: A Modern Approach* (Mason, OH: South-Western Cengage Learning), fifth edition, ISBN 1-111-53104-8 978-1-111-53104-1.

Woolley AW, Aggarwal I, Malone TW (2015) Collective Intelligence and Group Performance. *Current Directions in Psychological Science* 24(6):420–424, ISSN 0963-7214, 1467-8721, URL http://dx.doi.org/10.1177/0963721415599543.

Woolley AW, Chabris CF, Pentland A, Hashmi N, Malone TW (2010) Evidence for a Collective Intelligence Factor in the Performance of Human Groups. *Science* 330(6004):686–688, ISSN 0036-8075, 1095-9203, URL http://dx.doi.org/10.1126/science.1193147.

Xu R, Carty MJ, Orgill DP, Lipsitz SR, Duclos A (2013) The Teaming Curve A Longitudinal Study of the Influence of Surgical Team Familiarity on Operative Time. *Annals of Surgery* 258(6):953–957, ISSN 0003-4932, URL http://dx.doi.org/10.1097/SLA.0b013e3182864ffe.

Yuan CT, Pronovost PJ, Marsteller JA (2018) Harnessing the Power of Peer Influence to Improve Quality. *American Journal of Medical Quality* 33(5):549–551, ISSN 1062-8606, 1555-824X, URL http://dx.doi.org/10.1177/1062860618769158.

Zacharias C, Pinedo M (2014) Appointment Scheduling with No-Shows and Overbooking. *Production and Operations Management* 23(5):788–801, URL http://dx.doi.org/10.1111/poms.12065.

Zaheer A, Soda G (2009) Network Evolution: The Origins of Structural Holes. *Administrative Science Quarterly* 54(1):1–31, ISSN 0001-8392, 1930-3815, URL http://dx.doi.org/10.2189/asqu.2009.54.1.1.

Zhang ZX, Hempel PS, Han YL, Tjosvold D (2007) Transactive memory system links work team characteristics and performance. *Journal of Applied Psychology* 92(6):1722–1730, ISSN 0021-9010, URL http://dx.doi.org/10.1037/0021-9010.92.6.1722.

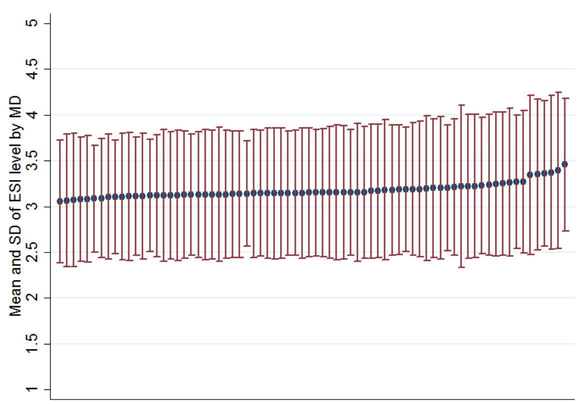
Online Supplement

A. Checking for Round-Robin Assignment of Patients to Provider Teams

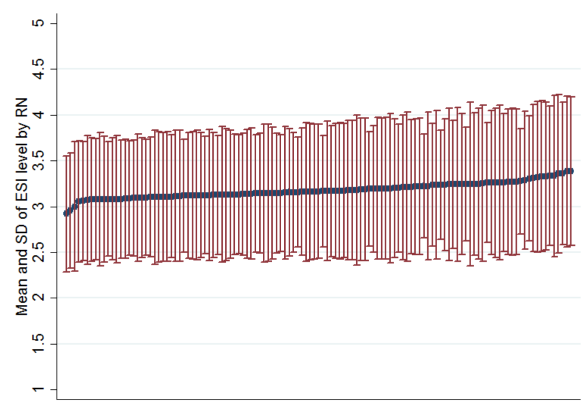
Metro ED reports using a round-robin assignment policy to assign patients to provider teams. In this section, we use the data from Metro ED to assess whether this seems to be the case.

An important way in which a violation of the round robin assignment policy would manifest is through variation across attendings, nurses, and residents in the severity of patients. We examine whether this is the case by plotting the mean and standard deviation of the ESI levels of patients assigned to each attending, each nurse, and each resident, respectively. As seen in Figure A.1, we find that the mean ESI level of assigned patients is 3 for each attending. There is no meaningful difference across attendings in either the mean or the distribution of patients' ESI levels. This pattern is also consistent when looking at the distribution of ESI levels of patients assigned to each nurse and each resident.

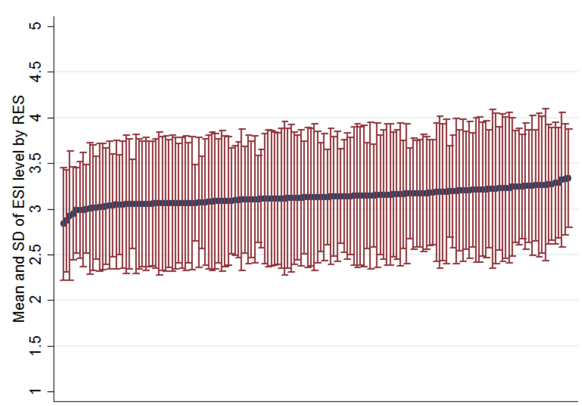
Figure A.1 Distribution of ESI level by attending, nurse, and resident



(a) ESI level by attending



(b) ESI level by nurse



(c) ESI level by resident

Note. The blue dots indicate the mean ESI level of all patients assigned to each provider. The bars depict the interval captured within two standard deviations of the mean.

B. Additional Tables and Figures

Table B.1 Sample selection

Sample	Observations	% prior	% initial
All ED admissions in three years of available data	178,841	N/A	100.0
Excluding first year of available data	120,304	67.3	67.3
Excluding age < 18 or missing age	120,119	99.8	67.2
Excluding those with missing gender	120,112	100.0	67.2
Excluding those with missing attending identifier	120,043	99.9	67.1
Excluding those with missing nurse identifier	119,924	99.9	67.1
Excluding those treated by a attending with < 50 cases in the three years	119,760	99.9	67.0
Excluding those treated by a nurse with < 50 cases in the three years	119,614	99.9	66.9
Excluding those who died in the ED	119,395	99.8	66.8
Excluding transfers	119,335	99.9	66.7
Excluding those who left without being seen	114,245	95.7	63.9
Excluding those with ESI level 1	113,733	99.6	63.6
Excluding those with time to disposition values less than the 1^{st} percentile or greater than the 99^{th} percentile value	111,491	98.0	62.3

Table B.2 Effects of team familiarity and partner exposure on logged time to disposition, including coefficients for all control variables

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0026***	-0.0020***	-0.0017***	-0.0016***	-0.0016***	-0.0015***	-0.0013***	-0.0013***	-0.0012***	-0.0011***	-0.0011***	-0.0010***
	(0.0005)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Team familiarity between ATT and RES	0.0002	-0.0000	0.0000	-0.0000	-0.0000	-0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	-0.0002	-0.0003	-0.0003	-0.0003	-0.0003	-0.0002	-0.0000	-0.0002	-0.0001	-0.0002	-0.0002	-0.0002
	(0.0008)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
ATT's partner exposure to NURs	0.0007	-0.0006	-0.0006	-0.0004	-0.0012*	-0.0007	-0.0012*	-0.0012*	-0.0012*	-0.0012*	-0.0015**	-0.0014**
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
ATT's partner exposure to RESs	-0.0001	0.0015*	0.0009	0.0006	0.0015**	0.0008	0.0012*	0.0013*	0.0011^{+}	0.0010^{+}	0.0012*	0.0011^{+}
	(0.0008)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)
NUR's partner exposure to ATTs	0.0004	0.0008	0.0008	0.0008	0.0006	0.0013^{+}	0.0021**	0.0025***	0.0022**	0.0019**	0.0017*	0.0016*
	(0.0007)	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
NUR's partner exposure to RESs	0.0011	0.0010^{+}	0.0012*	0.0014**	0.0017***	0.0012*	0.0008	0.0006	0.0009*	0.0011*	0.0013**	0.0012**
	(0.0007)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
RES's partner exposure to ATTs	0.0032***	0.0030***	0.0034***	0.0038***	0.0030***	0.0031***	0.0023**	0.0018*	0.0021**	0.0024**	0.0018*	0.0017*
	(0.0009)	(0.0008)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0009)
RES's partner exposure to NURs	-0.0021***	-0.0026***	-0.0027***	-0.0034***	-0.0032***	-0.0033***	-0.0028***	-0.0028***	-0.0030***	-0.0033***	-0.0031***	-0.0031***
	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Age	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Female	0.0325***	0.0325***	0.0326***	0.0327***	0.0326***	0.0326***	0.0325***	0.0326***	0.0325***	0.0325***	0.0326***	0.0326***
	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)
ESI level 3	0.0316***	0.0317***	0.0316***	0.0315***	0.0312***	0.0313***	0.0312***	0.0312***	0.0312***	0.0310***	0.0310***	0.0309***
	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)
ESI level 4	-0.1854***	-0.1852***	-0.1854***	-0.1855***	-0.1860***	-0.1858***	-0.1858***	-0.1857***	-0.1856***	-0.1858***	-0.1859***	-0.1861***
	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)
ESI level 5	-0.4639***	-0.4632***	-0.4637***	-0.4642***	-0.4643***	-0.4641***	-0.4639***	-0.4640***	-0.4642***	-0.4643***	-0.4643***	-0.4641***
	(0.0115)	(0.0115)	(0.0115)	(0.0115)	(0.0115)	(0.0115)	(0.0115)	(0.0115)	(0.0115)	(0.0115)	(0.0115)	(0.0115)
Second nurse present	0.3130***	0.3133***	0.3136***	0.3138***	0.3140***	0.3141***	0.3143***	0.3144***	0.3148***	0.3148***	0.3149***	0.3147***
	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)
ATT current workload	-0.0137***	-0.0137***	-0.0137***	-0.0137***	-0.0136***	-0.0136***	-0.0136***	-0.0136***	-0.0136***	-0.0136***	-0.0136***	-0.0136***
	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)
(ATT current workload)^2	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
NUR current workload	-0.0492***	-0.0491***	-0.0490***	-0.0490***	-0.0492***	-0.0492***	-0.0492***	-0.0492***	-0.0492***	-0.0493***	-0.0492***	-0.0492***
	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)
(NUR current workload)^2	0.0040***	0.0040***	0.0040***	0.0040***	0.0040***	0.0040***	0.0040***	0.0040***	0.0040***	0.0040***	0.0040***	0.0040***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
RES current workload	-0.0171***	-0.0166***	-0.0168***	-0.0166***	-0.0164***	-0.0164***	-0.0164***	-0.0163***	-0.0162***	-0.0160***	-0.0160***	-0.0159***
	(0.0036)	(0.0037)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)
(RES current workload)^2	0.0027***	0.0027***	0.0027***	0.0027***	0.0027***	0.0027***	0.0027***	0.0027***	0.0027***	0.0027***	0.0027***	0.0027***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
ATT experience	-0.0000	-0.0000	-0.0000	0.0000	-0.0000	0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
NUR experience	0.0001***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
RES experience	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000**	-0.0000**	-0.0000**	-0.0000*	-0.0000^{+}
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ED census	0.0110***	0.0110***	0.0110***	0.0110***	0.0110***	0.0110***	0.0110***	0.0110***	0.0110***	0.0110***	0.0110***	0.0110***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Time since ATT shift start	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Observations	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491	111491
R^2	0.1852	0.1854	0.1855	0.1858	0.1860	0.1861	0.1861	0.1863	0.1864	0.1865	0.1866	0.1866

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown are fixed effects for arrival hour of day, arrival day of week, arrival year-month, attending, nurse, and resident. ESI level 2 is omitted as base categories. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Table B.3 Effects of team familiarity and partner exposure on logged time to disposition using an alternate sample including outliers

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0028***	-0.0022***	-0.0018***	-0.0018***	-0.0017***	-0.0017***	-0.0015***	-0.0015***	-0.0014***	-0.0013***	-0.0012***	-0.0012***
	(0.0005)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Team familiarity between ATT and RES	0.0000	-0.0001	-0.0001	-0.0001	-0.0000	-0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001
	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	-0.0001	-0.0003	-0.0003	-0.0004	-0.0004	-0.0002	-0.0001	-0.0002	-0.0001	-0.0002	-0.0002	-0.0002
	(0.0008)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)
ATT's partner exposure to NURs	0.0008	-0.0006	-0.0004	-0.0002	-0.0011*	-0.0005	-0.0011+	-0.0011+	-0.0012*	-0.0013*	-0.0015**	-0.0013*
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)
ATT's partner exposure to RESs	-0.0002	0.0015*	0.0006	0.0003	0.0014*	0.0006	0.0012+	0.0012*	0.0011+	0.0011+	0.0013*	0.0010+
	(0.0008)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
NUR's partner exposure to ATTs	0.0003	0.0011	0.0011+	0.0011	0.0011	0.0018*	0.0025***	0.0031***	0.0024**	0.0019*	0.0016*	0.0015*
	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
NUR's partner exposure to RESs	0.0015*	0.0011+	0.0014*	0.0015**	0.0017**	0.0012*	0.0008	0.0006	0.0011*	0.0014**	0.0015***	0.0015***
	(0.0008)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)
RES's partner exposure to ATTs	0.0035***	0.0033***	0.0035***	0.0041***	0.0032***	0.0030***	0.0021**	0.0017*	0.0020*	0.0024**	0.0019*	0.0017+
	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
RES's partner exposure to NURs	-0.0023***	-0.0027***	-0.0027***	-0.0035***	-0.0034***	-0.0033***	-0.0028***	-0.0028***	-0.0031***	-0.0035***	-0.0033***	-0.0033***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
N	113718	113718	113718	113718	113718	113718	113718	113718	113718	113718	113718	113718
R^2	0.1983	0.1986	0.1987	0.1990	0.1992	0.1993	0.1993	0.1995	0.1996	0.1998	0.1998	0.1999

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Table B.4 Effects of team familiarity and partner exposure on logged time to disposition using an alternate sample including ESI 1

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0026***	-0.0020***	-0.0017***	-0.0016***	-0.0016***	-0.0015***	-0.0013***	-0.0013***	-0.0012***	-0.0011***	-0.0011***	-0.0010***
	(0.0005)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Team familiarity between ATT and RES	0.0002	-0.0000	0.0000	-0.0000	-0.0000	-0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0001
	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0002	-0.0001	-0.0002	-0.0001	-0.0002	-0.0002	-0.0002
	(0.0008)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
ATT's partner exposure to NURs	0.0008	-0.0006	-0.0006	-0.0004	-0.0011*	-0.0006	-0.0012*	-0.0012*	-0.0011*	-0.0011*	-0.0014**	-0.0013**
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
ATT's partner exposure to RESs	-0.0002	0.0015*	0.0009	0.0006	0.0015**	0.0008	0.0013*	0.0013*	0.0010+	0.0009+	0.0012*	0.0010+
	(0.0008)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)
NUR's partner exposure to ATTs	0.0005	0.0009	0.0009	0.0008	0.0006	0.0014*	0.0022**	0.0026***	0.0023**	0.0020**	0.0017*	0.0017*
	(0.0007)	(0.0006)	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
NUR's partner exposure to RESs	0.0010	0.0010+	0.0012*	0.0014**	0.0017***	0.0012*	0.0008	0.0006	0.0009*	0.0011*	0.0012**	0.0012**
	(0.0007)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
RES's partner exposure to ATTs	0.0032***	0.0030***	0.0034***	0.0038***	0.0030***	0.0031***	0.0023**	0.0018*	0.0021*	0.0023**	0.0018*	0.0016+
	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0009)
RES's partner exposure to NURs	-0.0021***	-0.0026***	-0.0026***	-0.0034***	-0.0031***	-0.0033***	-0.0028***	-0.0027***	-0.0030***	-0.0033***	-0.0030***	-0.0030***
	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
N	111986	111986	111986	111986	111986	111986	111986	111986	111986	111986	111986	111986
R^2	0.1847	0.1849	0.1850	0.1853	0.1855	0.1856	0.1856	0.1857	0.1859	0.1860	0.1860	0.1861

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Table B.5 Effects of team familiarity and partner exposure on logged time to disposition using an alternate sample excluding cases with second nurse

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0028***	-0.0022***	-0.0018***	-0.0019***	-0.0018***	-0.0018***	-0.0017***	-0.0015***	-0.0014***	-0.0014***	-0.0013***	-0.0012***
	(0.0006)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)
Team familiarity between ATT and RES	0.0005	0.0002	0.0002	0.0002	0.0001	-0.0000	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002
	(0.0006)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	-0.0003	-0.0004	-0.0008	-0.0008	-0.0009*	-0.0008*	-0.0006	-0.0007+	-0.0005	-0.0006+	-0.0006*	-0.0006*
	(0.0010)	(0.0007)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
ATT's partner exposure to NURs	0.0010	-0.0004	-0.0004	-0.0004	-0.0011+	-0.0007	-0.0009	-0.0009	-0.0009	-0.0010	-0.0007	-0.0012+
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)
ATT's partner exposure to RESs	-0.0002	0.0016*	0.0010	0.0009	0.0016*	0.0010	0.0012+	0.0011	0.0009	0.0009	0.0005	0.0009
	(0.0010)	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
NUR's partner exposure to ATTs	0.0020*	0.0012	0.0017*	0.0016+	0.0010	0.0018*	0.0029**	0.0036***	0.0030**	0.0028**	0.0026**	0.0025**
	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
NUR's partner exposure to RESs	-0.0003	0.0005	0.0000	0.0001	0.0006	0.0000	-0.0007	-0.0010+	-0.0005	-0.0002	-0.0000	-0.0000
	(0.0009)	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)
RES's partner exposure to ATTs	0.0033**	0.0039***	0.0038***	0.0042***	0.0030**	0.0033***	0.0023*	0.0019+	0.0025*	0.0025*	0.0023*	0.0023*
	(0.0011)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0011)	(0.0011)
RES's partner exposure to NURs	-0.0022**	-0.0034***	-0.0033***	-0.0040***	-0.0034***	-0.0038***	-0.0032***	-0.0032***	-0.0037***	-0.0039***	-0.0038***	-0.0039***
	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
N	71015	71015	71015	71015	71015	71015	71015	71015	71015	71015	71015	71015
R^2	0.1691	0.1694	0.1694	0.1698	0.1700	0.1702	0.1703	0.1705	0.1705	0.1707	0.1708	0.1709

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Table B.6 Effects of team familiarity and partner exposure on logged time in ED

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0035***	-0.0027***	-0.0023***	-0.0022***	-0.0021***	-0.0019***	-0.0017***	-0.0017***	-0.0016***	-0.0015***	-0.0014***	-0.0014***
	(0.0005)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Team familiarity between ATT and RES	0.0004	-0.0002	0.0001	0.0001	0.0001	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003+	0.0003
	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	-0.0010	-0.0013*	-0.0010*	-0.0008+	-0.0008*	-0.0007*	-0.0005+	-0.0005+	-0.0004	-0.0005+	-0.0005*	-0.0005*
	(0.0008)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
ATT's partner exposure to NURs	0.0009+	-0.0003	-0.0005	-0.0005	-0.0012*	-0.0005	-0.0012*	-0.0015**	-0.0013*	-0.0013*	-0.0015**	-0.0011*
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
ATT's partner exposure to RESs	-0.0003	0.0015*	0.0011+	0.0010+	0.0018**	0.0010+	0.0015**	0.0019***	0.0015**	0.0014*	0.0015**	0.0010+
	(0.0008)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
NUR's partner exposure to ATTs	0.0016*	0.0013*	0.0013+	0.0007	0.0013+	0.0024***	0.0028***	0.0029***	0.0026***	0.0020**	0.0014+	0.0017*
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
NUR's partner exposure to RESs	0.0006	0.0012*	0.0013*	0.0019***	0.0017***	0.0009+	0.0007	0.0008+	0.0011*	0.0016***	0.0019***	0.0017***
	(0.0007)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
RES's partner exposure to ATTs	0.0031***	0.0027***	0.0031***	0.0034***	0.0026***	0.0028***	0.0019*	0.0013	0.0015+	0.0018*	0.0020*	0.0018*
	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0009)	(0.0009)
RES's partner exposure to NURs	-0.0017**	-0.0019***	-0.0023***	-0.0028***	-0.0026***	-0.0029***	-0.0023***	-0.0020***	-0.0022***	-0.0025***	-0.0027***	-0.0026***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
N	111489	111489	111489	111489	111489	111489	111489	111489	111489	111489	111489	111489
R^2	0.3159	0.3162	0.3163	0.3166	0.3168	0.3169	0.3168	0.3170	0.3171	0.3173	0.3174	0.3173

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Table B.7 Effects of team familiarity and partner exposure on logged time from first provider to disposition

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0028***	-0.0021***	-0.0017***	-0.0016***	-0.0016***	-0.0015***	-0.0014***	-0.0013***	-0.0012***	-0.0012***	-0.0011***	-0.0011***
	(0.0005)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Team familiarity between ATT and RES	0.0003	0.0001	0.0001	0.0000	0.0000	-0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between NUR and RES	0.0001	-0.0001	-0.0002	-0.0002	-0.0002	-0.0001	0.0001	-0.0000	0.0000	-0.0001	-0.0001	-0.0001
	(0.0009)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)
ATT's partner exposure to NURs	0.0009+	-0.0006	-0.0006	-0.0004	-0.0012*	-0.0007	-0.0012*	-0.0013*	-0.0013*	-0.0013*	-0.0016**	-0.0014**
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)
ATT's partner exposure to RESs	-0.0003	0.0015*	0.0009	0.0006	0.0015*	0.0007	0.0012+	0.0014*	0.0012+	0.0011+	0.0013*	0.0011+
	(0.0008)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
NUR's partner exposure to ATTs	0.0006	0.0010	0.0010	0.0009	0.0007	0.0014+	0.0022**	0.0026***	0.0023**	0.0021**	0.0018*	0.0018*
	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
NUR's partner exposure to RESs	0.0010	0.0010+	0.0012*	0.0014**	0.0017***	0.0013*	0.0008	0.0007	0.0010*	0.0012*	0.0013**	0.0013**
	(0.0008)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)
RES's partner exposure to ATTs	0.0032***	0.0030***	0.0034***	0.0038***	0.0029***	0.0030***	0.0022**	0.0017*	0.0020*	0.0023*	0.0018+	0.0016+
	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
RES's partner exposure to NURs	-0.0022***	-0.0026***	-0.0027***	-0.0035***	-0.0032***	-0.0033***	-0.0028***	-0.0027***	-0.0030***	-0.0033***	-0.0030***	-0.0030***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
N	111481	111481	111481	111481	111481	111481	111481	111481	111481	111481	111481	111481
R^2	0.1835	0.1836	0.1837	0.1840	0.1842	0.1843	0.1843	0.1844	0.1845	0.1847	0.1847	0.1847

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Table B.8 Effects of team familiarity and partner exposure on logged time from disposition to departure using sample limited to patients who were discharged

Length of lookback window	(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months	(7) 7 months	(8) 8 months	(9) 9 months	(10) 10 months	(11) 11 months	(12) 12 months
Team familiarity between ATT and NUR	-0.0020**	-0.0015**	-0.0015***	-0.0014***	-0.0015***	-0.0014***	-0.0010***	-0.0009***	-0.0009***	-0.0009***	-0.0008***	-0.0008***
	(0.0007)	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Team familiarity between ATT and RES	0.0004	0.0007	0.0004	0.0007	0.0006	0.0003	0.0003	0.0003	0.0004	0.0003	0.0002	0.0003
	(0.0008)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)
Team familiarity between NUR and RES	-0.0007	-0.0006	-0.0006	-0.0004	-0.0003	-0.0003	-0.0003	-0.0004	-0.0003	-0.0003	-0.0003	-0.0003
	(0.0012)	(0.0009)	(0.0007)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0003)
ATT's partner exposure to NURs	0.0011	0.0003	-0.0009	-0.0012	-0.0014+	-0.0005	-0.0000	-0.0007	-0.0015+	-0.0013	-0.0014+	-0.0010
	(0.0008)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
ATT's partner exposure to RESs	0.0003	0.0012	0.0022*	0.0019*	0.0020*	0.0008	-0.0000	0.0010	0.0018*	0.0017+	0.0019*	0.0012
	(0.0012)	(0.0010)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
NUR's partner exposure to ATTs	0.0026*	0.0022*	0.0026*	0.0019+	0.0015	0.0016	0.0012	0.0013	0.0014	0.0009	0.0011	0.0015
	(0.0011)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
NUR's partner exposure to RESs	-0.0009	-0.0003	-0.0007	0.0000	0.0004	0.0001	0.0003	0.0002	0.0003	0.0007	0.0007	0.0004
	(0.0011)	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)
RES's partner exposure to ATTs	-0.0010	-0.0018	-0.0018	-0.0009	-0.0008	-0.0007	0.0001	-0.0007	-0.0004	-0.0006	-0.0003	-0.0004
	(0.0014)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0014)	(0.0014)
RES's partner exposure to NURs	0.0014	0.0012	0.0010	-0.0000	0.0002	-0.0001	-0.0006	-0.0003	-0.0005	-0.0003	-0.0004	-0.0004
	(0.0010)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
N	85348	85348	85348	85348	85348	85348	85348	85348	85348	85348	85348	85348
R^2	0.0993	0.0993	0.0993	0.0994	0.0994	0.0994	0.0993	0.0993	0.0993	0.0994	0.0994	0.0993

Notes. ATT=Attending. NUR=Nurse. RES=Resident. Columns (1)–(12) are log-linear regression models estimated at the encounter level. Controls not shown include age, gender, ESI level, second nurse presence, time since attending shift start, arrival hour-of-day, arrival day of week, arrival year-month, attending current workload and its squared term, nurse current workload and its squared term, resident current workload and its squared term, attending experience, nurse experience, resident experience, attending fixed effects, nurse fixed effects, and resident fixed effects. Standard errors (in parentheses) are clustered by attending-nurse-resident teams. $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.